Université Paris 13

Doctoral School **Erasme**

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Thesis defended by **Luis REYES**

Defended on ⟨*date de la soutenance*⟩

In order to become Doctor from Université Paris 13

Academic Field **Economics**

Speciality **Macroeconomics**

Thesis Title

Economic Policy and Income Distribution

The case of France since the early 1970s

Committee members

Referees	Edwin Le Heron	Maître de Conférences HDR Sciences-Po Bordeaux
	Olivier Brossard	Professeur Sciences-Po Toulouse
Examiners	Alain Sand	Professeur Émérite Université Lyon 2
	Cédric Durand	Maître de Conférences HDR Université Paris 13
Supervisor	Jacques Mazier	Professeur Émérite Université Paris 13

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École doctorale **Erasme**

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Politique Économique et Répartition du Revenu

Le cas de la France depuis le début des années 1970

Composition du jury

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Keywords: economic policy, income distribution, capital structure, stock-flow

Mots clés : politique économique, répartition du revenu, structure du capital, stock-flux

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To Emmanuelle

To my family

To the victims of neoliberalism

...that the market prices assets efficiently is close to being an article of faith among finance economists.

Fischer and Merton 1984, p. 48

Acknowledgments

The present work is far from being the sole product of my own work and/or my own ideas. I have learned from many economists and non-economists to be a better researcher, teacher and person ever since I began studying at *UNAM*. Some of these ’life-lecturers’ are no longer around, others arrived, and more will come. Most importantly, what is left is a feeling of satisfaction of having met them all and having learned from them, with the hope that they have also learned something with and/or from myself.

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Economic Policy and Income Distribution
The case of France since the early 1970s

Abstract

The core of our analysis of the French economy concerns the supremacy of interest rates and government spending as policy instruments in this economy. With the strong increase in interest rates at the beginning of the 1980s, non-financial firms started to demand less credit, whereas French households and other developing economies demanded more. Parallel to these developments, bulls became more abundant in stock markets, the unemployment rate soared and a full process of liberalization ensued. We analyze the consequences of this financialization process and some feasible scenarios in France by means of a Cowles Commission-type model that is in turn based on the stock-flow literature. Particular emphasis is given to distributive and fiscal variables. The model's results indicate that (given that French firms are caught in a liquidity trap) the interest rate has lost its power as a policy variable. In contrast, public spending has an important expansionary power.

Keywords: economic policy, income distribution, capital structure, stock-flow

Politique Économique et Répartition du Revenu
Le cas de la France depuis le début des années 1970

Résumé

L'idée centrale de notre analyse sur l'économie française concerne la suprématie des taux d'intérêt et des dépenses publiques comme instruments de politique économique. Avec la forte hausse des taux d'intérêt au début des années 1980, les entreprises non financières ont commencé à demander moins de crédit, tandis que les ménages français, ainsi que d'autres économies en voie de développement en ont demandé davantage. Parallèlement à ces développements, les marchés speculatifs ont dominé la bourse, le taux de chômage a augmenté, et un processus de libéralisation a suivi. Nous analysons les conséquences de ce processus de financiarisation et certains scénarios possibles en France, tout en utilisant un modèle de type Cowles Commission, qui est à son tour fondé sur la littérature stock-flux. Une attention particulère est donnée aux variables de répartition et fiscales. Les résultats du modèle indiquent que (étant donné que les entreprises françaises sont prises dans une trappe à liquidité) le taux d'intérêt a perdu son pouvoir comme une variable de politique. En revanche, les dépenses publiques ont une puissance expansionniste importante.

Mots clés : politique économique, répartition du revenu, structure du capital, stock-flux

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Foreword

The reader will note that I have written the previous pages in first person in singular. The remaining of the present work is, in contrast, written in first person in plural. This is done in order to hopefully (1) avoid making comments look like the product of my own invention (thus needlessly arrogant), and (2) pay tribute to those who have contributed in shaping my ideas (for a sample list see the Acknowledgments above). Clearly, I am solely responsible for what is written in the next four hundred pages or so.

Beyond this 'style' issue, *we* would like to start with an old ideological debate that is still going on at the moment. This debate is of particular importance not because it touches upon economic policy issues as such (it does not), but rather because it touches upon the practice of empirical economics; the ultimate guide to economic policy. Naturally, arguments for and against a given economic policy are set forth by social scientists all the time, but what ultimately *matters* (at least for actual policymaking) is their empirical verification, which is in turn a matter of technicalities rather than of scientific meaningfulness as such.

To take a concrete example, Joshua Angrist and Jörn Pischke's article "The credibility revolution in empirical economics: how better research design is taking the con out of econometrics" (Angrist and Pischke 2010) make strong statements with which people like Christopher Sims (and *our*selves) disagree. Despite the fact that in A&P "[t]he views expressed (...) are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research" (the organism publishing the working paper version), it must be noted that public opinion is shaped by the views of so-called experts, independently of whether these are (or not) in accordance with those of the publisher, be it peer-reviewed or otherwise. However, since not all experts agree with one other (i.e. because there are competing schools of thought, particularly numerous in economics), the validity of the views set forth by them often depend on methodological aspects that are out of the reach of public opinion.

In this sense, experts are opinion leaders, and their views (whether right or wrong) are often used for politically motivated agendas, and even for so-called 'scientific revolutions'. The second chapter of the present work deals with the former. As for the latter, a word about 'credibility' of economics is in order.

It is not uncommon to hear/read (in the newspapers, on TV, on the radio or even in specialized journals) that economics is the hardest of soft (social) sciences[1], namely be-

[1] We do not agree with this comparison. We believe economics is a discipline that deserves further understanding, rather than an apparent "absolute consensus", as is the current case with, say, medicine

cause of its resemblance to physics (at least as far as the use of mathematics is concerned). Nevertheless, it is also quite common to hear/read that certain economic policies, however well-defended on theoretical and/or empirical grounds they may be, turn out to be ineffective. Some may call this issue a lack of credibility in the discipline, mainly because with so many contradictory points of view, and with so many assumptions (present in all 'hard' and 'soft' sciences alike) any set of postulates that are rarely fulfilled fit into solid cause and effect empirical studies[2].

This credibility issue was a cause of deep soul-searching in the economics field following the fall from grace of structural econometric models that were commonly used from, roughly speaking, the 1930s to the late seventies[3]. The fact that economic stimulus (as was commonly practiced up to the late seventies) was no longer effective was confused with the fact that the model then used was in fact wrong. As a consequence, according to the dominant ideology back then, the tools used to analyze the economy were likewise wrong. As we understand it, this is the main complaint by Angrist and Pischke.

A&P base most of their examples of what empirical *economic research ought to look like* on applied works that are more closely associated to the microeconomic literature, presumably because the latter "has experienced a credibility revolution, with a consequent increase in policy relevance and scientific impact" (p. 1). In contrast, when it comes to macroeconomics, the authors mention that:

> With the growing focus on research design, it's no longer enough to adopt the language of an orthodox simultaneous equations framework, labeling some variables endogenous and others exogenous, without offering strong institutional or empirical support for these identifying assumptions. The new emphasis on a credibly exogenous source of variation has also filtered down to garden-variety regression estimates, in which researchers are increasingly likely to focus on sources of omitted variables bias, rather than a *quixotic effort to uncover the "true model" generating the data* (p. 15, emphasis added).

Let us focus, if only for a moment, on the words on italics from the previous quotation. Intense epistemological debates concerning the *how* (as opposed to the *why*) in empirical economic research has been focused on whether it *should* be carried out under a deductive (i.e. micro-oriented) or an inductive (i.e. macro-oriented) approach. Deduction (which pretends to go from specific issues to general ones) is no doubt a useful approach for postulating theorems which, however, are most of the time subject to stringent hypotheses. When the latter are not satisfied, these theorems fall apart. On the other hand, the inductive approach (which goes from general to specific issues), in economics at least, attempts to find the *true model*, or rather the so-called *Data Generating Process* underlying a given set of questions to be studied.

We believe deduction and induction are two complementary sides of the same coin and, contrary to what A&P seem to suggest, they are not competing ways of carrying out

(also a social science).

[2]In this sense, we feel closer in spirit to Leamer's critique (which A&P oppose) than to the opinions expressed by the authors concerning the 'credibility revolution'.

[3]See the part "Time, models and ideology" in subsection 2.2.1.

economic analysis. In the present work, while recognizing that omitted variables are an important issue, we attempt to uncover a *quixotic* "true model" for the French economy. However, we do not claim to actually have found "the" one and only model that describes this economy (as A&P misleadingly suggest structural modelers do). Instead, what we attempt is to provide *one* form of evidence based on economic history and theory (chapter 1), theoretical ideas that help explaining this historical evidence and other regularities (chapter 2), a model that contains several theoretical ideas based on the former (chapter 3), a system of equations that fits an empirical model that aims at explaining the French economy (chapter 4), a set of estimates that give meaningfulness to the postulates of the model (chapter 5), as well as a set of alternative scenarios and policy recommendations based on the former (chapter 6).

The debate about what *empirical research ought to look like* is open, and this is a good thing. We believe that sharing ideas and points of view (however contradictory these might be, and as long as they are kept under realistic assumptions) is no doubt a good thing. In contrast, we are confident that intellectual autism, indoctrination and sectarianism is what is keeping economics from evolving at a decent pace.

Summary

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Introduction

Over the past four decades there have been important changes in the global financial configuration, which in turn have dire consequences for the real side of the economy. Output growth rates and standards of living have overall deteriorated, at the same time that the unemployment rate soared despite the celebrated achievement of price stability. During the same period interest rates, exchange rates, labor markets and capital accounts were liberalized worldwide[4]. This liberalization process might be seen as a success by some (clearly, those who have benefited from it), as a failure by others (those who either lost from it or see it as unfair), or as having provided mixed results. One of the (apparent) successes of such process is that it has no doubt achieved its goal of providing the maximum level of profit for not-so-irrational utility- and profit-maximizers, most of which are oligopolistic multinational financial and non-financial firms. Unfortunately, however, liberalization did not bring about an equivalent maximum of welfare for society as a whole, and in turn widened income and wealth inequalities.

The previous conclusion may be interpreted in at least two ways. The first is that, if liberalization did not lead to Pareto optimality (often believed as being the result of all economic agents selfishly pursuing utility- and profit-maximization ends), then it was not the *right* agenda to pursue[5]. Accepting this idea could be interpreted as recognition of the fact that liberalization was not the adequate *aim* for achieving maximal social welfare, though this would not reject the idea that the economic (thus social) interaction of selfish individuals pursuing utility and profit maximization irresistibly leads to the most desired aggregate outcome of maximal welfare system-wide. Yet a second interpretation would be that neither liberalization was successful at providing the maximum welfare for all

[4]With the important exception of major economic powers like China, Russia and India, that have gone through a rather moderate (or slow motion) process of liberalization. For the Chinese case see Elliot and Yan 2013, for the case of India, see IMF 2013 and for the Russian case see IMF 2014a.

[5]Our wording may be a bit confusing, given that Pareto optimality refers to *efficiency*, rather than to *inequality*. However, what we want to stress here is that, if efficiency was or has in fact been reached, this does not seem optimal to us, in the sense that inequalities persist. Thanks to Cristian Frasser for pointing this out.

(in any case, the outcome was the opposite[6]) nor is the aggregate confluence of selfish individuals capable of bringing about the maximum level of economic well-being for all.

Now, sticking to the second interpretation and focusing on the economic arguments rather than on the philosophical ones, we intend to explain which were the *major* economic policies that supported this liberalization process in France, as well as their direct and indirect influences on the real side of the French economy. Our explanation (that is, the current thesis) is made up of two parts divided in six chapters.

The first part of our work is the stylized facts presented in chapter 1, the literature review presented in chapter 2, and a simulated stock-flow model presented in chapter 3 (published in *Revue de la Régulation*, see Reyes and Mazier 2014. Our analysis in these three chapters is based on major historical economic events (rather than on particular ones) and their importance in determining the fate of the French economy which, according to our line of arguments, went from pursuing maximum employment (despite high inflation) to aiming at the lowest achievable level of inflation (coupled with low growth rates and record high unemployment rates). Accordingly, movements in interest rates have been the main instrument used by central banks to steer the economy[7] (for good or otherwise), which in turn had important mutually reinforcing consequences in the real and financial sides of the world economy.

As mentioned above, chapter 1 focuses on the main stylized facts, with a strong

[6]One may argue that societies are better off nowadays than, say, forty years ago because wealth has accumulated over time and conditions have improved for all. This is partially accurate at best. Younger generations tend to look after better living standards. However, it is doubtful that the rate of progress and opportunities at which this improvement has taken place has been the same for all income and wealth brackets. For instance, as will be argued in chapter 1, the taming of the price level has benefited wealth owners, whereas it has left out of the labor force a larger proportion of the population than before the *Great Moderation* took force, at the same time that high land prices have made home-buying more expensive for middle and low classes. It must also be noted that inequalities are more important than at the end of the *Trente Glorieuses*.

[7]By this we do not mean to underestimate/undermine the role of other important policy instruments, like exchange rates, spreads, taxes or government spending. We recognize that other policy instruments (like the ones just described) play no minor role in a given modern capitalist economy. However, we (just as Keynes did in his *General Theory of Employment, Interest and Money*) suggest that the interest rate has been the *main* policy instrument around which other instruments revolve. This is so because movements of such instrument lead to changes in financial and current accounts, that is, in the financial and real sides of the economy simultaneously. This applies both at domestic and international levels. It is not uncommon that (say) high interest rates benefits some institutional sector or agent at the expense of another. For instance, higher-than-before interest rates on loans benefit holders of financial instruments such as loans (i.e. banks), whereas this has a negative effect on the balance sheet of the issuing agent (i.e. a firm or a household). On the international side, if such rise in loan interest rates is not matched by a rise in the same rate in other competing economies, and if the capital account of this country is open, then international lenders may wish to benefit from these rates and lend in the corresponding economy, in this way leading to capital inflows. Thus, what benefits national and foreign holders of debt (i.e. the increase in the interest rate), has the potential to discourage domestic investment. The magnitude of inflation reinforces these trends.

focus on economic policy and theoretical discussions. Chapter 2 provides the theoretical backbone of our work, which is in turn divided into three parts: a review of some of the main works by Keynes and Kalecki, the demand regimes literature and on income distribution, as well as the stock-flow (or portfolio theory) and modeling literature. Since the subject-matter of the current thesis is rather large, and also given that the discussion is followed by a macro-econometric model, the literature review is likewise abundant. Indeed, it goes from conjunctural analyses particular to the French economy, to data management techniques.

Chapter 3 is a reprint of the article *Financialized Growth Regime: Lessons from Stock-Flow Consistent Models*, co-authored with (and originally written under the supervision of) Jacques Mazier[8], and consists of a simulated model that takes arbitrary initial and parameter values. The inclusion of this model is intended to provide the reader with an example of how stock-flow consistent models work and of their usefulness and limitations.

The second part of the present work (chapters 4 to 6) consists of a Cowles Commission-type structural model (inspired also by the work of Godley and Lavoie 2007) that is then used for prospective experiments from which a set of economic policy proposals derive. We tried to make the model as detailed as possible so that it is familiar to economists with a Keynesian approach and, more particularly, from the post-Keynesian school. The model consists of roughly 200 equations, in turn divided into behavioral equations, accounting identities and ratios, with behavioral equations being in line with what we consider standard Kaleckian/Keynesian specifications, and they are useful in explaining the process of financialization into which the French economy gradually (though somehow quickly) entered.

Chapter 4 presents our empirical Stock-Flow Consistent (SFC) model, which aims at analytically integrating the most important macroeconomic fundamentals in the French economy since 1979[9] following the theoretical teachings of Keynes and Kalecki (upon the works of whom our own relies heavily) and their followers[10]. The fifth chapter presents the estimation of the behavioral equations used in the empirical exercise that put to test the analytical framework set forth in the previous chapter. Each specification

[8]This work was actually the result of an internship before the beginning of my first year of studies in Paris 13.

[9]As will be seen in this part, the period under analysis was restricted by data availability stemming from the financial accounts, which unfortunately are only available since 1978.

[10]"[I]t is Keynes' *Gestalt*-conception of how a modern capitalist economy works, and not 'what he really said', that we ultimately want to grasp. There is an obvious difference between the two: the task of distilling a logically consistent model from a coherent 'Vision' is an extremely difficult one. *To communicate such a vision, with the help of a model, in both an accurate and convincing manner is perhaps even more difficult*" Leijonhufvud 1968, p. 10, italics added.

was estimated following a two-step procedure, with the first step being a restricted Vector Autoregressive (or Vector Error Correction) model, and the second being an Error Correction Model, normally a re-parameterization of the former. It is the latter set of estimated equations which are included in the estimations that use quarterly data. Finally, the sixth chapter shows the results of the model, together with its properties, some scenarios, some policy implications and proposals.

Our analysis, sketched in chapter 1, can be roughly summarized as follows. Following the imposition of the Washington Consensus in 1971 (the so-called Nixon shock[11]), exchange rates were allowed to float. Since this implied a depreciation of the dollar, and given that the profits of oil exporting countries (most of them members of the OPEC[12]) were denominated in dollars, this is likely to have created discomfort for these member countries[13]. As a consequence, two major oil shocks (the Arab oil embargo in 1973 and the outbreak of the Iranian Revolution in 1979) took place. Up to then the major economic problem had been mainly the prevalence of high inflation rates virtually in every economy in the Western world (but more so in oil-importing countries), directly the consequence of high costs of production (clearly affected by the cost of transportation, in turn influenced by the oil shock, although this was also aided by the inflationary stance the economic authorities were following).

The policy response against this world-wide inflation problem came in 1979 from the then newly elected Federal Reserve chairman Paul Volcker, who decided to raise interest rates in order to tame prices[14]. With the sudden and lasting increase in interest rates in the United States, other central banks (mainly from other industrialized nations, which clearly had close financial ties with the U.S.) followed suit, mainly in order to avoid a

[11]That is, when Nixon announced the decision to stop the convertibility of gold to dollars. On this topic, see the first chapter of Graetz 2011.

[12]Organization of the Petroleum Exporting Countries, created in 1960 in Baghdad. According to the official website "OPEC's objective is to co-ordinate and unify petroleum policies among Member Countries, in order to secure fair and stable prices for petroleum producers; an efficient, economic and regular supply of petroleum to consuming nations; and a fair return on capital to those investing in the industry.", see http://www.opec.org/opec_web/en/about_us/24.htm.

[13]By the way, it must be remembered that the oil revenues of these countries goes directly to the government (since oil companies are state-owned) and that this had negative consequences not only for oil tycoons, but also for the welfare state of OPEC citizens. Note also that, as Ghosh (in Flassbeck et al. 2013, p. 148) points out "most late industrializing countries created strongly regulated and even predominantly state-controlled financial markets aimed at mobilizing savings and using the intermediary function of these markets to influence the size and structure of investment". Therefore, the mere fact that these oil companies are run by the government should not be seen as a market imperfection, but rather as a natural consequence of "late industrialization".

[14]It must be noted in passing that former chairman William Miller had stubbornly refused to raise interest rates, ending abruptly his one year tenure at the head of the Fed, mainly due to his failure at taming inflation.

capital flight. Now, focusing particularly in France, with interest rates on credit climbing, investment was strongly curtailed, unemployment soared, inflation and production fell, but perhaps most importantly, firms' demand for credit was severely reduced, which gave the signal for the whole process to start.

With the reduction in the demand for credit by firms, banks reduced their then sky-high interest rates charged on households in order to stay in business[15]. With households issuing massive amounts of debt, interest and mortgage payments increased drastically. Thus, the joint effect of wage compression and high unemployment, negatively weighing on the income side, and of interest and mortgage payments strongly pushing up the expenditure side, made the financing capacity and disposable income of French households deteriorate. As a consequence, two main outcomes resulted from this. On the one hand, since a large part of the income of those left on the workforce (whose numbers were in turn proportionately less than during the *Trente Glorieuses*) was destined to honor debt, and given that several others were left out of the labor market[16], aggregate demand was severely reduced. On the other hand, since credit was then cheaper for households, they were encouraged to invest in real estate during the first half of the eighties, which at the same time made home prices increase importantly by the end of the decade, and once again from 2001 to 2007[17].

Meanwhile, as mentioned above, the demand for credit by firms fell. As a consequence, and according to trade-off theory in finance (see below), a large part of these firms shifted their policy to issuing more equity than debt obligations in order to meet investment needs. Since selling equity requires buyers, bull markets were largely encouraged. This in turn created three major stock price bubbles: the first from 1982 to 1987, the second one throughout the second half of the nineties, and the third from 2003 to 2007. Thus, instability in the stock and real estate markets, coupled with the fall in demand, explain

[15]An alternative, though not contradictory, theory is that lenders also shifted their supply of credit to other parts of the world, i.e. to countries that would later on experience balance of payments imbalances (other European countries, Latin America and Asia mainly).

[16]That is, with the strong increase of the unemployment rate this meant that, compared to the years previous to the 1970s, more people willing and able to work at the given wage cannot find a job.

[17]Clearly, these real estate ups and downs were not nearly as bad as in several English-speaking countries or Spain. For an international comparative of housing bubbles see Girouard, Kennedy, and André 2006. However, as will be seen, these developments in the housing market have been (along with other problems) at the heart of the current crisis in France. It must be noted in passing that, rather than attaching too much weight to a single major event (i.e. the housing bubble) as the cause of the strong degradation in living standards for workers and profitability for firms, we give a much more important weight to long-term (clearly unsustainable and possibly also unanticipated) processes that took place since 1971 in explaining economic trends. Paraphrasing Shiller 2000 (p. 17): "Rome wasn't built in a day, nor was it destroyed by one sudden bolt of bad fortune".

a large part of the volatile nature of private investment in France since the early eighties, with the main driving factor being movements in interest rates[18].

The theoretical aspects of these arguments, as well as some issues concerning the model described in part 2, are discussed in chapter 2. The model is intended to provide some general guidelines for economic policy. Our proposals are in sharp contrast to the policies implemented so far by the current administration, which promotes austerity and inflation targeting, whereas we think that employment (rather than prices) should again be the priority for economic authorities. If instead of aiming at low inflation rates in order to protect the value of property of wealth owners authorities focused on providing the maximum level of employment (as it was the case before 1980s), it would be perhaps natural that delinquency and poverty rates shall fall. It is our contention that the trade-off between welfare for the already rich (as predicated today) and welfare for the poor should tilt towards the latter, so that all income brackets improve their standards of living.

Let us now start with some broad aspects of economic policy in France since the 1970s.

[18]The link between investment and interest rates is hardly new. What is new in our analysis, or so we think, is that our study of the French economy provides a rationale for understanding interest rates and how these have a strong influence above all other policy variables, as well as in what direction these should be kept (of course, down, as Keynes suggested).

Part I

Stylized Facts for France and Economic Theory

Chapter 1

Economic Policy and Income Distribution in France since the early 1970s

There is (...) [a] fundamental inference from our argument which has a bearing on the future of inequalities of wealth; namely, our theory of the rate of interest.
Keynes 1936, p. 374-375.

1.1 Economic Policy in France since the early 1970s

1.1.1 From the collapse of the Bretton Woods system to the Volcker shock

Perhaps one of the main events that illustrates the shift in the policy goals of economic authorities around the world (from maximum employment to minimum inflation) dates back to the collapse of the Bretton Woods system. Under such system –from 1945 to 1971– at a time when the dollar was already the dominant currency (see Eichengreen and Flandreau 2009), central banks around the world accumulated reserves denominated in dollars[1] in order to defend their currency parities in case of need, with the dollar being imperfectly tied to gold, and all currencies in turn tied to the dollar. This particular exchange rate regime is what Gandolfo 2002 (chapter 3) defined as a *limping gold exchange*

[1]Part of these reserves took the form of what are now know as Special Drawing Rights which were "created by the *IMF* in 1969 to supplement the existing official reserves of member countries" (see http://www.imf.org/external/about/sdr.htm).

standard, given that the gold content of the dollar may at some point not correspond to its actual value (thus the term *limping*). This *sui generis* system of fixed exchange rates created an atmosphere of discomfort in certain circles that saw intervention[2] with suspicion. Needles to say, according to market fundamentalists intervention is one of the major enemies of free markets, and free markets are (or should be, following this logic) the ultimate goal pursued by economic policymakers[3].

The fall from grace of Bretton Woods

There is little to no doubt that a financial system based on fixed exchange rates is not perfect[4]. However, this line of thought has led public opinion (usually not very well informed) and several policymakers to pursue foreign policy in the extreme opposite sense[5]. For instance, in an article entitled ’The end of the Bretton Woods System (1972-81)’ the *IMF* mentions that "[b]y the early 1960s, the U.S. dollar’s fixed value against gold, under the Bretton Woods system of fixed exchange rates, was seen as overvalued. A sizable increase in domestic spending on President Lyndon Johnson’s Great Society programs and a rise in military spending caused by the Vietnam War gradually worsened the overvaluation of the dollar" (see http://www.imf.org/external/about/histend.htm).

Another example of the official perception towards the Bretton Woods system is an article by Sandra Kollen Ghizoni from the Federal Reserve of Atlanta[6], which says that "[f]rom 1962 until the closing of the US gold window in August 1971, the Federal Reserve relied on ’currency swaps’ as its key mechanism for temporarily defending the US gold stock. In March 1962, the Federal Reserve established its first swap line with the Bank of France and by the end of that year lines had been set up with nine central banks (Austria, Belgium, England, France, Germany, Italy, the Netherlands, Switzerland, and Canada). Altogether, the lines provided up to $900 million equivalent in foreign exchange. What started as a small, short-term credit facility grew to be a large, intermediate-term facility

[2]For instance, when central banks buy their own currency in order to keep the exchange rate at a particular level, they intervene. At the same time, of course, they impede the ’natural’ working of markets in setting prices through supply and demand.

[3]Central to our arguments is the idea that central banks have lost power in steering markets since the liberalization process began, but have somehow gained it back after the crisis (more on this below).

[4]The existence of the EMU guarantees that there is a single currency for member countries. Yet, the euro floats with respect to other currencies.

[5]That is, to achieve exchange rates determined by the market. Under this light, liberalism may be seen as a master plan elaborated intellectually in the 1960s, started in the 1970s, in transition during the 1980s, full-fledged in the 1990s, with turbulence in the early 2000s, and in decadence during the 2010s. The question is now, what is the next step for the 2020s? For a more complete discussion of liberalism, its cause and consequences, see Duménil and Levy 2011.

[6]See the following link: http://www.federalreservehistory.org/Events/DetailView/33.

until the US gold window closed in August 1971. The growth and need for the swap lines signaled that they were not just a temporary fix, but a *sign of a fundamental problem in the monetary system*" (our italics).

During the Bretton Woods years, for a central bank to guarantee stability in the financial system it had to buy or sell its own currency in order to respect the established exchange rate, which in turn was tied to gold, whose price per ounce was fixed at 35 USD. If a currency was being undervalued (for instance, due to lack of demand for financial assets denominated in that currency), then the central bank would have to buy its own currency which otherwise nobody else would buy. In the extreme opposite case, when a currency was being overvalued (for instance, due to an excess demand for financial assets denominated in that currency) then the central bank would have to sell its own currency in order to keep the exchange rate stable. This particular form of intervention required a full set of side instruments, which included interest rates[7], tariffs, quotas, government expenditure, seigniorage, and whatever other means the authorities could lay their hands on in order to attain currency stability.

A major drawback of this system is that governments may (and often did) choose to make abusive use of protectionist policies (i.e. raising tariffs and quotas) in order to minimize their imports and/or to boost their exports (potentially achieved also through subsidies), thus gaining what others are loosing. This is an example of the so-called beggar-thy-neighbor policies that, as we saw above, were *not* part of public discussion. Perhaps the main reason of the unpopularity of the Bretton Woods system was the overvaluation of the dollar (characteristic of the period), which impinged a relative loss of competitiveness for U.S. producers and exporters vis-à-vis its trading partners, that in turn provoked the deterioration of the trade balance[8].

[7]Note that we refer to interest rates as being a "side instrument" in the sense that exchange rate stability was the *aim*. However, this does not contradict our claim that the interest rate is the most important policy instrument because its movements are a *tool*, not an *aim*.

[8]According to former chairman of the Federal Reserve, Arthur Burns, back then there was a widespread belief in American circles "that many U.S. industries can no longer compete against more efficient Japanese firms. There is worry as well that American producers are being victimized by unfair competition from low-wage producers in developing countries and subsidized products of European and other foreign enterprises. Such explanations of the U.S. foreign trade deficit contain an element of truth, but hardly more than that" (see Burns 1984). He then goes on to say that "[t]he principal causes of America's recent trade deterioration are to be found elsewhere: in the high value of the dollar in foreign exchange markets, in the faster rebound from recession in the United States than in Western Europe or Japan, and in the unavoidable need of debt-ridden developing countries to practice austerity". The author further adds: "[w]ith the virus of protectionist sentiment spreading, the need for economic statesmanship, especially in the United States and Europe, has become urgent" (ibid.).

The Bretton Woods years and leverage

Broadly speaking, the Bretton Woods system (or the world regime of fixed exchange rates) was characterized not only by stability of currency values, but also by relatively high growth rates, low unemployment rates, higher inflation rates, and also by higher leverage ratios (mainly developed economies, and at least compared to today's figures). The last of these observations is based on two factors. On the one hand, given that economic authorities tended to adopt an inflationary stance (deficit spending and low interest rates, for instance) credit might have been the preferred instrument (above equity) for non-financial firms to finance their investment (more on this below). On the other hand, by the end of the fifties Modigliani and Miller 1958 published one of the most influential papers on the field of corporate finance which (simplified at a maximum) led the authors to conclude that, under a set of assumptions[9], the capital structure (between debt issuing and equity issuing) of firms is irrelevant. Simply put, as Miller himself once put it, M&M states that "if you take money out of your left pocket and put it in your right pocket you are no richer" (see the following link http://www.economist.com/node/348586). The influence of this paper is not to be underestimated, for blind belief in its conclusions has wreaked havoc in the world economy.

Indeed, the M&M theorem attracted a good deal of attention, although it certainly did not make its way through without some opposition. During the seventies and eighties at least three strands of literature emerged from the opposition to M&M: trade-off theory (attributed to Kraus and Litzenberger 1973), agency costs (Jensen and Meckling 1976; Jensen 1986) and pecking order theory (Myers 1983; Myers and Majluf 1984). Other important economists also opposed this irrelevance theorem, among which we can find Hyman Minsky and James Tobin, both of which based their approaches on the work of J. M. Keynes. Minsky's financial instability hypothesis (Minsky 1977 and Minsky 1986) does not deal directly with the capital structure of firms, although it does address key issues concerning both debt and equity. James Tobin's seminal 'pitfalls' article (W. C. Brainard and Tobin 1968) paved the way of what is known today as modern portfolio theory[10], which in turn inspired the stock-flow literature (upon which we rely heavily) as in the work of Godley and Lavoie 2007. Both modern portfolio theory (at least the Tobin and Brainard strand) and the stock-flow literature deny any such irrelevance of the capital structure of firms[11].

[9] Basically, these are complete and perfectly competitive capital markets.

[10] Actually, portfolio theory dates all the way back to Harry Markowitz's work during the decade of the fifties.

[11] Tobin and W. Brainard 1977 p. 241 mention that "[i]t is true that the celebrated Modigliani-Miller

Going back to the leverage ratios of firms during the Bretton Woods years, the strands of literature described above did not (and still *do not*) agree on what the "best" (or optimal) strategy is for firms to adopt in order to finance their investment. On the one hand (at least from the pure theory perspective), M&M suggested firms should issue the least costly instrument or the one that bears the minimum risk[12], thus that yields the maximum value for the firm. In any case, there would not be any difference whatsoever for the value of such firms as long as they raised funds in order to invest, and since debt was by then quite popular (perhaps as much as it is unpopular nowadays), the capital structure of French firms tilted towards such instrument.

On the other hand, the major changes that took place after the end of the Bretton Woods system were in part a natural consequence of the event itself (going from a fixed exchange rate regime to a flexible exchange rate regime), and in part the consequence of the policy actions taken afterwards. A major policy decision was notably the strong rise in interest rates that took place (first in the U.S., then in several other countries including France) at the end of the seventies. One of the main direct consequences of this shock therapy in the banking system was that it forced firms to look for alternative (normally riskier[13]) ways to finance their investment; that is, issuing massive amounts of equity[14]. Again, M&M would predict that the value of the firm would not be affected following this change in their capital structure. As a result, not many economists or policymakers saw this shift as having severe consequences.

The ideological basis for contesting the Bretton Woods system

In contrast to the standard view that suggests that the main problem of the Bretton Woods system was a gold shortage, Eichengreen and Flandreau 2009, page 28 mention that "if there was a problem to be solved (...), it was *not a problem of gold shortage but rather a*

theorem says that a firm's valuation should be independent of its financial structure (...). But there are important reasons for believing that the valuation of a firm's physical assets and their returns cannot be divorced from its financial structure".

[12]The discussion of risk is undeniably linked to the Capital Asset Pricing Model. See Fama and French 2004 for a thorough review of this literature.

[13]As will be seen in detail below, the fact that firms financed their investment using more own funds (issuing equity) than external funds (issuing debt) turned out to be riskier than had been expected.

[14]As an anecdote, just two years after the 1987 stock market crash, artist Arturo di Modica dropped his infamous charging bull in front of the New York Stock Exchange (see http://chargingbull.com/), which is currently located two blocks away from the Exchange after being impounded by the police. Clearly, no reference is made to bears as in, for example, the Frankfurt Stock Exchange. Since credit was relatively expensive, we interpret this charging bull story as a sign that the U.S. stock market has encouraged buying equity aggressively, which in turn has been used to finance investment since shift in the capital structure of firms took place.

problem of gold distribution. Gold reserves were disproportionately concentrated in the coffers of two central banks: the Federal Reserve and the Bank of France" (our italics). It must be noted that this 'shortage' misconception may have been in part the reflection of misinformation about the ultimate purpose of the Bretton Woods system itself. Note that it could also be a sign of pressure coming from the heads of industry to allow for price competition (of course, with foreign competitors) which, up to then, was not possible in the downward direction[15]. In other words, because exchange rates were meant to remain at stable levels, price competition through the price of a given currency was not a possibility. Of course, under a system of flexible exchange rates and with the evolution of commodity prices under control this changed radically[16].

The Bretton Woods system had close ties with the progressive ideas being promoted and implemented in the United States since the times of the New Deal, which in turn had an important (direct and indirect) influence in other economies[17]. In fact, fixed exchange rates are some type of way of protecting workers from being affected by sharp fluctuations in the value of their money wage, relative to workers from competing countries, provided there are no tax increases, wage cuts or reductions in social benefits. This idea, although debatable[18], could be a coincidental byproduct of the time rather than an objective in itself. The period 1944-1971 was coupled with an inflationary bias that favored employment. Such *high employment regime* was, however, seen with suspicion by (among others) central bankers, mainly because under such circumstances it is difficult to achieve their seemingly main (or single) goal of taming the inflation rate. On this point see the Per Jacobsson lecture delivered by Arthur Burns in 1979 entitled "The Anguish of Central Banking" (Burns, Cirovic, and Polak 1979).

According to our arguments, interest rates are the single most important policy instrument that brought about a series of changes in the global financial system. As a consequence, we believe it is relevant to analyze the ideological motivations of those responsible of deciding the direction of change of interest rates[19]. In fact, some years

[15]It must be remembered that labor unions were strong during this period (at least much stronger than nowadays). At the same time, economic authorities did not have the ability to devalue their currency (of course, much less so did the U.S.) by more than a predetermined narrow band set by the *IMF*. Compared to the post-Bretton Woods system (also referred to as the Washington Consensus), these two factors no doubt weighted heavily on firms' costs.

[16]Thanks to Carolina Rocha for pointing out the deficiency of the argument in a previous version.

[17]Note, the title of the current subsection is inspired by the title of the seminal work of Bhaduri and Marglin 1990 entitled "Unemployment and the Real Wage: the Economic Basis for Contesting Political Ideologies" upon which (among others) our analysis relies.

[18]Thanks to Julio López for pointing this out.

[19]As Hetzel 1998 put it in his 1998 article *Arthur Burns and Inflation*, (p. 21): "[t]o explain monetary policy, one requires more than an understanding of the views of the Chairman of the FOMC. One must

after the Per Jacobsson lecture (which by the way gathers central bankers and other financial actors) took place, Burns categorically brought up the Bretton Woods system, this time in an article which can be found in Foreign Affairs. In it, he mentioned that "Europeans naturally prefer a stable dollar to one that oscillates in buying power, and for that matter so do Americans and others. But no one has yet found an *acceptable* method of returning to the kind of stability in exchange rates that existed under the Bretton Woods system. In a world in which capital movements often overshadow trade movements and in which inflation rates of individual countries diverge widely, central bank intervention in foreign exchange markets - a remedy that is *still* popular in some political circles - cannot accomplish anything beyond smoothing out the very short-run fluctuations of exchange rates." (Burns 1984, our italics).

The oil shocks and the paradigm shift

In this context, and given the growing aversion towards intervention and inflation, Nixon suspended the convertibility of gold into dollars in 1971, thus making the dollar (the currency to which all other currencies were tied) float. This change from fixed to flexible exchange rates, despite the price controls implemented right after, made the dollar devalue mainly vis-à-vis the German mark and Japanese yen. The devaluation made the price of oil, along with that of other commodities, fall. "Oil producing nations lost purchasing power throughout the world as the value of the dollar fell because their oil prices were set in dollars. In September 1971, a month after Nixon's speech, at an OPEC meeting in Beirut, its member states increased oil prices by nearly 9 percent explicitly to compensate for the devaluation of the U.S. currency. And the value of the dollar continued to decline for several more years. By mid-1973, the dollar price of gold had risen to more than $90 an ounce; by the end of the decade, it exceeded $450" (Graetz 2011, p. 18).

High (though volatile) demand for oil and low prices certainly left oil producers unhappy, so much that in 1973 OPEC members embargoed the U.S. and other countries. The main cause being, of course, their reduced oil- and dollar-related profits. Thus, the first half of the seventies was the beginning of a new era, which started with the oil shock just mentioned. The main consequence of this oil shortage was the sharp increase in the general price level. At the end of the decade, another oil shock took place, though this time retaliation came apparently for political, rather than economic, reasons (the

understand the general political and intellectual environment of the time as well". Moreover, according to Hetzel, a monetarist, in order to understand Burns, one must first understand Wesley Clair Mitchell, an institutionalist and founder of the National Bureau of Economic Research.

Iranian Revolution). The direct effects of oil shocks on the global economy are analyzed in Roubini and Sester 2004. In the remaining of our work, however, we will focus on other (seemingly indirect) effects, such as the shift in the capital structure of firms in developed countries (the U.S an Western Europe, mainly) and the corresponding consequences of these.

Policymaking around the globe during the decade of the seventies was thus marked by a strong inflationary bias, both *caused* and *absorbed*. One of the factors that we believe *caused* this bias was the existence of a strong (though by then declining) Welfare State[20] that was created during (and preserved after) the New Deal years, and that was reinforced after WWII, which in turn promoted job security and benefits. As a consequence, unions were relatively strong, so that workers were able to appeal against wage, employment and social benefits cuts. Important *absorbed* factors include the oil shocks[21], which worsened the inflationary bias significantly, so much that they overly dwarfed previous problems (i.e. those already existing in the labor market, just mentioned on the *causes*).

The "paradigm shift", materialized in the collapse of the Bretton Woods System imposed (or rather *replaced*) by the so-called Washington Consensus, came along with a set of dire consequences worldwide. The first of these were the oil shocks briefly described above. Past the second one of these, the then newly-elected chairman of the Federal Reserve Paul Volcker (who, like Milton Friedman and Alan Greenspan, was deeply influenced by Arthur Burns) raised the federal funds rate by three to four times its 1977 level (around 4% back then[22]). In our view, it is this decision (the strong rise in interest rates) which led to a full reconfiguration of the financial system in which we live today. Other policies (like liberalizing current and capital accounts, austerity measures and the like) are thus seen here as being complementary.

In the remaining of our work, we will focus on key macroeconomic fundamentals for France past the Volcker shock. In the next part we analyze the direct effects of high (then rapidly falling) interest rates for households in the first half of the eighties. Then, in the following part, we turn to analyze the consequences for non-financial firms and, as a consequence, production and employment.

[20] By 1979 Paul Samuelson would even say that "[t]oday's inflation is chronic. Its roots are deep in the nature of the welfare state." (Samuelson 1986, p. 972).

[21] In our opinion, these were rather caused by irresponsible decision-making, and the bill, of course, was paid by the working class (worsening of their income and wealth) and developing countries (balance of payments crises).

[22] See Goodfriend and King 2005 for a monetarist explanation of the "success" of this policy.

1.1.2 The Effect of High, but Falling, Interest Rates for French Households

Following the so-called Volcker shock, and given that goods and financial markets around the globe were already on their way to becoming more and more integrated, *Banque de France* and other central banks raised their interest rates as well. This decision was the only reasonable choice to make because, had they not followed lead their economies would have suffered a pronounced capital flight towards the most profitable financial market which at the moment had the highest interest rate[23] (i.e. the U.S.).

By raising interest rates, the Fed and the other central banks around the world created a new economic environment in which the working class would have to pay for previous policy mistakes[24]. The oil shocks, which were more responsible than unions in generating the strong inflationary atmosphere that prevailed by the end of the seventies, were thus palliated by means of a combination of strong devaluations, wage restraint (see Boyer 1992), high unemployment rates and the loss of progressive taxation as a tool to fight income and wealth inequality (see Piketty 2003 for the French case, and Piketty and Saez 2003 for the case of the United States). However, the anti-inflationary stance taken by *Banque de France* (further reinforced by pressures coming from Germany and the European Economic Community) was met with resistance from the socialist government elected in 1981, but the dispute was settled in favor of the monetary and supranational authorities with the *tournant de la rigueur* in 1983 (see Douchaussoy 2011).

The (main) reasons behind the rise in demand for credit by households

By the end of the seventies French households did not rely as much on credit as they do today[25]. In the last quarter of 1982 the share of their stock of credit liabilities out of their disposable income was no more than 20% (solid line in Figure 1.1) at the same time that the quarterly real interest rate they paid was 3.5%. In stark contrast, by 2012 indebtedness

[23]This idea can also be found in Burns 1984, who mentions: "first, high American interest rates are damaging European economies by attracting to the United States funds that otherwise would be directed to capital investment at home. Second, European interest rates are also higher than they would be without the outflow of capital to the United States".

[24]As we saw from the quotation in footnote 20, back in the seventies there was the widespread belief that workers had become too demanding. As a consequence *discipline*, following this 'logic', would have to come from the labor market, and eventually also from the government.

[25]As anticipated above, this strong increase in credit demand by households is not independent of the fall of credit demand by firms. Once private banks realized this, they sought for alternative sources of profit. Moreover, "if new ways of distributing business loans were established, the most dramatic change indeed concern the relationship of banks with 'households'" (Braudel and Labrousse 1993, p. 1179, our translation).

represented 76% of households' disposable income, whereas the real (apparent) interest rate was only 0.27%, measured on a quarterly basis.

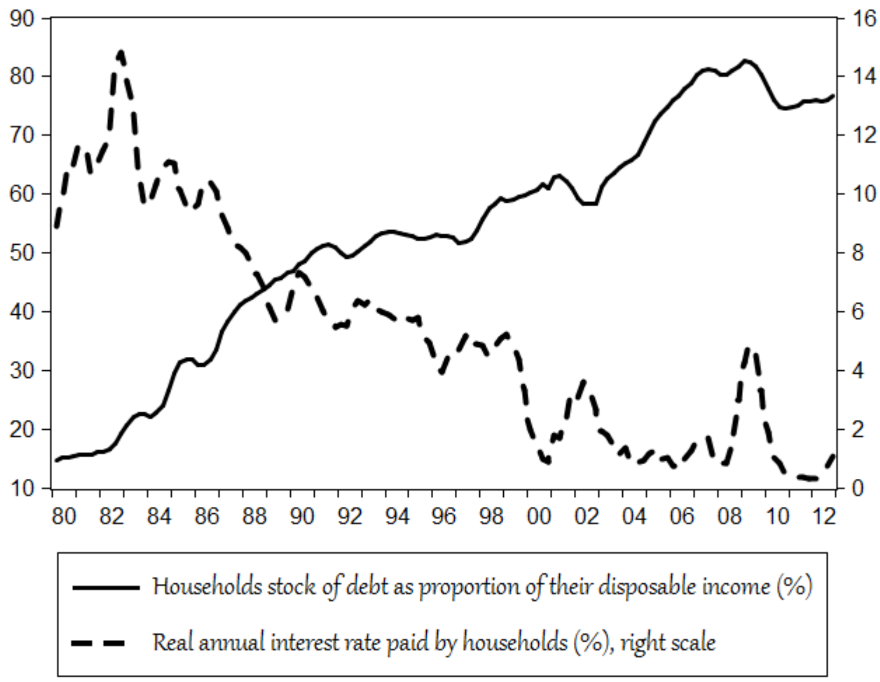

Figure 1.1 – Households' stock of debt as proportion of their disposable income and apparent real interest rate paid by households; 1980-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

All French interest rates are calculated as "apparent". For instance, the annualized quarterly nominal interest rate paid by households was calculated as the ratio of the quarterly interest payments disbursed divided by the stock of debt obligations (previously brought to quarters) from the previous period. However, it must be noted that in the model simulated in chapter 6, we were obliged to bring these series to quarters in order to maintain coherence in the system. For further details on the construction of the series and on our motivations on why we proceeded in this way see the Appendix, in which we also show a comparison between our calculated apparent interest rates and the official figures published by *Banque de France*.

Figure 1.1 shows that, as real interest rates fell, the proportion of the stock of debt by households out of disposable income increased. From 1980 to 1982 the quarterly interest rate went from 2.15 to 3.5%, period during which the stock of debt out of disposable income went from 15 to 16%. This was partly the result of stable debt levels and falling aggregate income due to the 1980 crisis. From then up to 1989, the countercyclical behavior of both series (which by the way is almost perfectly timed) is more evident. However, from the second quarter of 1989 to the second quarter of 1990 both series increased sharply. This was again the result of falling households' revenues. In 1994, following the recovery from the 1990 recession, the debt-disposable income ratio fell from 53.7 to 52.5%, whereas the real quarterly interest rate was also falling, from 1.4 to 1.2%. This, of course, was due to the opposite effect (that is, rising income, which weighs on the denominator), but it was by no means even close to being enough to offset the already threefold increase of debt's share of disposable income since the beginning of the eighties.

From the first quarter of 1999 to the third quarter of 2000, the quarterly interest rate strongly fell from 1.3 to only 0.2%, again creating an incentive for households to borrow larger sums of money out of their disposable income, which this time went from 59 to 61.7%. Past the crisis, interest rates went up again, and household indebtedness correspondingly fell. This process went on until 2002, when the quarterly interest rate started falling again, at a speed comparable to those observed in 1982 and 1999. From 2004 to 2006 the quarterly interest rate stabilized at 0.24%, but borrowing as share of income kept on increasing dramatically, going from 67.5% in 2004 to 81.4% in 2007, despite the slight increase in the interest rate in the second quarter of 2006. Once the 2007-08 crisis hit, both series have evolved more pro-cyclically, perhaps due to the fact that households have become less sensitive to reductions in interest rates (i.e. they fell into a liquidity trap after the global financial crisis).

The deterioration of disposable income

The strong increase in interest rates had two major effects for the economic well-being of French households. The first was already mentioned in the previous section, and is related to the rise in interest payments which, coupled with the restrictive monetary, fiscal and incomes policies, made disposable income fall both in absolute terms (i.e. its growth rate) and in relative terms (i.e. as share of *GDP*), as is shown in Figure 1.2. With falling income, rising interest payments and taxes at a time when the unemployment rate was high and with wage growth lagging behind increases in labor productivity[26], it is pretty evident that, on the aggregate, French households dedicated larger shares of

[26] According to our database (described in the Appendix) from 1982 to 1986, on average, labor productivity grew faster than real wages paid by non-financial firms: 0.3% higher on a quarterly basis (which is equivalent to 1.2% annually).

their paychecks to service debt. This combination (rising debts, unemployment and taxes coupled with falling incomes) grew unbearable for households, and ultimately weighted heavily on domestic demand.

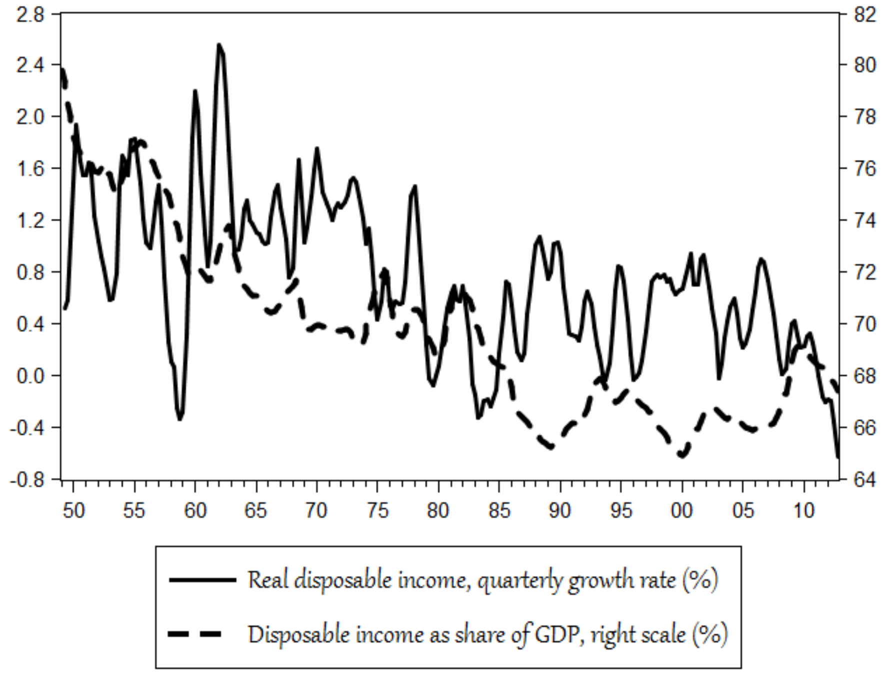

Figure 1.2 – Households' disposable income; 1949-2012. HP filters with $\lambda = 10$. Source: author's calculations based on data from *INSEE*.

The solid line in Figure 1.2 shows that the growth rate of disposable income (left scale) fluctuated violently during the decade of the fifties, although it was on average more than 1% quarter after quarter and only reached zero in 1958. From 1950 to 1957, the annual growth rate of output was 4.6%, with inflation imposing an important threat to the economy. In 1958, following the strong devaluation of the franc, the slowdown of the world economy, and with a political crisis unfolding, France knew one of its major economic crises (see Jeanneney 1992, p. 10-11). From 1958 to 1969 population increased 12.4%, *GDP* grew 5.5% annually, investment 7.6% and real wages 3.6% (ibid., p. 12). During this period, disposable income grew at a quarterly average of 1.3% (close to 5% annually). This rhythm would go on until 1974, when the quarterly rate of growth of disposable income began its volatile downward path, until it reached its then historical low of -0.1% in 1983q4. From that period and until the fourth quarter of 2007, it fluctuated at a quarterly average of 0.5%. Besides these unfavorable developments, disposable income fell as a share of *GDP* (dashed line in the figure), passing from 75.5% in 1949 to as low as 63.1% in 1999 and, despite the recovery that took place right after (mainly due to an important fall in the denominator of the corresponding ratio), it only reached 67% around 2009.

Period	*Wages*	*Profits*	*Taxes*	*Int. rec.*	*Int. paid*	*S. ben.*	*S. contr.*	*Cons.*
1949-1959	61.7	37.9	4.0	2.3	0.7	15.4	16.2	83.1
1960-1969	68.7	32.9	5.3	2.9	0.8	18.8	20.8	81.1
1970-1979	77.4	26.3	6.3	5.7	2.2	21.8	25.9	79.4
1980-1989	81.9	23.0	8.4	8.6	3.9	27.7	33.0	85.2
1990-1999	80.7	22.9	10.6	7.5	3.3	30.2	34.1	85.3
2000-2007	81.9	22.7	13.7	4.0	2.3	30.3	31.7	84.8
2008-2013	81.1	21.5	13.3	3.0	2.2	32.0	31.9	84.1

Table 1.1 – Selected macroeconomic fundamentals for households, average quarterly shares of disposable income, all as %; 1949-2013. **Wages** are the sum of *masse salariale*, *cotisations sociales employeurs* and *cotisations imputées*. **Profits** are gross profits of individual entrepreneurs and households. **Taxes** are the sum of *impôts sur le revenu* and *autres impôts courants*. **Int. rec.** are interests received. **Int. paid** are interests paid. **S. ben.** are social benefits, and are the sum of all items denominated *prestations*. **S. contr.** are social contributions, calculated as the sum of all terms denominated *cotisations* (these are paid by workers). **Cons.** stands for personal consumption. **Source:** Author's calculations using data from *INSEE*.

The deterioration in households' revenue was further reinforced by important changes in the composition of disposable income itself. These can be observed in Table 1.1[27]. The profits of individual entrepreneurs and households has steadily fallen since the late forties, going from 37.9% of disposable income in the first sub-period under analysis (1949q1-1959q4) to as low as 21.5% in the last one (2008q1-2013q1), which is mainly due to the fall in the number of individual entrepreneurs at the same time that the number of salaried workers was on the rise (Bournay and Pionnier 1987). Correspondingly, wages increased their share of disposable income from 61.7% during the 1950s to 81.9% in the 1980s, and remained at around that level since then. We interpret these developments as a sign of the degradation of individual entrepreneurship in France since the fifties, and not as a sign of the strength of wages which, as will be seen below, has not been the case.

[27]Note: the data shown in this table do not match those presented by Braudel and Labrousse 1993 (p. 1063) for two main reasons. On the one hand, data is revised constantly. On the other, the authors' presentation is somehow different than ours. However, the trends described in their work (up the period they analyzed) are reinforced and prolonged in ours.

The fourth column of the table shows the tax rate paid by households, which is calculated as the proportion of tax payments out of disposable income. This indicator escalated from 4% in the late forties and throughout the fifties, to more than three times that level since 2000. This tax increase (in relative terms) took place notwithstanding the fall in income (in absolute terms).

Interest receipts for households (which normally stem from deposits) increased sharply as share of disposable income, going from no less than 3% before the 1970s, to 5.7% in that decade, reaching up to 8.6% in the eighties, thanks to the stark increase in interest rates (described above). Following the fall of the latter instrument, interest received also declined and went back to levels comparable to those prevailing in the 1950s. Interest payments (most of which are used to service debt) follow the same up and down trend. Strikingly, however, these go from representing around 0.8% of disposable income before the seventies, to 2.2 and 3.9% in the 1970s and 1980s respectively, and start falling since then. However, these payments do not go back to less than 1% and stay at more than double that level afterwards. Moreover, the gap between interests receipts and interest payments (both as share of disposable income) has narrowed over time, going from 1.6% in the 1950s to only 0.8% after the global financial crisis.

From 1949 to 2007 social security contributions paid by households out of their gross disposable income was higher than social security benefits received by them, with the gap between the two widening in some periods (1970s, 1980s and 1990s) and narrowing at others (1950s, 1960s and 2000-2007). From 2008 to the first quarter of 2013, however, the sign of the gap was reverted, with benefits exceeding contributions, which is likely to have been caused by the strong activation of the automatic stabilizers following the 2007-08 crisis. That is, the combination of the fall in aggregate income, consumption and government tax receipts coupled with the rise in the number of registrations in *pôle emploi* asking for unemployment benefits contributed to this reversal. Needless to mention, had this latter mechanism not been present, and despite the hostility that austerity pundits show towards this type of public expenditure, aggregate demand and production would have fallen even more after 2007.

Interest rates and housing bubbles

A second major consequence of the increase in (and consequent drop of) interest rates for households was the build-up of two housing bubbles[28]. Now, when dealing with *housing*

[28]This suggests, of course, that most of the money borrowed was channeled towards the housing market, although it is likely that part of that demand for credit was partly used for consumption purposes (see,

problems one may naturally tend to believe it is the price of 'housing' (*logements*) itself which lies at the heart of the analysis. However, as can be seen in Figure 1.3, our series built from the *Comptes de Patrimoine* indicate that it is not the evolution of the price of housing (the dashed line) itself which should be worrisome; it is rather the price of land (solid line + circle). Indeed, the growth rate of the price index of non-financial assets held by households (solid line) depends on the evolution of the previous two indicators, as well as on other relevant non-financial assets. Nonetheless, it should be noted that the extreme volatility of land prices have been strongly mirrored in the evolution of the former indicator that contains it.

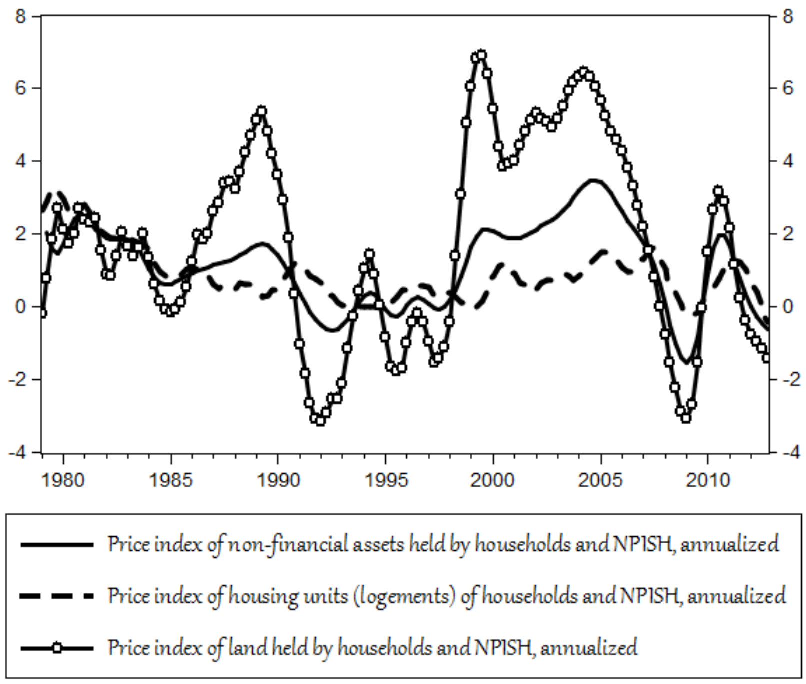

Figure 1.3 – Growth rate of housing prices; 1980-2012. HP filters with $\lambda = 10$. Source: author's calculations based on data from *INSEE*'s *Comptes de Patrimoine*.

The first bubble took place in the second half of the eighties, and was coupled with a strong and sustained increase in the price of dwellings, which went from a level of 40 in 1985 to 53 in 1991 (with the price index *in level* being 100 in 2005, series not shown). In

for instance, Cynamon and Fazzari 2014 and the corresponding comment by Akerlof 2008). Despite the fact that these bubbles in France were *not as important* as those in several English-speaking countries or Spain does not imply in itself that they were unimportant for France. As we will see, they had no minor consequences.

terms of the figure shown above[29], this was equivalent to a strong rise in the quarterly growth rate of the price of non-financial assets that went from 0.7% in the first quarter of 1985, to 1.7% in the second quarter of 1989. The figures for the price of land were 0 and 5% respectively, which clearly indicates that these severe fluctuations had a larger impact on the previous indicator than the price of housing itself, whose growth rate was by then was falling from 1 to 0.4%.

From 1989 to 1998 housing prices fell from its previous level of 53 to 51. However, the second bubble (way more important than the first one) started that year, and lasted until 2008 when the price of non-financial assets suddenly stopped its upward path. By then, nevertheless, it had already reached 120, that is, more than double its 1998 level. As was shown above, during this period household indebtedness soared, both in absolute and relative terms (in level and as percentage of disposable income, respectively). From the first quarter of 1998 to the fourth quarter of 2004 alone, the quarterly growth rate of the price of households' non-financial assets went from 0.3 to 3.4%[30], whereas that of land reached 6.1% in 1999q3 and 6.2% in 2004q3. Both real estate indicators started a steep fall afterwards that lasted until the last quarter of 2008. Perhaps this pronounced and lasting drop in land, housing and non-financial assets' prices is a clear early warning that the crisis (at least on the real estate front) could have been anticipated, softened or even avoided[31].

It is reasonable to believe that as interest rates charged to households declined indebtedness and, as a consequence, housing investment increased, thus promoting the creation of the real estate bubbles just described. The presence of bubbles, while they last, are just as good as the aftermath of the bursting of the bubble is bad for homeowners' balance sheets. Or, even if they do not burst[32], their remaining at high levels (as in the French case) can reduce the demand for dwellings considerably. With land (or, for that purpose, house) prices growing well above their fundamental values, existing proprietors may feel confident that they are becoming richer and may even pay a blind eye to the issue, actually believing that prices 'naturally' go up. Moreover, several homeowners

[29] Note: the analysis is carried out in terms of the smooth series. Despite the 'lack of realism' this may imply, we want to highlight overall long term trends, which serves as a justification for this.

[30] These growth rates may appear insignificant. However, it must be noted that these are presented on a quarterly basis. As a rough representation of the annual figures, one must multiply these by four to get an idea how large these growth rates can be.

[31] Somehow anticipating the build-up and corresponding burst of housing bubbles, the previous trends were studied for Norway by Jacobsen and Naug 2004 and for the U.S. by McCarthy and Peach 2004, with the latter paying close attention to land prices.

[32] The housing bubble in France has not yet burst, for example. However, as Reinhart and Rogoff 2008 suggest, eventually all bubbles burst. Thanks to Carolina Rocha for pointing this out.

rent their property and as the value of the former rises, even in the absence of a rise in demand for rented property, market ideology leads them to raise rents, further worsening renters' disposable income and, in this way, aggregate demand. New home owners, on the other hand, are irresistibly tempted to get a loan (which anyways is cheap) perhaps because the future value of their property-to-be will more than offset the current cost of indebtedness[33]. Households' stock of assets goes up rapidly during the expansionary phase of property prices, and so does debt and other (related or unrelated) expenditures, potentially improving (or at least not worsening) their net worth. When the trend reverts, households' stock of assets declines but their debt liabilities do not. In fact, they may even increase if debts remain unpaid and sanctions arise. Clearly, in the absence of a bailout (normally the responsibility of the government) the deterioration in households' wealth becomes critical. This is an example of how national wealth can be quickly lost.

House and land prices revisited

Under this logic, it was the reduction in interest rates paid by households (which are ultimately set and regulated, if at all, by the central bank) that provided green light to the housing industry for the build-up of the bubbles. As we saw above, these were not the result of increases in the price of housing itself, but of the rise in the price of land (a non-produced non-financial asset). The discrepancy between market values and fundamental (replacement or simply non-market) values, created an incentive for indebted households to dig their own hole. The natural question that arises is: how come the authorities ignored these instability problems? Of course, this question assumes that the authorities were aware of these evolutions, and they were!

A document published by Bouveret, Costes, and Simon 2010 entitled *Trends in the French housing market* (prepared under the authority of the Treasury, though without the Ministry assuming responsibility for the authors' opinions) mentions the following (p. 4 of the English version):

> During the period of sharply rising home prices, public policies sought to contain rising prices by stimulating supply; these policies took the form of tax breaks (a series of tax incentives for buy-to-let investment since 1986, and subsidized loans to finance low-rental housing), or legislative and regulatory

[33]This optimistic perception can in turn be fueled by the expectation that inflation will be contained, thus that with stable prices their property will be more valuable in the future than at the time they signed the contract. However, what happens with homes happens also with debts, so that indebted households who expect to gain from price stability actually loose from it.

> measures, e.g., the law on urban solidarity and renewal (the "SRU [*solidarité au renouvellement urbain*[34], LR] law") providing for the construction of low-rental housing, and housing-to-office floorage ratios.
>
> During the period, however, the policies addressing the property sector also had social objectives that made them **procyclical**. The **measures** for first-time buyers and measures intended to correct a market imperfection (solvent, modest-income households excluded from the market because unable to make the appropriate down payment) thus stimulated demand and activity during a period of sharply rising prices (authors' emphasis in the original).

So, an attempt to answer the question asked a few paragraphs above would be: the French authorities allowed the [second] bubble build-up because there were other forces that were (and still are) found elsewhere that made them overlook the problem. These problems were related to the link between firms and banks through their balance sheets, and their influence on that of households. This takes us back to the starting point, the collapse of the Bretton Woods system and the late seventies policy response implemented by the Federal Reserve and other central banks around the world. When interest rates sharply increased in 1979, this included the one paid by firms on their loans. As French firms perceived the rise in the cost of debt, many of them reduced their demand for this instrument and, as they did, they turned to the stock market to finance their investment. By doing so, banks sought alternative ways to lend. Perhaps one of these alternatives was lending abroad, which may have been one of the main causes of the 'capital flight' episodes that gained strength from the mid-eighties on in Europe, Latin America and Asia (in no particular order). Another alternative was lending to households, the effects of which we have already seen.

1.1.3 The Effect of Rising Interest Rates for French Firms and the Liquidity Trap

While excessive indebtedness proved dangerous for households, it is still a need. Indeed, without it several households would not be able to buy a house or invest in small or medium sized businesses. In the absence of bubbles, and under fair and stable conditions, credit should not be seen as a bad thing. Nevertheless, when dealing with a large structure that needs financing in order to hire workers (generate employment) and buy intermediate

[34] Solidarity urban renewal.

goods (investment demand) in order to produce goods and services, credit may prove vital. Broadly speaking, two other sources of funding (other than credit) include own funds (that is, issuing equity) and profits. The combination of these three (which may ultimately boil down to the first two only) has been both a matter of controversy and misunderstandings. After all, as Kester and Luehrman 1992 (p. 31) put it "managers typically estimate the cost of capital for a particular project by first determining how much debt the project can support and, by implication, how much equity capital must be put at risk".

French firms and leverage

During the 1960s French non-financial firms gradually became highly leveraged. That is, their issuance of debt obligations was growing importantly, relative to their issuance of equity. According to data from Braudel and Labrousse 1993 (p. 1171) in 1961, their share of debt out of total liabilities[35] (in stock form) was 55.1%, whereas by 1969 it had reached 64%. Naturally, this means that the share of own funds out of liabilities correspondingly fell from 44.9 to 36%. There are several potential drawbacks for firms that accumulate large amounts of debt.

The first and most obvious of these drawbacks is that, the larger the stock of debt (compared, for instance, to the stock of non-financial assets) the higher the risk of default. The second is that the incumbent firm's sensitiveness to changes in interest rates may increase, and with it their incentive to lobby for lax monetary policy. A third disadvantage is that, in their attempt to raise larger amounts of funds through debt, firms may be subject to conditions imposed by banks (i.e. credit rationing[36]) so that the latter reduce default risk at a minimum[37]. As a consequence of the latter, a fourth drawback emerges, and is directly related to risk perception and the nature of investment. When a firm is highly leveraged, the constraints imposed by banks often make firms engage into less risky (thus, if successful, less profitable) investment projects than they otherwise would. The natural counterpart of this is that, when firms rely much less on credit than on their

[35]Note, for the remaining of our work we will refer to this share as our measure of the capital structure of non-financial firms.

[36]An obliged reference on this subject is Jaffe and Stiglitz 1990.

[37]Analogous to these conditions are, at an international level, the structural reforms imposed by the *IMF* on debtor (more often developing) countries. Crises no doubt have had major consequences on the financial and real sectors of affected and neighboring economies, but the imposition of these reforms (deregulation in financial markets, privatization, and restrictive monetary and fiscal policies, mainly) have not always been in the right direction, and in some extreme cases (for instance Latin America) they have even proven disastrous.

own funds, they may invest in riskier (though potentially more profitable) projects.

Long and Malitz 1985 studied whether the type of investment opportunities determined financial leverage. Their theoretical model posits that the value of equity may increase if a risky investment is chosen. This is so because bankers may not want to finance risky projects and because they would bear most of the loss in case the project (which in any case would be costly to monitor) is not successful. The authors provide cross sectional evidence for 68 U.S. portfolios between 1978 and 1980 to their model, which takes different measures of leverage as the dependent variable and some potential explanatory variables; such as advertising expenditures and R&D expenditures as proxies for risky investments[38], as well as capital expenditures as a proxy for productive capital. They found a statistically significant negative relationship between the first two and leverage (which suggests that risky investments are not financed by debt) and a positive one between capital expenditure and leverage, which indicates that *productive investment* is closely related to indebtedness.

If Long and Malitz's evidence is well founded, and if their results are not particular of time and space, then their conclusion concerning the advantages of debt implies that (in the aggregate) French firms during the 1960s were not only bearing important default and related risks, but also that they were likely to have invested in less risky and productive projects. In contrast, this would also mean that, since capital expenditure (which normally is labor-intensive) was preferred above advertising and R&D expenditures (which tend to be labor-saving), then labor demand was likewise higher than under an alternative hypothetical scenario in which firms would not have been highly leveraged.

Capital structure of French firms and inflation

Unfortunately, we were unable to find information about the capital structure of French non-financial firms during most of the 1970s. A hunch indicates that during this period debt represented at least more than 50% of their stock of liabilities. Fortunately, however, *Banque de France* provides data on the financial accounts for all sectors in the economy since 1978. Based on these, we were able to see that the capital structure of non-financial firms shifted in favor of own funds starting in the mid-eighties. The dashed line in Figure 1.4 shows the share of the stock of debt out of total liabilities. This share was quite important in 1982 (68%), but in that period it began falling rapidly, reaching as low as 14% in 1999 and remaining at 20% on average from that period on, until 2012.

The figure also shows the long term evolution of the quarterly real interest rate paid

[38]It must be noted that these types of investment tend to be less labor-intensive. More on this below.

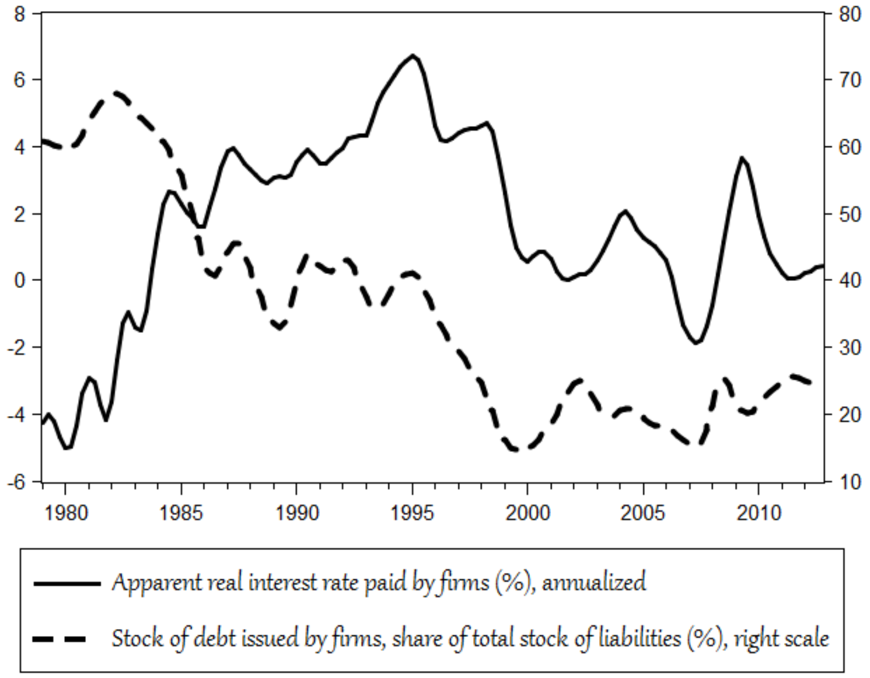

Figure 1.4 – Firms' real interest rate paid by firms and stock of debt as proportion of their liabilities; 1980-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

by firms (solid line). This indicator was in negative territory until the second quarter of 1984, period after which it increased rapidly, reaching 1.26%[39] by the end of 1995, and falling sharply afterwards until the 2007-08 crisis aftermath made it go up again. One may naturally ask, if real interest rates were negative in the first half of the 1980s, why did firms shift their preference in favor of own funds and away from indebtedness? Our interpretation of this phenomenon goes like this: since managers and consulting firms (the main decision-makers at the corporate level) were well aware of the central bank's commitment to fight inflation, they expected nominal interest rates to rise and the inflation rate to fall. Both factors may have contributed to the belief that credit would become more expensive. On the one hand because the nominal cost of contracting loans was rising. On the other hand, because with lower inflation the real value of debt related payments would turn out to be higher at maturity than at the time when they were contracted[40].

[39]Roughly, this would be tantamount to a yearly real interest rate of 5%.

[40]This argument can also be found in Krugman 2011 where the author mentions that "a fall in wages,

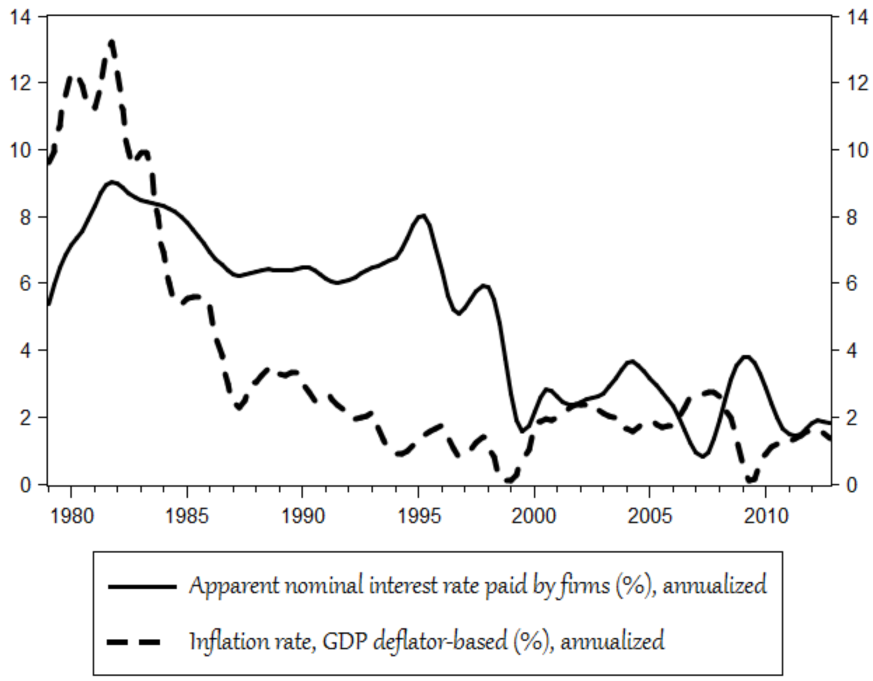

Figure 1.5 – Apparent nominal interest rate paid by firms and inflation rate (HP filter with $\lambda = 10$); 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

Figure 1.5 shows the nominal interest rate and the inflation rate on a quarterly basis, the difference of which make up the real interest rate shown previously. From 1979 to 1982, both inflation and the nominal interest rate went up. The latter increased as a policy response to the rise in the former[41]. The quarterly inflation rate went from 2.5% in the first quarter of 1979 to 2.9% in the last quarter of 1981, at the same time that the quarterly interest rate went from roughly 1 to 1.7%. While this was happening, non-financial firms increased their demand for credit above their own funds, which went from 60% in 1979 to 68% in 1982. *Banque de France*'s resolution to take control over the price level was so effective that from that year on inflation, employment and credit demand fell sharply. The stark rise in interest rates brought about this new financial configuration, which in

leading to a fall in the general price level, worsens the real burden of debt and actually has a contractionary effect on the economy". Naturally, without a strong fall in the demand for credit, banks would benefit from a contractionary monetary policy, as much as firms would benefit from a loose monetary policy, as long as inflation and indebtedness do not reach unusually high levels.

[41]See the 1983 *compte rendu* from *Banque de France* in the following link http://gallica.bnf.fr/ark:/12148/bpt6k6495802s/texteBrut.

turn affected the labor market, the structure of the productive sector, the strong welfare state achieved during the Bretton Woods years, banking practices, economic policy goals, the status quo of the economics profession and even politics[42].

The relevance of Keynes' state of long-term expectation

In our view, the strong shift in the capital structure of firms was the result of a combination of (1) high nominal interest rates (which affect the current cost of credit), (2) rapidly falling inflation rates (which increase the burden of debt at maturity), and (3) expectations concerning interest and inflation rates (which affect the behavior of financial actors when it comes to medium- to long-term planning). Note that we are giving importance to expectations but we are not attaching too much weight to their assumed underlying nature, like the rational expectations literature does. Instead, we interpret these in terms of Keynes 1936 (chapter 12) *state of long term expectations*[43]. Keynes' analysis (at least in that part of his vast contribution to the economics field) is carried out in terms of the psychology of financial investors in the stock market and animal spirits. Two major episodes concerning two major financial actors may be useful in illustrating our arguments.

The first concerns Michael Milken (one of the men who inspired Oliver Stone's main character, Gordon Gekko, in his 1987 film *Wall Street*) who in 1977, while working at Drexel (an important financial firm back then), contributed largely to the creation of what is nowadays known as the junk-bond market. Junk-bonds are characterized by high-yields and are, as a consequence, considered speculative. Simply put, what Drexel did under Milken's influence was what other financial firms were unwilling to do: help underrated (thus, seemingly unprofitable) companies get funding (if only at a higher interest rate, which is why they were speculative[44]). These firms' *underratedness* are decided by rating agencies under a set of standard criteria that are by no means infallible. In 1989, Milken was accused of fraud and one year later he would start serving a 10 year sentence that eventually was reduced to two[45].

[42]Labor unions around the world lost bargaining power, riskier and less labor-intensive investments were favored (i.e. advertising and R&D), austerity measures were preferred above employee-friendly policies, banks favored households as clients, policy goals went from maximum employment to minimum inflation, economics would become even more intertwined with public opinion and politicians, and so-called socialist or labor political parties which since that period preach the opposite of what they actually do (i.e. promote employment).

[43]In this sense, we consider ourselves *Chapter 12ers* (see Krugman 2011).

[44]Needless to say, firms that are meant to pay a higher interest rate are often seen as been uncompetitive or suit to get credit at market rates.

[45]The full story can be found in an article entitled "Stars of the junkyard" in The Economist

Now, for the purpose of our exposition, what we want to stress from this case is the fact that rating agencies often act in a way resembling newspaper competitions of which Keynes spoke in chapter 12 of his *General Theory*. In these competitions, actors "have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole" (Keynes 1936 p. 156). Furthermore, this practice is so standard that we have even "reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be" (ibid.). Translating to Milken's case, what this implies is that average opinion (i.e. that of rating agencies) often overlook firms' productive potential, thus restricting access to credit for them. Junk-bond dealers, be they honest or otherwise, fill in this financing gap.

The second episode concerns George Soros who, like Milken[46], is a philanthropist and finance researcher. In 1992 Soros literally 'broke' the Bank of England[47] by short-selling financial instruments denominated in sterling. In this episode, the BoE's commitment to adhere to the Exchange Rate Mechanism (the arrangements previous to the introduction of the euro) forced the monetary authorities to devalue the pound. Speculators like Soros (clearly, he is the most important one) bought massive amounts of sterling when this currency became slightly appreciated, and sold it when it depreciated. The conviction that the value of the British currency would eventually fall was key to Soros' success in his becoming one of the wealthiest (and most hated) individuals in the world.

What stands out from this second example is that speculators can make large profits (even at the expense of central banks and whole nations) simply because this is allowed to happen. Again, on this point Keynes mentions that "[t]he spectacle of modern investment markets has sometimes moved me towards the conclusion that to make the purchase of an investment permanent and indissoluble (...). For this would force the investor to direct his mind to the long-term prospects and those only" (ibid. p. 160). Eventually, what Soros taught the BoE (which by then it should have already known) was that, as a monetary authority, you cannot expect to make credible commitments without expecting a whiplash of speculation (when it is allowed) in return.

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http://www.economist.com/node/17306419.

[46]Interestingly, in 2009 Milken published a post on The Wall Street Journal entitled "Why Capital Structure Matters", where he sets forth several arguments which provide support for our own in the present work. See the following link http://www.wsj.com/articles/SB124027187331937083.

[47]See http://www.investopedia.com/ask/answers/08/george-soros-bank-of-england.asp.

Indebtedness vs own funds

Going back to the discussion about the capital structure of French firms, it should be clear that *mass psychology* (i.e. public opinion) and *herd behavior* (i.e. speculation) play an important role in financial markets[48]. Coincidentally, from the moment when *Banque de France* achieved its goal in bringing down prices (1982) firms began a furious de-leveraging race that left private banks with no other choice but to look for alternative sources of profit. A major alternative source, together with its consequences, was discussed in the previous part; household's credit.

While excessive debt is certainly a bad thing, excessive (and more extreme) reliance on own funds has proven even worse. Before 1982, French firms invested at the pace allowed by the evolution of interest and inflation rates. When the interest rate declined, investment tended to rise. When inflation increased, and this increase was likely to last (at least until maturity of the corresponding debt was to be reached) firms had an incentive to borrow, thus to invest. In contrast, banks normally have an incentive to lend with high interest rates and low inflation rates. After 1982, French firms became more sensitive to changes in the *CAC 40*[49] index than to interest rates. This is so because since then they rely more on equity (or what is misleadingly called "stock") in order to finance their investment. Several implications arise from the discussion up to here. Let us stop for a moment and take stock of the points raised.

In a nutshell, the effects of rising real interest rates at the end of the seventies for French firms were the following. First, given that credit became more expensive firms relied more on equity than on debt, and ever since the corresponding shift took place productive investment became more sensitive to the evolution of stock market fundamentals. Second, as this was happening business executives became more estranged from central bank command (which is normally exercised through the interest rate) and felt the irresistible need to lobby for deregulation in financial markets. Third, as a consequence of the former point, the French economy was subject to what Keynes labeled as *liquidity trap*. Fourth, by demanding less credit, lenders (i.e. banks) had a strong urge in becoming *market makers* and find customers from which there were formerly no potential gains (i.e. households and developing economies), creating new sources of instability. Fifth,

[48] It must be noted in passing that financial markets (like any other market) have two sides; holders and issuers. Now, despite the obviousness of this sentence, it is worth reminding this to the reader because, even in the academy, often one side or the other is blatantly ignored, whereas it is crucial to study both **simultaneously**.

[49] *CAC 40* stands for *cotation assistée en continu*, and is a benchmark stock market index that represents a weighted measure of the 40 largest firms in the French stock market.

since firms are no longer subject to the pressure of banks to invest in safer-though-less-profitable projects, investment tends to take place in riskier sectors, thus promoting even more risk-taking (i.e. issuing more equities at higher prices). Sixth, as a consequence of the former point, since riskier investment projects tend to be less labor-intensive than less-risky projects, labor demand diminished, thus aggravating (and even perpetuating) the unemployment problem. Seventh, since the nature of riskier projects tends to be unproductive (for instance, advertising), new creation of wealth tends to be slower than it would otherwise be[50]. Let us now deal with each consequence at the time.

Financial and non-financial accumulation

As evidence of the first point raised, Figure 1.6 shows the ratio of the price of equities issued by firms[51] and the price of non-financial assets for firms (solid line) together with the annualized accumulation rate (dashed line, right scale). The timing of both series' ups and downs is impressive, notably from 1985 to 1987 and from 2002 to 2008.

The price of firms' non-financial assets has followed the evolution of housing prices for households which, as seen above, have in turn been deeply affected by the evolution of land prices. Since firms also own land, the price of their non-financial assets has followed roughly the same long-term trends as those of households[52]. Despite this, the evolution of equity prices has been even more extreme, so much that during the second half of the eighties and from 1997 to 2004, while land prices were on the rise, equity prices increased even more. Except for the period that goes from 1987 to 1997, this series and the physical capital accumulation rate followed the same long term trends, in the sense that they *tended*[53] to rise and fall at about the same time. We hypothesize that the sense

[50] This was coupled with (and in turn worsened by) the *re*allocation of manufacturing towards other less developed countries, which by the way were often the targets of the new allocation of financial flows (i.e. Latin America and Asia).

[51] Note, both indexes were computed from *Banque de France*'s financial accounts, and they follow very closely the evolution of the original series (i.e. *CAC 40* and price of non-financial assets of firms). However, we decided to show these two because they stem straight from the accounts, thus they include all firms and not only the 40 largest. These data were also used in our model, and the details of how these were computed can be seen in the appendix at the end.

[52] A straightforward negative consequence of this on firms is the strong increase in the denominator of the profit rate, calculated as the ratio of current period self-financing and the stock of capital the previous quarter. Clearly, with rising prices of capital, the profit rate tends to fall. We will come back to this in the second and fifth chapters.

[53] The emphasis is on this word because we do not mean that the evolution of both series was not perfectly timed. In fact, since both variables in the graph are seasonally adjusted, we are unable to provide a detailed description of the turning points. However, over a three to five years span we can see that both move in the same direction, and this is the main aspect in which we want to focus throughout our work rather than on particular events.

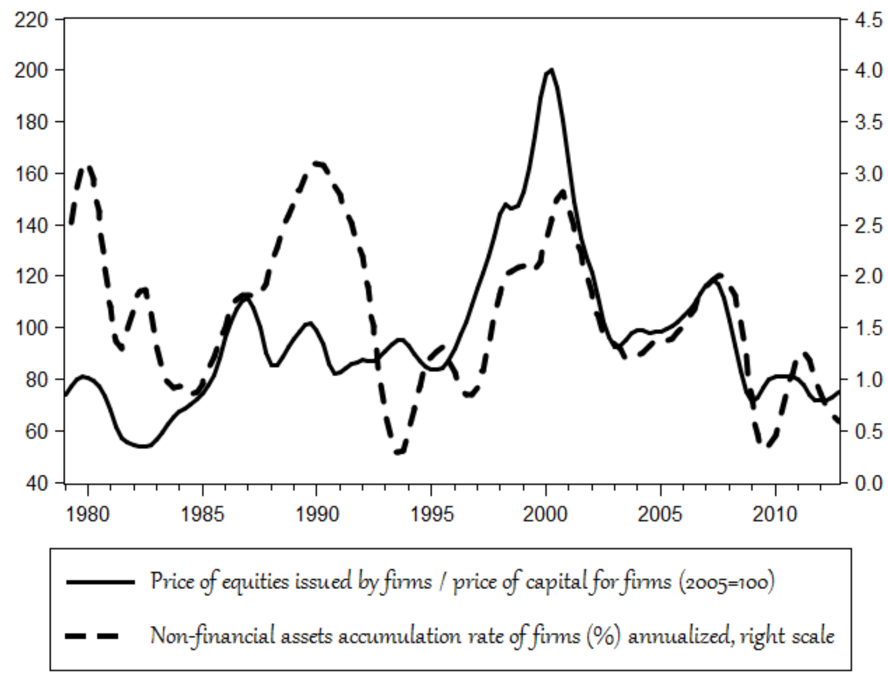

Figure 1.6 – Price of equities issued-price of capital ratio and accumulation rate of firms (seasonally adjusted); 1980-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

of causality between the price ratio (of equity and capital), simply called relative price henceforth, and the accumulation rate has constantly changed and could even be a matter of confusion.

For instance, the drastic fall of this relative price that took place between 1980 and 1982 was more *likely* to have been *caused* by the fall in investment, whereas the takeoff that went from 1985 to the 1987 stock market crash (given the circumstances of the time, i.e. that firms were issuing more equity than debt) is likely to have driven the strong recovery[54]. Likewise, the stock market boom that began around 1995 (manifest in the strong increase in equity prices) is likely to have driven the lagged response in the accumulation rate from that period and until 2001, when the synchronization of both series resumed. This in turn lasted until 2008, when the dependency between the two series (in whatever sense it has played) was strongly diminished. This stylized fact alone reinforces the rest of the points raised above (and dealt with below).

[54]That begs the question of why both series became disconnected afterwards. We come back to this below, when we deal with the role of the government in policymaking.

Deregulation, the liquidity trap and risk-taking

The second effect of rising interest rates for non-financial firms (executives' alienation from central bank command and their incentive to lobby for deregulation in financial markets) is a direct consequence of the former. The reason is straightforward, by feeling less dependent on debt, firms also become less sensitive to changes in the interest rate. Since the latter is set by the central bank, less sensitiveness to interest rates is equivalent to more independence from central banks. All the while, investment becomes dependent on its new source of funding, but if regulations keep funds from flowing freely from buyers to sellers of equity, then both types of actors (notably the latter) will find it irresistible to lobby for these to be removed.

The third effect (the economy's susceptibility to fall into a liquidity trap) derives straight from the former. With less debts on the liability side of firms' balance sheets and consequently less reliance on interest rates, any changes in the latter during this period is likely to have no effect in the demand for credit from non-financial firms, thus on investment.

The fourth effect (banks becoming *market makers*) is an indirect consequence of the former three, and has to do with the fall in the demand for credit, through the lenses of bondholders[55]. With banks perceiving the degradation in their balance sheets (as a consequence on their profits) their 'natural' reaction was to seek for other sources of funding. This point was discussed above in some detail.

The fifth effect (firms' risk-taking behavior) is twofold. On the one hand, following the strong rise in the cost of credit, existing firms that rely on this liability may either declare bankruptcy or (if they make it through) may consider the possibility of changing the nature of their productive activity. Now, if Long and Malitz's evidence (and the works inspired by it) are right, then French firms shifted to other (usually less labor-intensive) activities under the brave new financial order[56], which means that (following the standard textbook production function story) they tended to favor capital over labor and, in contrast to the years of the *Trente Glorieuses*, favored supply-side measures above demand-side ones, perpetuating in this way the unemployment problem. On the other hand, with less external influence (i.e. that of private and central banks) firms tended to

[55] For an interesting article dealing with this and other issues raised in this part (which was also a source of inspiration in this part of our work), see Shi 2003.

[56] As an example of this is the industrial composition shift, from agriculture and manufacturing before the eighties, to commerce and other services afterwards. On top of that, the dot-com bubble gave non-service industries the *coup de grâce* by seemingly providing evidence to the substitutability of manpower and computers (or, more broadly, machines).

promote speculation in the stock market in order to attract capital. This leads us back to the first point raised and to Figure 1.6.

Labor market liberalization and the worsening of unemployment

Obviously, the sixth effect (the worsening of the unemployment problem) is closely linked to the former point. Here we do not mean at all that the capital structure shift caused the unemployment problem *per se*. The strong rise in the unemployment rate in France since the late 1970s has its roots in several factors, some of which are particular of their time (the oil shocks and the corresponding restrictive policies implemented), and others rather structural (*la tournant de la rigueur* and labor market liberalization, for instance). However, what we do imply in this point is that the shift in firms' capital structure coupled with the corresponding industry shift towards riskier and less labor-intensive activities, worsened the *already existing* unemployment problem and may have even contributed in making it last longer than it would have lasted, had it only been a minor random recession dealt with what were considered standard tools up to then. By reducing labor demand, firms were making the recovery even more difficult, given that by doing so they reduced an important source of demand for their own products (workers' income). Parallel to the case of banks being obliged to look for alternative borrowers, French firms were somehow forced to look for new sources of demand (i.e. exports) or innovative techniques to sell to existing sources (i.e. aggressive advertising campaigns).

Finally, all this leads us to the seventh effect, which by the way was caused and further reinforced by the previous ones. The apparent superiority of riskier projects led firms to invest in these rather than on capital expenditures. Unfortunately, however, the long term trend of the accumulation rate (dashed line in Figure 1.6) tends to be in the downward direction (not upward, as the European authorities presumed it would). Supply-side and demand-side effects have no doubt played a role in this and, naturally, they just tend to reinforce each other. But with firms favoring the production of services rather than agriculture and industry[57], wealth creation (which by the way occurs *only in the real sector*) takes place at a slower pace than it would have done under no such productive and capital structure shift.

[57] As of 2010, industry in France employed 3.5 million workers, whereas commerce, transportation, accommodation and catering absorbed roughly 5.3 million workers (see INSEE 2013, p. 15). To put these numbers into perspective, "the weight of industry in employment was around 30% in 1962; it is no more than 15% in 2007" (Marchand 2010, our translation). For a detailed description of the transformations in the structure of employment see ibid., which can be found in the following link http://www.insee.fr/fr/themes/document.asp?reg_id=0&id=3071%C2.

Let us now focus on the liquidity trap and the discussion surrounding this interesting subject.

1.1.4 From the Liquidity Trap to the Financial Crisis... and Depression

It is not uncommon to read or hear journalists and economists refer to the current recession as a problem related to the so-called liquidity trap. As mentioned above, this situation is said to have arisen once downward movements in interest rates no longer have an expansionary effect on the economy. Most (though not all) economists would agree that the mechanism which links interest rates and investment is the credit market. A common argument, other than the one based on the credit market, is that quantitative easing *in itself* is expansionary, with the newly printed money making its way through banks, thus lowering interest rates. The idea is relatively simple to grasp, and describing the symptoms of such disease are also straightforward. What is, however, not straightforward is how an economy can get to that point[58].

Investment vs saving

So far our discussion has focused on movements in interest rates and the shift in the capital structure of firms. Central to our argument is the idea that, just as Keynes hypothesized more than eight decades ago in his *GT*, *the key instrument to steer the economy is the interest rate*[59]. An increase in interest rates would bring about benefits to debt- and bond-holders (national and foreign), whereas it would leave debtors (governments, firms or individuals) worse-off. Equivalently, a fall in interest rates would bring about a fall in bankers' profits, whereas it would leave debtors better-off, thus creating an incentive for borrowers to invest and, as long as that investment is not excessive (i.e. it does not lead to the build-up of bubbles), an accrual in national wealth. The idea is based on two major assumptions (which in turn depend on other assumptions). The first is that investment is the main

[58] An interesting exception is Koo 2009 which, despite some crucial differences of opinion concerning Keynes' work and other subjects, also inspired parts of our research.

[59] Of course, Keynes' analysis was based on good old standard ('western') finance. As a consequence, it excluded the possibility of finance with*out* interest rates (in which case another general theory would have to be studied). For instance, Islam forbids Muslims to charge and to receive interest (what could be seen as *selling money*, which of course has no intrinsic value). As a consequence, *Islamic Finance* is interest-rate-less finance (see Buiter and Rahbari 2015 for an overview which, by the way, gives more weight to debt than to own funds). Islamic finance is a common practice nowadays (notably, for instance, in Muslim countries like Malaysia), but there are still some drawbacks that have to be addressed for it to be a solid alternative to standard finance. A discussion about this passionating subject is well beyond the scope of the present work.

driver of economic growth. The second is that the economy is sensitive to changes in interest rates.

Despite some theoretical differences with respect to the neoclassical school (at least in its textbook version), there is rather consensus among economists (at least on the non-mainstream camp) that investment, and not necessarily saving, is in fact the main driver of economic growth. Keynes explained this through his now famous paradox of thrift which, despite ample theoretical and empirical evidence of its importance, is far from being fully accepted[60]. The main counter-argument to detractors of the investment-saving discussion can be found in the works of Michal Kalecki. As a summary of his thoughts concerning the supremacy of investment over saving[61] in being the main driver of economic growth in a capitalist economy, let us read his own words written as early as 1937:

> *Investment* considered as capitalists' spending *is the source of prosperity*, and every increase of it improves business and stimulates a further rise of spending for investment. But at the same time investment is an addition to the capital equipment and right from birth it competes with the older generation of this equipment. The tragedy of investment is that it calls forth the crisis because it is useful. I do not wonder that many people consider this theory paradoxical. But it is not the theory which is paradoxical but its subject – the capitalist economy (Kalecki 1937a, p. 95-96, our italics).

'Mr. Keynes and the economy'

Now, concerning the sensitiveness of investment with respect to the interest rate, Keynes' liquidity trap is of the utmost importance. This is so not only because it clearly provides a rationale for understanding what has happened to the French economy since the capital structure shift took place, but because it fills an important apparent gap in Keynes' *general* theory: inter-sectoral relationships, notably with respect to banks. But before delving into the details of the French liquidity trap, let us take a small step back and review the

[60] For instance, a quick glance at investopedia (a website dedicated to investing education) says that "the paradox of thrift is a theory, not a fact, and is widely disputed by non-Keynesian economists. One of the main arguments against the paradox of thrift is that when people increase savings in a bank, the bank has more money to lend, which will generally decrease the interest rate and spur lending and spending". See the following link http://www.investopedia.com/terms/p/paradox-of-thrift.asp.

[61] For a discussion on the differences and similarities between Keynes and Kalecki on this point can be found in López and Mott 1999.

words of one of the most influential economists of our day with respect to Keynes' *GT*, Paul Krugman, whose words are also worth quoting in full:

> Perhaps the most surprising **omission** in the *General Theory* – and the one that has so far generated the most **soul-searching** among those macroeconomists who had not forgotten basic Keynesian concepts – is the book's failure to discuss **banking crises**. There's basically **no financial sector** in the *General Theory*; textbook macroeconomics ever since has more or less discussed money and banking off to the side, giving it no central role in business cycle analysis (Krugman 2011, p. 16, italics in the original, bold caps added).

Interestingly, the title of Krugman's article (of course, from where this citation was obtained) is "Mr. Keynes and the moderns", which is a straightforward reference to Hicks 1937 article "Mr. Keynes and the "classics"; a suggested interpretation". Not that this part is devoted to either Krugman's or Hicks' interpretation of what Keynes meant, did not mean or should have meant, but a few words about the titles themselves are worth mentioning.

Hicks' IS-LL (later renamed IS-LM by Alvin Hansen) model proposed in that article is quite relevant today, despite some drawbacks in the way it is taught today (Colander 2003) and criticism from its own author (Hicks 1980). His model became the macroeconomics mainstream of the post-*GT* era and the pre-monetarist one. Yet his interpretation that Keynes' theory is particular rather than general, and that the general theory was (and still is) a special case of the classical theory, gives way (in our opinion) to Krugman's analogy with respect to modern macroeconomic theory; the idea that Keynes' theory is incomplete. If Krugman (indeed an important spokesperson for Keynesian economists[62]) is right in that Keynes ignored the financial sector, then explicit inclusion of the financial sector into his theory is the right lead (though certainly not the only one). Without intending to lecture our predecessors, our model modestly proposes some hints in that direction. The discussion of the liquidity trap is a bridge.

The liquidity trap

Since, as we saw in the previous section, French firms changed their capital structure in favor of equity given their perception that the nominal interest rate was rising and the inflation rate was falling, naturally the relevant variable is the real (not the nominal)

[62]Note, the Keen-Krugman controversies have fueled Krugman's falling from grace from (non-new-) Keynesian circles.

interest rate. Going back to Figure 1.4, it is worth noting that roughly until 1995 (at least at a first glance), the share of debt obligations in the stock of liabilities of non-financial firms and the real interest rate paid by this same institutional sector moved counter cyclically. From then up to 2001, however, they moved in the same direction. From 2001 to approximately 2004 the relationship between the two became again negative, but turning once again pro-cyclical from 2004 to 2008. Following the crisis, of course, the relationship between credit demand and the interest rate became again negative.

In other words, following the restrictive policies implemented at the end of the seventies, the liquidity trap in France *could* be said to have started with the internet boom (1995) and spanned until the global financial crisis (2008), with the important exception of 2001-2003. However, this assertion would presume that our evidence is based *exclusively* on the long-term procyclicality of the interest rate and the capital structure of firms. But what this would ignore is that the disconnection between the two series may be coincidental without reflecting any clear-cut (dis)association. Indeed, under a long-run perspective, the real interest rate kept on rising after the capital structure had already shifted in favor of equities (around 1982), but the short-run fluctuations in the latter do not follow the short-run movements in the former shortly after this period. In order to provide a less simplistic (though still rough) explanation of the timing of this relationship[63], let us carry out a simple first year undergrad correlation exercise from a standard econometrics course.

Period	*Correlation coefficient*
1979q1-1981q3	0.66
1981q4-1986q2	-0.81
1986q3-1992q2	0.41
1992q3-2000q4	0.79
2001q1-2003q4	-0.91
2004q1-2008q3	0.21
2008q4-2012q4	-0.92
1979q1-2012q4	-0.45

Table 1.2 – Correlation coefficient between quarterly real interest rate and capital structure of firms, several periods. Source: authors' calculations based on data from *INSEE* and *Banque de France*.

Table 1.2 shows the correlation coefficient between the real interest rate and the capital structure of firms (seen from the debt-side). In the absence of any anomaly, this

[63]Clearly, this aspect alone deserves a study of its own, but lies outside the scope of the present work.

relationship *should* be negative, given that credit demand depends negatively on its cost, which in this case is represented by the difference between the nominal interest rate and the inflation rate on a quarterly basis. The correlation coefficient between these two series in three sub-periods (1981q4-1986q2, 2001q1-2003q4 and 2008q4-2012q4), more than -0.8 in absolute value, indicate that this was indeed the case. Nevertheless, three other sub-samples (1979q1-1981q3, 1986q3-2000q4[64] and 2004q1-2008q3) are, under this light, anomalous. Let us delve a little bit deeper into these numbers.

As mentioned previously, the restrictive monetary policy implemented by *Banque de France* beginning in 1979 was a response to two major adverse effects; domestic inflationary pressures and dis-inflationary measures in the United States (thus the risk of capital flight). Depending on the circumstances and the reactivity of economic actors, macroeconomic policy may take some time to be effective. This was the case at the end of the 1970s. Nominal interest rates were already on their way up, but for this to have any effect on the inflation rate (thus on the real interest rate) two more years would have to elapse. As a consequence, the relationship between the real interest rate and the capital structure is positive from 1979q1 to 1981q3. Nonetheless, once the policy gained effectiveness and credibility, rising interest rates reduced demand for credit and output expansion significantly. Indeed, for the share of debt issued out of total liabilities to go from 68% in 1982 to only 41% in 1986 is no minor change. With the onset of the 1987 stock market crash and following the 1990 recession, indebtedness showed slight signs of recovery with respect to own funds, but the overall trend since the second quarter of 1986 and up to the fourth quarter of 2000, the correlation coefficient between the series analyzed (real interest rate and capital structure) was positive, although stronger since 1992q3. Following the strong fall in the price of equities in 2000-2001, credit demand was again given a place of honor (and with it the interest rate too), but this lasted only until 2004, when capital structure became insensitive to changes in the real interest rate. The 2000-2001 story repeated itself with the global financial crisis.

Based on this rough correlation representation, we can say that the liquidity trap started in 1986q3 (not in 1995 as graphical inspection alone seemed to suggest), and lasted until 2008q3. An important exception of this *trap span* is the post-crisis period 2001-2003, during which debt issuance gained momentum, even if only for a short time. Now, in 2008 the stock-market bubble burst, and the housing bubble drastically stopped its aggressive upward path. As has been suggested throughout the discussion, the process

[64]This period is shown in two parts. More on this below.

of the origin (and end) of both is strongly related[65], and can be explained by the evolution of interest rates, which in turn were strongly influenced by the events leading (and pertaining) to the Volcker experiment.

Sum-up of long term trends

To sum up, the housing bubble is likely to have been fed by, at least, two major long-term trends: (1) the sharp increase in households' indebtedness, and (2) the strong degradation in their living standards (wage contraction and rise in unemployment, mainly). In turn, throughout the same period the stock-market bubble grew thanks to the bull market that accompanied the massive issuance of equities created by (1) movements in interest rates and (2) the falling from grace of credit demand by firms (both of which were mutually reinforcing). With the collapse of Lehman Brothers in the U.S. came the signal of the worldwide bubble burst of both markets[66]. Persistent price increases of houses and equity could not last forever unless major changes occur, notably so in the context of a monetary union.

Since the implosion of the most recent global financial crisis, tons of works (well-founded or otherwise) have addressed this important issue. Perhaps before getting there directly, it is worth taking one more step back in order to understand what the government can do (if it has the will to do or if it is not constrained to follow 'disciplinary measures') to smooth the business cycle, particularly before and after a slump.

1.2 From Maximum Employment to Minimum Inflation; The Role of the Government and Income Distribution

1.2.1 The Employment-Price Stability Paradox

The outcome of the strong restrictive monetary policy implemented at the beginning of the 1980s in France has had important negative consequences for households and non-financial firms, and the government has (at times) tried to compensate these unfavorable events. The consequences on their balance sheets and current accounts was described in the previous section. Nevertheless, in our opinion there are two more consequences even

[65]For a thorough (and somehow different) analysis of the link between housing and stock market bubbles, see Shiller 2014 Nobel lecture.

[66]This is only a half truth. Housing bubbles went bust in several English-speaking countries and Spain, but not in France and other countries. Indeed, the second major bubble mentioned in section 1.1.2 did not collapse. What happened instead was a sudden halt in the upward evolution of housing (and land) prices.

more important than the ones described up to here: the strong increase and persistence of high unemployment and income inequality.

Unemployment as a worsening factor of income inequality

To illustrate our reasons, for the sake of simplicity (and despite the clear lack of realism), let us assume that everything that we have described thus far happens in an economy that is at full employment, even in the face of dire changes in the interest rates, firms' capital structure, inflation, and so on. Under this logic, firms may be assumed to lower wages proportionately for all workers instead of laying some of them off in case of important financial constraints.

In these circumstances, following a resolute decision of the authorities to implement a strong restrictive monetary policy of the same size as that observed in the early 1980s, firms would have to lower wages drastically in order to preserve their share of national income constant. In the absence of a paternalistic or even populist[67] government, the fall in wages would have to be considerable. For this to work, unions would have to accept wage cuts instead of opposing them. Be it as it may, with the strong fall in wages every worker would be worse-off than before the adverse shock. Now, at this point we did not assume equal wages for every worker, so that inequalities already existed in this hypothetical scenario. With the adverse shock, and under the circumstances depicted here, the wage cut would have to be proportional for all.

If this had actually been the case (clearly, it was not) national revenue would have fallen equally for all and, no matter how strong the fall in national income would be, the economy would still be at full employment. Eventually, of course, with the recovery everybody will be equally better-off, depending on how fast the economy grows. Those at the bottom of the income distribution ladder would momentarily find themselves below the poverty line (whatever that level might be) during the slump, but would get out of it with the recovery. Those at the top of the ladder would see their wealth diminish and rise up again, without their very subsistence being threatened. Under this restrictive set of assumptions we have ignored (just like neoclassical economists do in their models) that employment and income and wealth inequality *do not* remain proportional along the business cycle. This simple thought experiment is useful in that it proves (by assuming

[67] Interestingly, in a recent conference at Kedge Business School addressed by the newly elected vice-president of the European Commission Jirky Katainen, we were able to see that every time Mr. Katainen referred to 'Euro-skeptics' he would add the term 'populists' in order to highlight his perception that *skepticism about Europe* (which should in any case be perceived as skepticism about the rules imposed by the authorities in charge, rather than on Europe itself) comes from *populists* who oppose fiscal discipline.

the 'absurd') the importance of why employment and inequality matter.

Personal distribution of income

Before delving into the aspects concerning the role of the government in smoothing business cycles and the *functional* distribution of income, let us first deal with the *personal* distribution of income. To do so, let us first take a look at Figure 1.7, which shows the unemployment rate[68] and the inflation rate, which normally make up the Phillips curve in a single diagram with no time dimension. In the mid-seventies, the inflation rate was high and the unemployment rate was correspondingly low. The series moved counter-cyclically until 1978, then pro-cyclically from that period until 1981, only to get back to the previous regular pattern, which was reversed again between 1996 and 1999. By then, however, the unemployment rate was already intolerably high (10%). In contrast, consumer prices were growing mildly (much less than 1% per quarter). Whereas, having a well paid job was commonplace before the seventies, it seems as though it were a privilege today, particularly so for the young.

It is important to note that, as the inter-sector leveraging shift (between firms and households, as described above) took place in the second half the eighties, the unemployment rate reached 9% and the inflation rate drastically fell to 0.63% on a quarterly basis. Perhaps since then, the regime and paradigm shift can be associated to the capital composition of firms. Central bankers' dream of taming inflation[69] came true, but clearly at a high price (though this price was clearly born only by those at the bottom).

With the unemployment rate at triple its *Trente Glorieuses*-level[70] and with the degradation of living standards[71], inequalities are likely to have risen since then. Thus, under the new Spencerian order, social polarization between income brackets would turn out to be even more extreme, with the bottom becoming thicker and the top slimmer.

[68]This graph starts in 1975 given that unemployment quarterly data from *INSEE* is only available starting in that period.

[69]See for instance Feldstein's interview with former Federal Reserve chairman Paul Volcker (Feldstein 2013). See also "The Anguish of Central Banking" by also former chairman of the Fed Arthur Burns, Cirovic, and Polak 1979.

[70]Just like any statistic, we believe this series contains important measurement errors (see Goarant et al. 2010, p. 7). Moreover, it is likely that it is underestimated, given methodological issues stemming straight from ILO (number of hours worked to be considered employed, or the consideration of 'actively searching for a job', for instance).

[71]As we will see below, real wages were also contained.

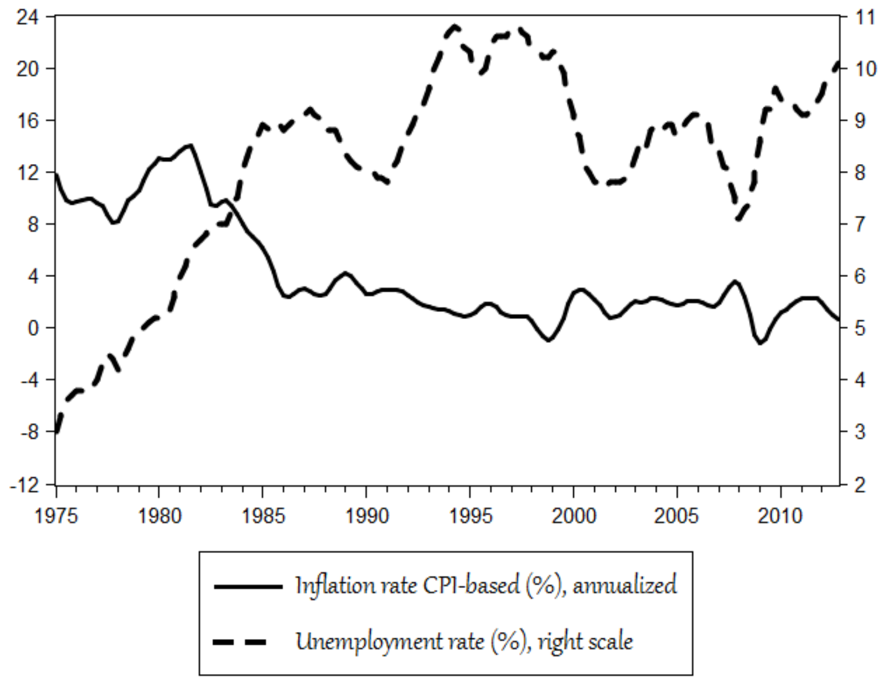

Figure 1.7 – Unemployment rate and inflation rate (%); 1975-2012. Source: author's calculations based on data by *INSEE*.

1.2.2 The Role of the French Government in Economic Policy

Throughout the years known as the *Trente Glorieuses*, the French government was a key player in the economic landscape. Not only because it was (and still is) *big* in the sense implied by Minsky 1986, but also because it was wise in following what we consider to be the correct measures[72]. These measures had a common goal: to achieve the maximum level of employment.

As stressed over and over in this work, with the advent of the Washington consensus came two major oil shocks, and with the second one came a strong policy response that drastically changed this landscape, and with it (along with all the changes described in the previous section) the role of the government. Since *Banque de France* proved being stronger than the government (probably also because of the alleged supremacy of interest

[72]The word *correct* should be interpreted in a broader sense when it comes to this particular case. For instance, for much of the fifties and sixties, public investment as a proportion of *GDP* was growing importantly. This policy in itself is seen as encouraging private investment and thus employment in the corresponding country. However, at least a part of these expenses was used to finance the war in former Indochina and Algeria and related expenses. War, in whatever context, is not seen here as *correct*.

rates), the minimum inflation goals of the former would have to be pursued at the expense of the latter's goals (at least up to 1979) of maximum employment. A contemporaneous example of this policy goal conflict in the European Union is the Stability and Growth Pact[73] which, of course, has as a priority *stability* (otherwise it would be called the Growth and Stability Pact). It should be noted that the European authorities see consumer price stability (rather than, for example, equity or housing price stability) as a precondition of growth, instead of as the standard trade-off implied by the Phillips curve. Clearly, seven years after the crisis, sustained economic growth is still to come for all member states.

Public revenue

Let us begin by studying the current account balance of the government. Table 1.3 shows the income side of the public current account from 1949 to 2012 in several sub-periods. Two stylized facts stand out from these numbers. The first is that the bulk of government receipts come from taxes (value added taxes and income taxes[74]) and contributions. The second is that some clear trends provide support to our claim of the policy goals pursued before and after the strong rise in interest rates.

Period	*GOP*	*VAT*	*Subv.*	*Div/Int*	*Inc. tax*	*S. contr.*	*Transf.*	*Publ. rev.*
1949-1959	3.2	51.2	-6.9	2.7	14.8	30.7	4.4	31.6
1960-1969	3.8	47.2	-6.4	3.0	15.6	35.4	1.4	35.3
1970-1979	4.2	37.6	-5.0	3.2	17.0	41.5	1.5	38.5
1980-1989	5.0	33.7	-5.0	2.8	17.5	44.7	1.3	44.5
1990-1999	5.2	32.4	-3.4	2.4	19.1	42.8	1.5	46.5
2000-2007	5.3	32.1	-3.2	1.5	24.4	38.3	1.5	47.1
2008-2012	5.9	31.8	-3.2	1.7	23.2	39.2	1.6	47.7

Table 1.3 – Government revenue by source % of total government receipts, except last column (% of *GDP*). **GOP** is gross operating surplus. **VAT** is the sum of *TVA*, *droits de douane*, *impôts sur les produits*, *impôts sur la main d'oeuvre* and *autres impôts sur la production*. **Subv.** are subsidies. **Div/Int** are interests, dividends, insurance and property income. **Inc. tax** are all income taxes received by the government. **S. contr.** are social contributions paid by all sectors. **Transf.** stands for transfers received. **Publ. rev.** is total public revenue. **Source:** Author's calculations using data from *INSEE*.

[73] On the European Central Bank website one can read that "[t]he Stability and Growth Pact (SGP) is a set of rules designed to ensure that countries in the European Union pursue sound public finances and coordinate their fiscal policies." See http://ec.europa.eu/economy_finance/economic_governance/sgp/index_en.htm.

[74] Reminder; as we saw above, income taxes as proportion of disposable income has increased sharply since the 1950s. As a consequence, a bulk of these government revenues has come from the pockets of households.

The second column of the table shows the gross operating surplus of the government[75], and it shows that it has somehow progressed as proportion of total public revenues, mainly due to the reduction in public sector employment. The third column shows the opposite trend for value added taxes, which in the decade of the fifties represented more than half of total revenues, but has progressively fallen to less than a third. As Kalecki hypothesized in his mark-up theory of prices[76], any increase in sales taxes (i.e. VAT) would either have to reduce mark-ups or translate into higher prices, which would ultimately be paid by consumers. This strong tendency for value added taxes to fall as a proportion of public receipts may reflect the French government's will to promote price stability.

Subsidies, dividends and interest receipts have declined significantly since the beginning of the sample under study. Since, as we saw above, individual entrepreneurs (allegedly the most important recipient of subsidies) have decreased in number, it is not surprising to see subsidies represent a smaller share of total receipts. Now, before the 1980s dividends (the most important item in the fifth column of the table) were more important than afterwards as a proportion of government receipts. This is so because of the privatization wave that accompanied the liberalization and deregulation process characteristic of the last thirty-some years.

The weight of income taxes in public revenue has been progressively rising since the late forties, going from 14.8% in the first sub-period (1949-1959) to 23.2% in the last one (2008q1-2012q4). Actually, given the strong activation of the automatic stabilizers after the 2008 crisis, income taxes fell relative to public revenues afterwards. Social security contributions, on the other hand, has neatly increased in the composition of government incomes. The bulk of these are paid by employers (61.7% out of total). Transfers represented 4.4% of public revenues from 1949 to 1959 (mostly in the form of international cooperation, or simply reconstruction aid), but since the following decade it has not reached more than 1.6%. Finally, to our surprise, as the last column shows public revenue as a share of *GDP* has increased (and not fallen, as we would have expected). We interpret this being mainly the result of the gradual fall in growth rates since the immediate post-war period.

[75]This item is the difference between value added (which in the case of the government is non-market production) and subsidies on the one hand, and wages paid to civil servants on the other.

[76]Reynolds 2004 (p. 105) mentions that "[t]he main thrust of [Kalecki's 1941 papers] was to argue in favour of rationing and *against indirect taxes*, which he saw as merely a form of government-controlled inflation" (italics added).

Public expenditure

Let us now analyze the expenditure side of the public balance. Table 1.4 shows the main components of public expenditure by broad group. The first column indicates that the amount of public resources dedicated to pay public servants has been declining since the 1980s. On average, this item represented no less than 41.2% out of total expenditures from 1949 to 1979, but from then on it has progressively fallen until finally reaching 34.5% in the period 2008q1-2012q4. It must be noted that wages, together with benefits, represent the bulk of government expenditures.

Period	*Wages*	*Int.*	*S. ben.*	*Transf.*	*Govt. outlays*
1949-1959	42.8	5.2	45.1	6.9	21.3
1960-1969	41.2	4.3	49.0	5.6	23.5
1970-1979	42.2	3.1	50.1	4.6	26.8
1980-1989	39.2	6.4	50.0	4.4	33.4
1990-1999	36.5	8.8	48.9	5.9	36.2
2000-2007	36.5	7.8	48.5	7.3	36.2
2008-2012	34.5	6.8	50.2	8.4	38.3

Table 1.4 – Government current expenditure by destination % of total public spending, except last column (% of *GDP*). **Wages** is the sum of *masse salariale*, *cotisations sociales employeurs* and *cotisations imputées*. **Int.** is interest payments. **S. ben.** is the sum of all social security benefits (*prestations*). **Transf.** are all transfers. **Source:** Author's calculations using data from *INSEE*.

Interest payments are, of course, paid to banks (both domestic and foreign) in exchange for the issuance of bonds. Given that interest rates were presumably lower before the 1980s[77], it is hardly surprising that interest payments actually diminished from the 1950s to the 1970s. With the restrictive monetary policy implemented in the early 1980s, we can see that during this decade interest payments more than doubled in importance as share of public spending. The following two sub-periods it would be even higher (though diminishing), in order to settle at 6.8% from 2008q1 to 2012q4. It must be noted that the interest rate paid by the government progressively fell in the mid-nineties (more on this below).

After having increased by 3.9% out of public expenditure from the fifties to the sixties,

[77] As we mentioned above, data constraints do not allow us to calculate apparent interest rates before 1979. However, taking a look at the first pages of chapter 20 (dedicated to France's interest rates in the 20th century) of Homer and Sylla 2005 *A History of Interest Rates* strongly support this claim about the T-bill rate.

social benefits have remained remarkably stable, remaining at around 49%. However, it is worth noting that despite the worsening of households' revenue and the strong rise in the unemployment rate since the 1980s, benefits (which include family allowances, along with retirement, handicap and unemployment benefits) did not increase their share. This lack of proportionality between benefits (on the expenditure side) and falling incomes (on the social side) may be indicative of a political motivation to contain public expenditure, which is often considered as inflationary in itself. Other types of aid, included under the heading transfers (fifth column), fell steadily until the 1980s but progressed afterwards. This item includes current transfers to non-profit institutions serving households, intra-governmental transfers, the *quatrième ressource propre* and other redistributive expenses (see INSEE 2014, p. 120-121).

Public investment

Another key element at the disposal of the government to smooth the business cycle is investment which, added to the current expenditure analyzed above, and both subtracted from public revenue make up the government balance or, equivalently, its financing capacity (when it is positive) or need (when it is negative). These two items are shown in Figure 1.8 as percentage of *GDP* from the first quarter of 1949 to the fourth quarter of 2012.

Several features of the series stand out. One is the fact that the government balance –the solid line– reached an important surplus (1.5% of *GDP*) in 1959, after having climbed rapidly since 1956, period in which there was an important public deficit[78] (2.2% of *GDP*). Since then, however, it has steadily deteriorated, reaching record deficits in 1993 (6.3%) and 2009 (7.6%). Another aspect that is important to highlight from the public balance is that it has been strongly countercyclical, although not always with perfect timing. For example, following the first oil shock, the government ran a deficit equivalent to 2.6% of *GDP*. However, with the second oil shock already hurting the economy, the Giscard administration (with Raymond Barre as prime minister) did not allow for the automatic stabilizers to be activated, and these would wait until François Mitterrand was elected president for Barre to resign and allow the government to run a public deficit equivalent to 2.9% of *GDP* in 1982, which would be kept at around that level until the first *cohabitation* (with Jacques Chirac elected as prime minister), period during which the government would pursue fiscal consolidation again.

[78] At this point it must be noted that this series does not correspond to the Maastricht criteria, therefore, the graph does not necessarily represent the ones shown in the press.

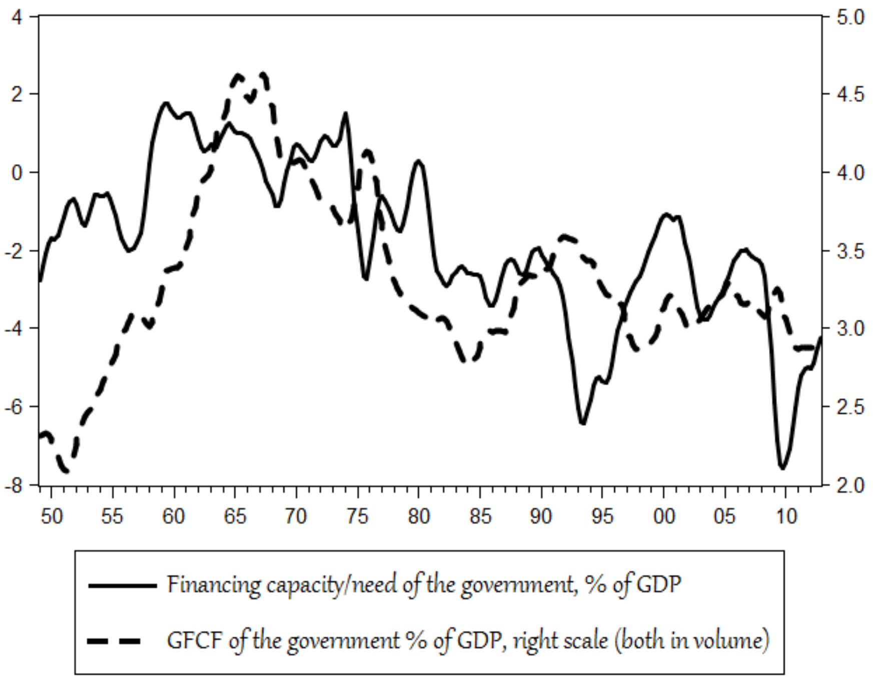

Figure 1.8 – Government balance and investment as share of *GDP*; 1949-2012. HP filters with $\lambda = 10$. Source: author's calculations based on data by *INSEE*.

Public investment was very important during the 1950s and 1960s. This can be seen in the strong rise of this series during these two decades, going from 1.8% of *GDP* in 1951, to 4.2% in 1965 (notably, due to the reconstruction). Since that peak it would start declining, first strongly (1967-1978, with the exception of 1975-76), then it would stabilize and even increase (1978-1992), in order to fall again after the 1990 recession and during the internet boom (1992-1998) in order to rise (until 2009) and fall again (after 2009).

A particularly interesting episode started around 19 October 1987 (black Monday), period in which the price of equities issued by non-financial firms fell drastically. Nonetheless, taking a look back at Figure 1.6, it can be seen that, despite the fact that (according to our arguments) investment was no longer reacting to changes in the interest rate but were instead sensitive to the evolution of the price of equities, physical capital accumulation *did not* fall immediately after this adverse shock. In fact, accumulation even gains momentum, and this is thanks to the fact that *public investment did not fall during this period* - it actually increased - thus crowding-*in* (and not crowding-*out* as anti-Keynesians like to think) private firms' investment[79]. By 1989 (with socialist Édith Cresson as prime minister) public investment started declining again slightly, but with the 1990 recession it climbed back up rapidly, together with current public expenditure. These developments led to a strong government deficit that lasted until 1993, when Édouard Balladur (formerly minister of the economy and finance during Chirac's tenure) took office as prime minister, inaugurating the second *cohabitation* and the renewal of the fiscal consolidation agenda.

Public debt and the interest rate paid by the government

It is worth mentioning that the expansionary fiscal policies (when they took place, mostly under prime ministers from the socialist party) implemented after 1980 were coupled with restrictive monetary policies. What this implies is, on the one hand, that the effectiveness of such policies was rather limited due to the lack of consistency between fiscal and monetary policy. On the other hand what this implied was that, with employment, production and money supply being strongly constrained, coupled with a government that has a reputation for being generous with its citizens, this had the effect of pushing up the burden of public debt as share of *GDP*. With *Banque de France* (and the ECB after the introduction of the euro) pulling in one way, and with the government pushing in the other sense, it is natural that the overall outcome has been mixed since the capital structure shift took place. Moreover, with less growth and employment, the more the need for public debt to finance the lack of effective demand.

Figure 1.9 shows the stock of liabilities of the government[80] as share of *GDP* (dashed line) and the interest rate on public debt (solid line). Two things must be highlighted from the figure. The first is that both the interest rate and the debt-*GDP* ratio were low at the beginning of the 1980s (-1.9% and 19%, respectively), but comparatively high by 2012 (0.3%[81] and 93%). The second is the apparent lack of synchronization between business cycles and the debt-*GDP* ratio. Let us deal with each at the time.

As mentioned previously for the relationship between firms' debt and the interest

[79] Interestingly, given that non-financial firms had already drastically curtailed their demand for credit, with the government stepping in as a *borrower of last resort* even if this had made interest rates rise (it *did not*), such rise would not even have been a problem, given that firms relied much more on own funds than on debt.

[80] Note, this series was built under certain assumptions that fit our model's simplification purposes. However, we tried to keep the series as loyal to the original as possible. See chapters 4 and 5 for the details.

[81] This number may seem low. However, the reader must note that (1) these are quarterly interest rates (thus, roughly four times that number should be equivalent to the annual figure), and (2) the interest rate at the end of the period is higher, so that these numbers are also significantly higher than at in the first half of the eighties in absolute terms.

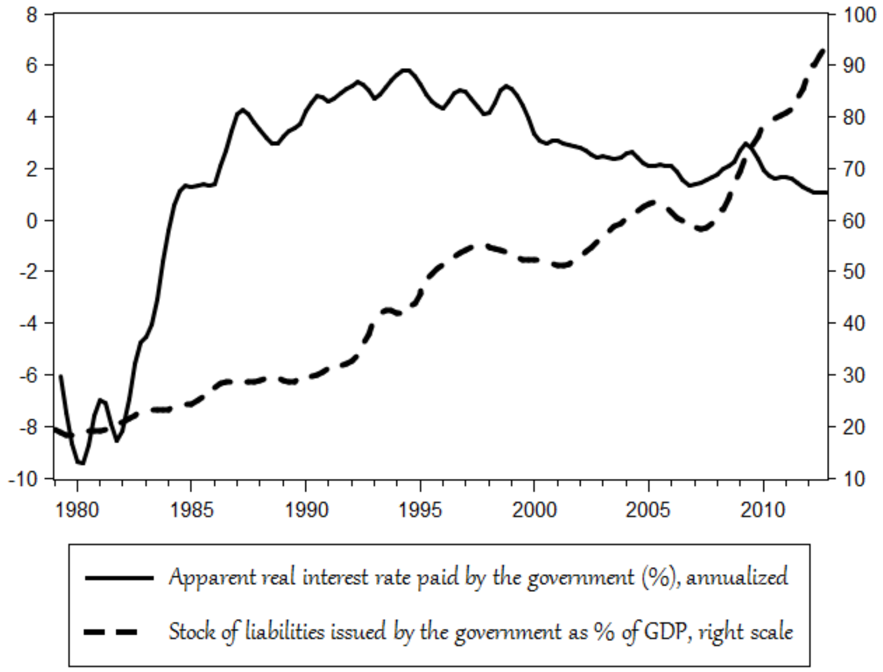

Figure 1.9 – Public liabilities (% of *GDP*) and apparent interest rate paid by the government (%); 1980-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

rate they have to pay, once a debt is contracted it is paid back at maturity. Now, public liabilities are made up of bonds in a much larger proportion that debt, which could indicate that the treatment is different. However, governments have the reputation of *rolling-over* debt (that is, delaying payments) as much as possible. As a consequence, long-term debts contracted in, say, 1982 would normally be expected to get paid back one, five or ten years hence. Moreover, the temptation of paying debt with yet more debt in periods when incomes, tax receipts, employment, production and savings are falling (i.e. the 1980s) is irresistible given that there seems to be no other alternatives of raising funds for the fiscal authority. Bearing this in mind, it is now comprehensible why we did not observe a strong rise of the stock of government liabilities immediately after the 1980-1982 recession. What was observed instead was a strong and sustained (though irregular) rise in the debt-*GDP* ratio starting in 1992; ten years later.

Naturally, with *GDP* growing rapidly during the internet boom (1995-2000) the public debt-to-*GDP* ratio tended to fall, if only during that period, for after the 2000 crisis it would increase drastically. The rise in this indicator was due to three effects: (1) the fall in output (the denominator of the ratio), (2) the rise in debt itself due to the crisis[82], and (3) the slight fall in the real interest rate that took place beginning in 2001. A relatively strong drop in the public debt-*GDP* ratio taking place between 2005q3 and 2007q2 (the beginning of the global financial crisis) marked the resumption of the rise in this ratio, which from then until 2012 grew even more.

The apparent lack of synchronization between the interest rate and the debt-ratio is partly explained by the timing problem described above. However, two more things should be added. First, with the real interest rate going up (that is, with the combination of the increase in the nominal interest rate and the fall in the inflation rate) the cost of debt increased but, since governments look after this element with less stringency than firms (presumably because they have multiple objectives which must correspond to other sectors other than itself) debt kept on rising[83]. Second, with public debt contracted in a period when commodities' prices are higher than at maturity, the burden of debt increases in itself. A low inflation environment, of course, is beneficial for lenders (i.e. domestic and foreign banks), but as much as it benefits them it harms indebted sectors (households and the government at this point) because it implies that a given amount borrowed at some point in time will have to be reimbursed at a higher value in the future (interest payments aside).

This discussion clearly refutes the idea that public debt is a *cause* of the current crisis in France. We see it rather as a *consequence* of events that date all the way back to the collapse of the Bretton Woods system, its consequent replacement by the Washington consensus, the Volcker shock, and the restrictive policies irregularly implemented (though eventually converging) since then. With rising nominal interest rates the inflation rate fell and firms de-leveraged at the same time that they issued massive amounts of equity to finance their investment, making the economy more sensitive to the stock market and less so with respect to the central bank. Once real interest rates stopped rising for households, these (despite the strong fall in their incomes) increased their demand for credit, and this in turn created two housing bubbles. In the meantime, with falling demand for credit from firms and with households borrowing part of these 'unborrowed' funds, the government also stepped in as a *borrower of last resort*, although it might have been obliged to do so rather than having the political will to do it.

[82] Another important factor is the arrival of baby-boomers at retirement age (Goarant et al. 2010, p. 8) which, of course, have to get paid for retirement, the sources of which also come from debt.

[83] It should also be noted that governments do not issue equity (yet?), so there is no alternative to raise funds other than taxes and money printing, but since neither option seemed feasible (except the former, see below), debt kept on increasing because it was basically the only option available.

Déjà-vu ?

Let us now focus our attention on the aftermath of the global financial crisis to confirm what we just said. From 2008 to 2010 the automatic stabilizers were allowed to be activated, thanks in part to the *IMF* and in part given the strong need for these to act, if at least as in a regular recession. In 2010, notwithstanding the gravity of the crisis and the high unemployment rates, fiscal consolidation was back on the policy agenda. Paradoxically though, this time it is the socialist party in power that pursues this goal. Now, aiming at fiscal consolidation during the slump (and not once this phase of the cycle is over), that is, at a time when aggregate demand is falling, production is stagnating, *firms and households are de-leveraging*, demand for dwellings and equity is weakening and, perhaps most importantly, when the unemployment rate is at unbearably high levels, does not seem like a good idea (or even a *morally* viable choice!). Moreover, by asking affected Eurozone member states to pursue "belt-tightening" measures in order to safeguard the stability of their common currency in this period when it is most needed (at levels comparable to those only seen between two world wars), European authorities may be seen as endangering political stability, thus promoting the opposite of what it is actually looking for.

Now, since in France social security and health expenses paid by the public sector are the main items in which the government spends[84] (fourth column of Table 1.4), it is not surprising that *l'Élysée* also targets these important safety nets. By reducing spending on these two and other key social development items (for instance education), let alone expenditure itself, the government may quickly reach its obsessive goal of achieving fiscal balance, but at a *high social cost*. By considerably reducing the welfare state (or carrying out so-called "structural reforms"), European authorities might only see the day they achieve their Lisbon strategy dream of turning Europe (if only the northern part) into the most competitive block when middle- to low-income European economies become fully de-industrialized (including France).

Perhaps if instead of following European authorities down a blind alley the French government pursued expansionary **monetary, fiscal and incomes** (that is, *Keynesian/Kaleckian*) policies as it is supposed to do[85], private sector balance sheets would recover faster. In fact, if it chooses to follow the austerity way, as it has so far, balance sheets of firms, households, the government, and even banks may (if at all) take longer to be repaired.

[84] Indeed, these two items also rank high among developed economies, see Finances 2013.

[85] As a socialist party, it *should* promote these policies, otherwise it is no longer socialist, thus it should at least change its name to avoid confusing the uneducated public.

Now, lending support to our claims that the *paradigm shift*, manifest in the change of the capital structure of firms (in turn caused by changes in interest rates), has had a major impact in the new economic order, Luigi Pasinetti (a major figure of the Cambridge capital controversies) is of the opinion that "the emphasis and insistence, as well as the thrust with which the Modigliani-Miller theorem was adopted, elaborated and presented in such numerous articles, books and textbooks of mainstream economic theory, contributed to generating a dramatic shift in economic, monetary and financial policies over the past few decades" (Pasinetti 2012, p. 1440).

1.2.3 Personal and Functional Distribution of Income from the Golden Years (1949-1979) to the Washington Consensus (1979-2012)

Functional distribution of income

As we saw above (Figure 1.2), in 1949 French households' disposable income[86] represented around 75% of *GDP* and it has declined since then. By the end of the forties, their saving was roughly 13% of total output, whereas their investment was about 6%. Compared to today's figures, these are high levels of income and saving, but a low level of investment. These numbers imply that the sector's financing capacity (the difference between their saving and investment) was close to 7%.

During the decade of the fifties these numbers changed considerably. Households' financing capacity[87] fell gradually to 3.8% by the end of the decade, but this was the consequence of an increase in their investment rate to 7.7% on average through the second half of the corresponding decade. Disposable income represented 3% of output less than in 1949. However, it must be noted that these trends were coupled with an unemployment rate of no more than 3% (see Galeson and Zellner 1957). Inflation went from nearly 0 in 1949 to 7.5% quarterly in 1951q2, and a sharp decline again close to 0 that lasted from 1952 to 1957, then growing again, though not as much as before[88].

By 1961, households' saving rate was 12.3%, though it climbed significantly from that point on until it reached 13.5% in 1963 (mainly driven by a sudden quarterly increase of 3.5% of the real wage), bouncing slightly back to 13% in 1964, but settling at around

[86]Households' disposable income is individual entrepreneurs' profits plus (net) wages received by workers, interest received on deposits, dividends, and benefits, less interests on debts, contributions and taxes paid.

[87]That is, the difference between their savings and investments.

[88]The data described in this paragraph, and the rest of the section, unless otherwise specified (for instance the unemployment rate before 1975) stem from *INSEE*'s *Comptes Detaillées par Agent*.

13.3% until 1969, when it fell again. These ups and downs are mirrored in the evolution of disposable income, which went from 70% of national income in 1961 to 71.4% two years later, though it gradually fell until it reached 70% in 1968, despite the strong decline in production of 5.4% in the second quarter of that year. During this decade, their investment rate kept on increasing, going from 7.3% in 1960 to 9.1% in 1969, which further diminished their financing capacity. During the first half of the sixties (perhaps the peak of the years known as the *Trente Glorieuses*) the average unemployment rate was 1.5%[89], and the average quarterly inflation rate 1%. The figures during the second half were 2.3 and 1.1%, respectively.

Meanwhile, firms' financing *need* (that is, the difference between their profits after distribution and taxes, or self-financing, and their gross investment) went from -0.4% of *GDP* in 1950 to -5% in 1951. From that period until 1953 it remained at around that level, and began declining gradually until it reached a 7.3% deficit in 1958. It must be noted that, during the 1950s, their self-financing remained at an average of 4.7% of total output, whereas their investment rate remained at around 8.8%. During these two 1950s and 1960s the saving rates of these two sectors (households and non-financial firms) moved counter cyclically, mainly given that a financing capacity from households normally financed firms' investment. A particularly interesting episode took place from 1961 to 1963, when the slice of the cake for households grew by 3.4%, at the same time that that of firms shrank by 4%.

For the first three years of the decade of the seventies households kept their financing capacity at around 4.3% of *GDP*, the government balance was in equilibrium, and the financing need of non-financial firms moved counter-cyclically with respect to the rest of the world's current account. The first went from a 5.6% deficit in 1970q2 to -4.2% a year hence, whereas the current account went from near balance to a 1% deficit. The link between financing capacities and needs between firms and the rest of the world was much clearer once the first oil shock hit. From 1973q4 to 1974q1, firms' financing need went from -4.6 to -7.6% of output. The financing capacity of households went from 4.2 to 3.1%. At the same time, the current account improved by 2.7%. The losses incurred by the private sector were not absorbed by the government *immediately*, which saw its financing capacity rise from near-balance to 1% of national income. Nonetheless, the public balance started worsening in the second quarter of 1974 and, as the government increased its expenditure above its receipts, the balance of households and firms improved. This is a clear example of the effectiveness of fiscal policy. It is also worth saying that part of its

[89]See Table 1 of Nickell, Nunziata, and Ochel 2005.

success is due to the fact that monetary policy *was not* as restrictive it is today.

Despite the sharp and prolonged decline in output between 1974 and 1975[90], during this period firms and households improved their current account balances. In 1975 the government ran a deficit of 2.8% of *GDP*. However, the year after it embarked upon a fiscal consolidation plan (the so-called *Plan Barre*), which had as a consequence a worsening of the financing capacity of the private sector while the plan lasted. In the meantime, although price increases were more or less contained, the unemployment rate did not stop from growing. Our interpretation of the efficiency (rather than the inefficiency) of fiscal policy is clearly at odds with the current official discourse, which is documented in Martin, Tytell, and Yakadina 2011.

Personal distribution of income

Now, this more or less brief discussion of the financing capacity of households, firms, the government and the rest of the world before 1979, which accounts for a description of the *functional* distribution of income, has to be complemented by an analysis of the description of the *personal* distribution of income up to then. Although difficult to come by, certain measures are available at the Top Incomes Database[91], some of which we present here.

Figure 1.10 shows the Lorenz coefficient[92] and the Top 1% income share, that is, the share of income held by the wealthiest 1% of the French population. Evidently, if the top 1% becomes richer, the remaining 99% becomes likewise poorer, and the other way around. The Lorenz coefficient (a) is interpreted in the opposite sense and for a comparative between the top 1 and 0.1% shares. Thus, if a increases income concentration is less extreme between the top 1 and the top 0.1%. From 1949 to 1961 income inequality increased, given that the income share of the top 1% increased from 9 to 9.8%. Paradoxically, inequality *at the top* decreased. From 1961 to 1970 income

[90] At this point it is worth mentioning that, during this period, the growth rate of real wages did not match the fate of the growth rate of output. In fact, contrary to *GDP*, real wages did not fall. This was rather rare, given that there was a clear direct association between both series from 1949 to 1979, except for some particular periods (1960-1963 and 1968q2).

[91] See the following link http://topincomes.parisschoolofeconomics.eu/.

[92] As mentioned at the source, this coefficient is calculated as $a = \frac{1}{\left(1 - \frac{log(S1\%/S0.1\%)}{log(10)}\right)}$. Thus, it should be read as increasing when income inequality between the top 1 and 0.1% percentiles is less acute. This is so because if $S1\%/S0.1\%$ is proportional to $1/0.1$, then $\frac{log(S1\%/S0.1\%)}{log(10)}$ should be equal to 1 and, if this is the case, $\left(1 - \frac{log(S1\%/S0.1\%)}{log(10)}\right)$ boils down to zero, and a tends to infinity. As a consequence, when a increases there is less inequality between the top 1 and the top 0.1 percentiles.

Figure 1.10 – The Pareto-Lorenz *a* coefficients were computed using the top shares estimates. As a rule they were estimated from the top 0.1% share within the top 1% share. When the top 0.1% and top 1% shares were not available, the closest substitutes were used; 1949-2005. Source: Top Incomes Database.

inequality was reduced, which can be seen in the fact that the share of the top 1% fell to 8.3%. After a rather short period (1970-1973) inequality worsened, but for the next decade it improved considerably. The counter-cyclicality between the Lorenz coefficient and the top 1% share was only clear beginning in 1969, which indicates that from then on income inequality at the top would follow the same trend as global inequality between the top 1% and the remaining 99% percentiles.

From 1983 to 1990 income inequality worsened, and improved from then up to 1993, when it started deteriorating again. With the arrival of the global financial crisis, all incomes worsened, but top 1% incomes did so even more. It is interesting to note, perhaps only coincidentally, that the Lorenz coefficient (solid line in Figure 1.10) follows the exact same pattern as the share of debt out of total liabilities of non-financial firms (dashed line in Figure 1.4). Both series rise from 1979 to 1982-83, then fall from that period until 1989, rise momentarily (until 1992) and fall again drastically until 2006-07, and starting in that period both series go up once again. Note that the timing of our analysis is *not* exact, it is in fact lagged one year for the Lorenz curve. If this is *not* a mere coincidence, then this would imply that *income inequality worsens when firms' capital structure tilts towards own* *funds*. If this were true[93], then the missing link would be Long and Malitz's model of the advantages of debt. For a rise in demand for credit above own funds would promote more productive labor-intensive investment projects, while it would avoid bubble build-ups. This would reduce income and wealth gaps because, on the one hand, with labor, wages and productivity going up, workers see an improvement in their income, and possibly also in their balance sheets. On the other hand, with *monopoly power*[94] contained by limiting the power of firms in the economy through credit rationing (when and if necessary) by enhancing at the same time the *power of the central bank to steer markets through the interest rate* (see section 1.1.2).

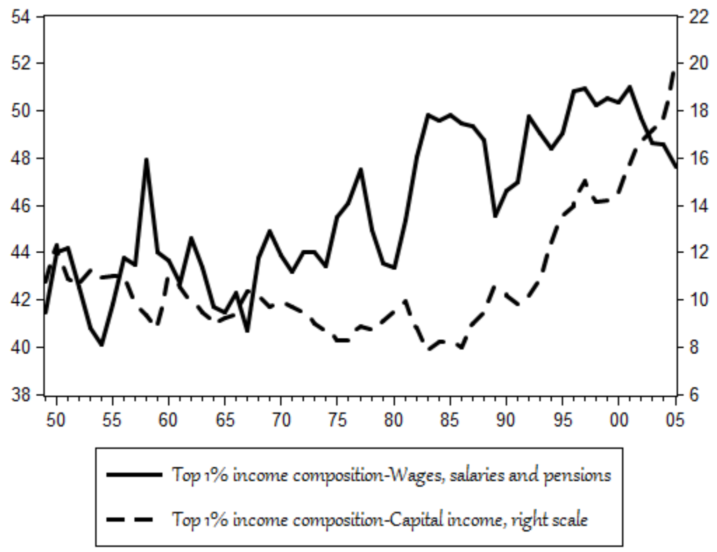

Figure 1.11 – Top 1% income composition: wages, salaries and pensions and capital income (%); 1949-2005. Source: Top Incomes Database.

Figure 1.11 shows the concentration indexes of wages, salaries and pensions (solid line) and capital income (dashed line). The share of wage earners' at the top increased rapidly until the 1980s and 1990s, respectively, and slightly falling since then. We interpret this as being the result of the rise of well-paid individuals at the expense of other seemingly less productive workers. In the period 1983-1989 their share diminishes strongly because, in our view, top paid workers (mostly managers) were not doing particularly well those days. This is perhaps related to conflict between managers and shareholders, as in the

[93] At this point, we are not able to defend this idea as solidly as we would like to. However, we do not exclude the possibility that this is an unexplored stylized fact.

[94] This could even be interpreted in the light of Kalecki 1938 *degree of monopoly*.

agency costs literature.

However, what is less surprising is the strong and persistent rise in the top 1% capital income[95] since the mid-eighties, after a three-decades and a half gradual decline[96]. Indeed, this is one of the main results reached by Piketty 2003 in his seminal article "Income Inequality in France, 1901-1998". This thesis provides support for our claim that the interest rate is the key policy instrument, which may even be seen as a *distributive tool* that, when it increases tends to concentrate income and wealth in the hands of a few, and when it falls it tends to reduce income and wealth inequalities.

Income distribution from the Golden Years to the Washington Consensus

Let us now go back to the functional distribution of income, that is, the part that is explained by national accounts. With the arrival of the second oil shock came the new set of economic policies (described above) that would radically change the functional distribution of income and wealth drastically. As mentioned in the previous sections, it sufficed the unilateral decision of the Federal Reserve to quadruple the federal funds rate in order to change the configuration of financial and real markets around the world.

Following the strong increase in interest rates, wages and inflation were contained, at the same time that output stagnated and unemployment soared. The decade by decade average growth rates of these series are shown in Table 1.5.

The table shows that wages, output and households' disposable income grew at no less than 4% per annum on average before 1979. Naturally, since demand was high and unions strong back then, prices progressed *pari passu*, except during the decade of the seventies.

These numbers may be seen as the tip of the iceberg. The underlying reasons for this drastic deterioration are mostly the result of developments in financial markets, which are summarized in Table 1.6. The second and third columns indicate the apparent real interest rates paid by households and firms, respectively. Columns 4 and 5 are the growth rates of the price of households' capital and of the price of equity. The last two columns show the leverage ratio of households (stock of debt / stock of non-financial assets) and a measure of own funds for non-financial firms (stock of equities issued / stock of total liabilities).

[95]This item is made up of interest income, dividends, rents, royalties, and fiduciary income. See Figure 3 in Atkinson, Piketty, and Saez 2011.

[96]It would be interesting to extend the span of the data to include the years after the crisis. However, by the time of downloading the database, these were not available.

Period	*Real wage*	*Disp. Income*	*Real output*	*Profit*	*CPI*	*Unempl.*
1949-1959	5.2	4.0	4.8	7.2	6.4	NA
1960-1969	6.8	5.6	5.6	7.4	4.0	NA
1970-1979	5.2	4.0	4.0	7.6	4.4	4.2
1980-1989	1.2	1.2	2.4	7.8	6.8	7.8
1990-1999	2.0	2.0	2.0	10.4	1.2	9.7
2000q1-2008q2	1.6	2.0	1.6	9.8	2.0	8.3
2008q3-2012q4	0.8	0.0	0.0	9.2	0.3	9.2

Table 1.5 – Selected macroeconomic fundamentals, average annualized growth rates[a] except profit (% of *GDP*) and unemployment rate, all as %. **Profit** is self-financing, or net profits (after distribution and taxes); 1949-2012. Source: *INSEE*.

[a]Growth rates were originally calculated quarterly, but are here presented multiplied by four. The figures do not change if they are brought to quarters using the formula $(1+x)^4-1$.

Period	*int. rate H*	*int. rate F*	*Hous. price*	*Eq. price*	*Lev. ratio*	*Cap. Str.*
1979-1984	11.9	-2.1	7.1	11.7	5.8	37.0
1985-1989	8.3	2.8	5.0	21.4	12.2	57.9
1990-1994	6.2	4.6	0.5	2.7	16.6	59.6
1995-1999	4.5	4.2	2.1	27.9	18.7	72.7
2000-2004	1.8	0.8	10.2	0.0	16.9	79.6
2005q1-2008q2	1.1	-0.3	7.9	7.1	14.5	82.0
2008q3-2012q4	1.7	1.3	0.7	1.4	14.6	76.5

Table 1.6 – Selected macro-financial fundamentals, annual averages (all as %); 1979-2012. **int. rate H** stands for the real interest rate paid by households. **int. rate F** is the real interest rate paid by firms. **Hous. price** is the growth rate of the price of non-financial assets held by households. **Eq. price** is the growth rate of equities issued by firms. **Lev. ratio** is the ratio stock of debt-stock of capital of households. **Cap. Str.** is the capital structure of firms from the equity side. Source: own calculations based on data by *INSEE* and *Banque de France*.

From both tables it is clear that the French economy went from a high-employment regime before the eighties to a high unemployment regime from then on. The latter has been coupled with low inflation and slim growth rates for output and wages. Thus, these real sector developments account for the *fall in income*. At the same time, the fall in the real interest rate paid by households promoted their indebtedness (see columns 2 and 6 of Table 1.6), which in turn encouraged their demand for houses. This demand effect can be seen in the strong yearly average growth rate of the price of households' capital from 1979 to 1989 (more than 5% annually), that is reflected in the fact that households' indebtedness ratio more than doubled from the first to the second five-year period under analysis. These developments in the financial account of households explain a large part of the *increase in expenditure* in the form of interest payments[97].

These two effects combined (*fall in income* and *increase in expenditure*) made households' financing capacity suddenly fall from an average of 4.5% of *GDP* (1949-1984) to virtually zero in 1987. This sudden strong negative shock was symmetrical to the even stronger rise in firms' balance. Prior to 1984, their financing *need* had been around 3.8% of output, whereas in 1987 they enjoyed a financing *capacity* close to 1%. This was possible thanks to two effects which contrast with the degradation in households' balance[98].

Cost reduction as a synonym of demand contraction

Unfortunately, at least since unions' bargaining power became an important constraint in firms' decision making (say, after WWII), firms have sought for innovative ways to *reduce costs* while expanding their productive capacity[99]. Under the new set of policies promoting labor market flexibility in the eighties (see López, Sánchez, and Assous 2008), firms were able to "substitute workers for machines" without the obligation to pursue welfare state goals in terms of employment and compensation to workers[100]. This explains in part the sharp rise in the unemployment rate. Therefore, by contracting wages and employment, firms enjoyed a considerable *rise in profit rates*[101], if only until 2000 (when

[97]Even if during the eighties interest payments were diminishing as share of the stock of debt (the definition of *apparent interest rate*), the former increased considerably. For instance, these payments were roughly 10.7% of *GDP* before 1972, but grew considerably from the on, until they reached more than 20% at the end of the seventies. From 1980 to 1993 interests were, 28.1% of national income on average, but fell gradually until 2005 (12.7%), and climbed back up to previous levels prior to the crisis.

[98]Similar arguments can be found in Medlen 2007 for the case of the United States. Thanks to Julio López for pointing this out.

[99]In the first part of chapter 5 we show that this has indeed been the case, given that labor productivity increased significantly since the end of the eighties until 2008.

[100]This explains in part why "[t]he 1980s marked not only a deepening interest in the role and importance of human capital, but also the origins of *technological progress*" (Sardadvar 2010, p.21, italics added). An argument which reinforces the position that the evolution of the financial sector has had a deep impact in the labor market, and which is directly linked to the capital structure of the corporate sector mentioned above, can be found in Long and Malitz 1985, who mention that "corporations which invest heavily in intangibles, such as R&D and advertising, have a tighter capital market imposed debt capacity than those investing in tangible assets" (p. 345). In our opinion, this suggests that labor-saving technology has been in vogue since at least the mid-eighties in France, and this (among other factors) has contributed in maintaining a high unemployment rate.

[101]Thanks again to Julio López for correcting our bad wording.

the strong rise in the price of non-financial assets held by firms made it fall).

Therefore, the combined effect of *reducing costs* and *rising profits* made possible the improvement in the financing capacity of firms. This trend was further reinforced by the fact that investment was being financed by massive amounts of internal funds (issuing equity) which replaced external funds (credit issuing). This is seen in the last column of Table 1.6. Own funds (the stock of equities issued by non-financial firms) as share of the value of the stock of liabilities increased dramatically, going from 37% in 1979-84 to 82% just before the financial crisis. With strong demand for equities, in part generated by the rise in the interest rate paid by firms, financial market indicators (such as the *CAC 40*) created self-reinforcing optimistic trends of higher bids accompanied by higher (at least expected) financial accumulation rates.

This was no minor shift. From the mid-eighties until 2008, the average financing capacity (as proportion of *GDP*) of households was 3%, whereas that of firms was close to 0.2%. However, since the early nineties the corresponding series of households and firms moved in the same direction (in contrast to the counterclockwise behavior before 1979 described above) with respect to each other, and negatively related with respect to the financing capacity of the rest of the world.

Indeed, since at least 1991 an improvement in the *foreign current account* has been mirrored by a worsening of the private sector's (other than banks) current account. We interpret this *current account counter-dependency shift* as being a byproduct of globalization. When firms realized that households' financing capacity was strongly reduced, they turned to foreign sources to finance their investment, which were by then in vogue. At the same time that this shift took place, the financing capacity of firms became increasingly important, also moving in the opposite direction of that of households and firms.

Until 1975, current and investment expenditure by the government moved in opposite directions. From 1952 to 1960 public current expenditure fell from 26% of *GDP* to 21% (series in real terms). At the same time, however, public investment went from 2.1 to 4.4%. In 1974 both series increased considerably, as a response to the oil crisis. But, the conservative counter-response (the *Plan Barre*) reduced both in 1976. During the first three years of the Mitterrand administration (starting in 1981), public investment fell from 3 to 2.7%, whereas current expenditure increased from 23.7 to 25%. Ironically, with Chirac elected as prime minister, from 1986 to 1988 both types of expenditure increased considerably. Throughout this period, the stock of debt went from 18% of *GDP* in 1979 to 30% in 1988, whereas taxes collected represented around 19% of total income[102]. This

[102] In fact, taxes remained at around that level until 1993, when they climbed drastically to 25% of *GDP*.

suggests that a great part of public expenditure was being financed by bond issuing.

Starting around 1990, public current and investment spending moved pro-cyclically, first falling until 1998, then rising throughout the period when Jospin was prime minister. The decline in these two series for the first eight years of the nineties may seem to contradict the fact that both debt and taxes increased considerably as shares of output. In fact, these resources were partly used to finance in transfers to households[103], which are not considered either current or investment spending, and debt-servicing. In kind transfers represented 13% of *GDP* in 1990, but this figure rapidly increased to 14.6% in 1995. During this period interest payments by the government went from 2.1 to 3.1% of national income.

In view of the dynamism of the public debt, in 1996 Alain Juppé (right wing) created the CADES (*Caisse d'Amortissement de la Dette Sociale*, or 'social debt sinking fund') in order to renegotiate debt payments and raised taxes, which went from 22% of *GDP* to 25.5% in 1998. As a result of this policy, public debt went from 55% as a proportion of *GDP* in 1997 to 50.8% in 2001. With the automatic stabilizers quite active in 2000, public indebtedness resumed its upward trend, and reached 63.4% of *GDP* in 2005. Taxes, of course, did not go back to their pre-1996 level (19% of *GDP*).

Liberalization revisited

In short, the process of liberalization and the pursuing of anti-inflationary measures (which aim at protecting the value of property) has led to an important weight of public debt in the French economy. Nonetheless, we do not interpret this as a justification for reducing public deficits as European authorities insist in doing. On the contrary, we are of the belief that, whenever the private sector is unable to increase its level of spending in order to ignite a recovery from a crisis, the public sector must step in and provide the helping hand that is needed to achieve this goal. Clearly, the authorities are too afraid of (1) increasing the level of indebtedness to unsurmountable levels, and (2) inflation, despite the beneficial effects this can bring about[104].

We are currently witnessing how the insistence on reducing the government budget deficit is only widening the gap between the privileged and the underprivileged countries

[103]Note: since these transfers are *in kind*, they are not considered either as a *use* in the current account of the government, or as a *resource* in that of households (which makes up their *adjusted disposable income*).

[104]On this point see the interesting discussion in Shiller 1996, in which the author attempts to explain why people dislike inflation despite the fact that this phenomenon may be harmful to some (i.e. bankers, wealth owners) whereas it tends to benefit others (i.e. debtors).

in Europe. So, why insist on this? For the sake of stability[105] and future stronger recovery seem to suggest Euro-officials. Instead, we urge for a relaxation on both budget deficits and inflation. The last chapter of the current thesis provides some hints of what the consequences of this would be, and these are far from being harmful to the French economy.

Let us now focus our attention on another (perhaps "the") key policy instrument that has received a good deal of attention in the discussion of the sustainability of the Eurozone.

1.2.4 Exchange rate and open economy issues in France since the late 1970s

It is all too well known that economies joining the Eurozone would loose the exchange rate as a policy instrument as soon as they adopted the single currency. As far as we can understand, it was often believed that this could only benefit members in the Eurozone and in turn encourage trade among them while making trade transparent, instead of forcing them to adopt beggar-thy-neighbor policies in order to boost the trade balance, which usually involve devaluations and inflation, as it was commonly done after the collapse of the Bretton Woods system.

The exchange rate and the current account

Figure 1.12 shows the French current account as a percentage of *GDP* and the real effective exchange rate index, where the latter was only available starting in 1980. The first half of the 1980s was characterized by what came to be known as 'competitive devaluations', and consisted in strong falls in the value of the franc, vis-à-vis other currencies from France's main trading partners, with the strongest devaluation taking place in the second half of 1982.

This *real devaluation* process appears to have been effective with a lag of one or two years, given that the fall in the value of the franc began in 1980q3, whereas the recovery of the current account as share of *GDP* began in 1982q4. Under a long-term perspective, it can be observed that the devaluation went on until 1985, when the REER increased strongly. The fall and rise of this index coincides with at least three other major economic

[105] By stability they understand consumer price stability. It must be noted that it was not until recently that they started to focus their attention on financial markets, where prices (i.e. of equity and bonds) fluctuate wildly.

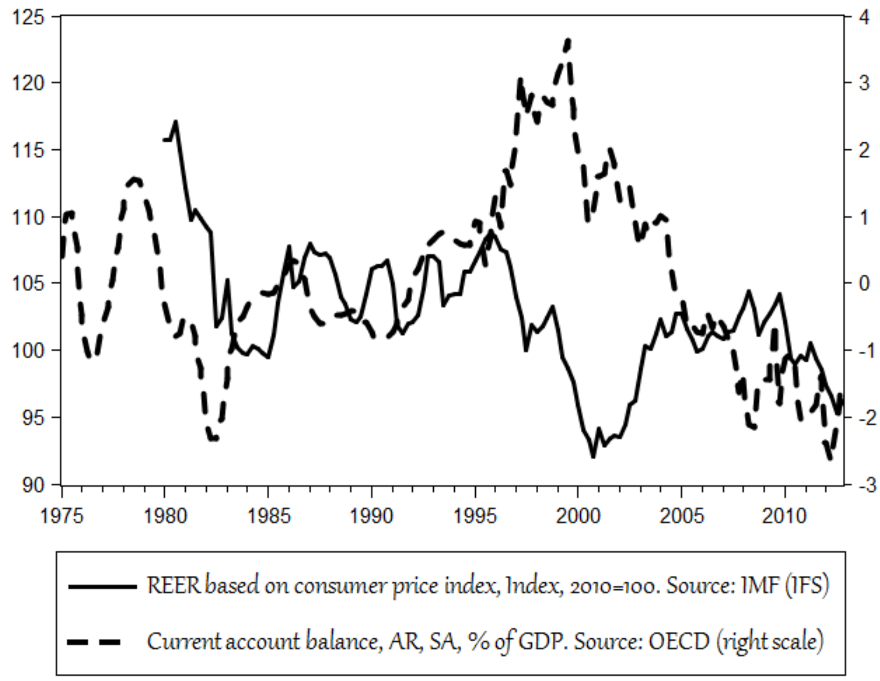

Figure 1.12 – Current account as share of *GDP* and Real Effective Exchange Rate (REER) index, 2010=100. Sources: *OECD* and *IMF*.

events in the French economy described above; (1) the achievement of price stability (see the dashed line in Figure 1.5), (2) the beginning of the first post-Bretton Woods housing bubble (see Figure 1.3), and (3) the stock-market boom that led to the 1987 crash (see the solid line in Figure 1.6).

With financial markets artificially blossoming through the creation of two major bubbles[106], and with the promise of a better future for wealth owners (given the control of inflation), the current account reached equilibrium around the mid-eighties and, despite the 1985 revaluation of the franc, it remained at around that level until the beginning of the next decade. During this time, three other devaluations took place (1989, 1991 and 1993), but these were followed by strong revaluations the year after.

From 1996 to 2000 the franc (alternatively called the "French euro" after 1999) was again strongly devalued under the Jospin administration[107], going through a slight revaluation phase in 1998. This clearly had a positive effect on the current account, which

[106]Interestingly, these did not burst at the same time, unlike what happened in 2007-2008. For an interesting account of this double-bubble process see Shiller 2014.

[107]That is, the third *cohabitation* that spans from 1997 to 2002.

went from near-balance in 1995 to a surplus of 3.6% of *GDP* in 1999. It is important to note that this period was also characterized by strongly speculative financial markets that fueled one of the strongest stock-market booms experienced in recent memory, with interest rates rapidly falling (which in turn fueled the devaluation) and equity prices strongly rising (which encouraged capital flows despite the fall in the value of the French euro).

1.2.5 Interest rate parity and balance with the foreign sector

Unfortunately, the current account surplus could not last forever, neither could the exchange rate further devalue, given that equity prices were rapidly falling, thus making equity owners poorer. The natural antidote against a massive capital outflow of Latin American dimensions was to make the exchange rate revalue. At this point, it is worth reminding the reader that the real interest rate paid by firms began its upward path in the early eighties, and that (on a long term perspective) this path was uninterrupted until 1996, when it reached 6.6%. After this period this interest rate fell drastically, which was perhaps an attempt from *Banque de France* to signal firms to reshuffle their capital structure but, as firms were no longer sensitive to changes in the interest rate (i.e. the French economy was stuck in a liquidity trap), these downward movements of the interest rate were ineffective all along except between 1999 and 2002.

As a consequence of this liquidity trap, the interest rate channel to provoke the revaluation was rather limited. This can be seen in Figure 1.13, where the domestic and the foreign interest rates (both calculated as apparent) are shown.

Both series follow the same pattern at the beginning of the eighties as the interest rates paid by households, going strongly up from 1979 to 1982, then falling gradually. However, in the case of exchange rate determination what matters is not the evolution of the level of each series, but how the gap between the two evolves. The difference between the national and the foreign interest rates consistently fell from 1979 to 1983, which is consistent with the real devaluation that lasted until 1985. Starting in 1984, and up until 1987 (when the stock market boom reached its hiatus) the difference between the two series increased drastically, then settled at around the same level until 1995, when a new and stronger stock market boom emerged. With the former taking place, the interest rate differential kept on increasing (instead of falling, as we would normally expect) until 2001, when the interest rate paid by France to the rest of the world fell, compared to that paid by the rest of the world to France. The difference between both series again increased starting in 2003 and then stabilized (this time in positive territory), as did the

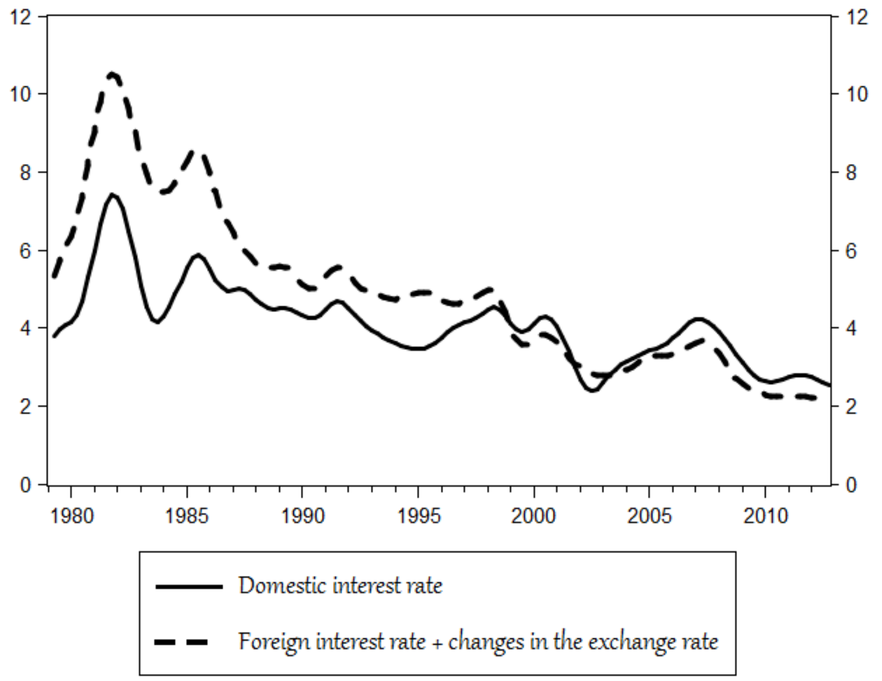

Figure 1.13 – Domestic and foreign interest rates annualized (%), both calculated as apparent. Sources: *Banque de France* (financial assets) and *INSEE* (interest payments).

REER index.

We interpret the fact that the gap between the domestic interest rate and the foreign interest rate was negative before 1998 and positive for most of the period afterwards as signifying that, broadly speaking, before joining the Eurozone France was a net receiver of capital flows, whereas it became an important net provider of capital following the introduction of the euro. This statement can be defended on the basis of Figure 1.14, where the timing is certainly not perfect, but supports our claim.

Let us first briefly discuss how the series were constructed. The solid line (net balance of indebtedness) is the difference between the outstanding amount of stocks held in France and their corresponding liabilities vis-à-vis transactors abroad. The dashed line is the capital account, which is analogous to the former series, albeit with the important distinction that the latter is in flow form. The Figure shows a horizontal line that is drawn on the zero (or balance) line, and a vertical one in 1999 that indicates the year in which the euro was introduced in France. The contrast between the French foreign position (the balance in stock form) back in 1980 and the same series in 2012 is indeed sharp. For it went from a surplus of 19% of *GDP*, to a 22% deficit.

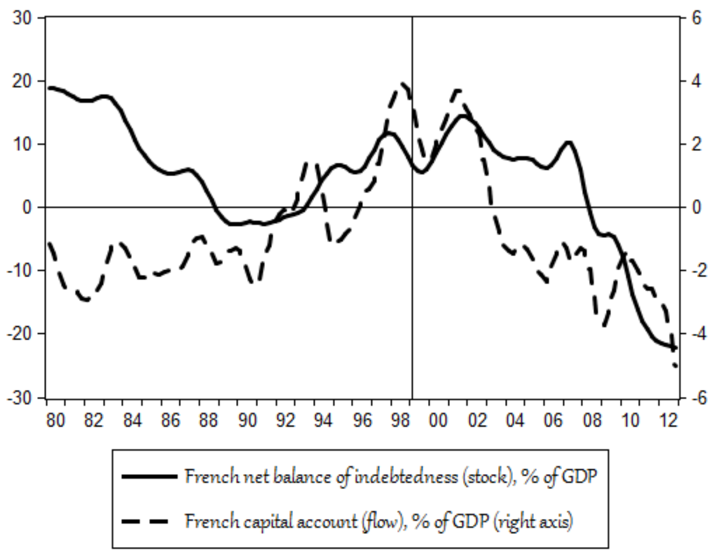

Figure 1.14 – French foreign position (balance in stock form) and capital account (balance in flow form); 1980-2012. Sources: Own calculation using data from *Banque de France* and *INSEE* (*GDP*).

As discussed above, following the stark increase in interest rates in the United States at the end of the seventies, capital flooded the US economy, while at the same time draining other economies. France was clearly no exception and, given that the policy response was relatively slow[108], a slow (compared to Latin America or South East Asia) but painful capital flight ensued. In 1989 the French balance of indebtedness reached equilibrium, then went into deficit for close to four years. In 1993 it went back to positive territory, and kept on rising rapidly, until it reached a surplus equivalent to 12% of *GDP*. Between 1998 and 1999 the stock of financial assets in the hands of residents in France declined importantly, but from around 2000 to 2007 it recovered (possibly by draining capital out of other weaker European economies). Since the 2007 crisis, however, this balance quickly approached balance the next year, and ever since has been on negative territory.

The capital account, on the other hand, has remained in deficit for most of the period under analysis, except for the year 1993, and then from 1996 to 2003. This unfavorable evolution of stocks and flows of financial assets in, and mostly out of, France has close

[108]By "slow" we do not mean that the French authorities remained arms akimbo watching how capital flew out of the country. We prefer to see this as a result of political and economic forces that resisted the shock in the immediate aftermath (i.e. unions, left-wing activists and politicians, progressive chiefs of industry). Nonetheless, it should be noted that, despite the 'slowness' of the policy response, the liberalization process took place quite rapidly.

ties with the evolution of financial markets world-wide, with the introduction of the euro and with the restrictive policies suggested by international organizations (mainly the *IMF*) and implemented by the economic authorities.

The deterioration of French competitiveness

We saw above that the control of inflation made debt-to-output ratios, equity prices and inequalities soar, whereas at the same time it created important changes in the capital composition of firms and led to two major housing bubbles. Moreover, along with this process, competitiveness declined and outsourcing (its main outcome) became commonplace. Figure 1.15 shows the ups and downs of competitiveness[109].

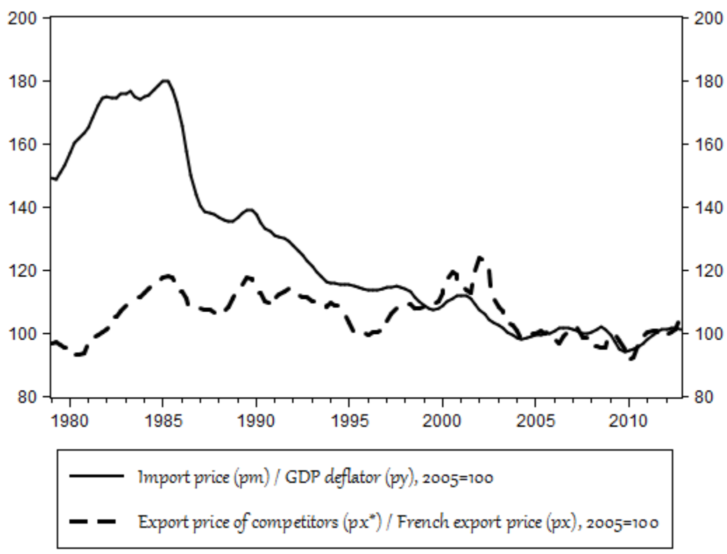

Figure 1.15 – French competitiveness, two price measures (moving averages); 1980-2012. Sources: Own calculation using official data from *INSEE* and the *OECD* (p_{x*}).

The series shown in the figure are two different price competitiveness indicators commonly used in the literature. The first (solid line) is the ratio of the price of imports (expressed in national currency) to the *GDP* deflator (p_m/p_y). Naturally, when this ratio rises this implies that either imports become more expensive (relative to French equivalents) or that French products became cheaper (compared to foreign products). In either case, this would mean a relative improvement in the competitiveness of French

[109]For an in depth analysis of this issue in France up to the time of the publication, see Mazier, Basle, and Vidal 1997, particularly p. 190-191.

exporters, via prices. The relative price of exported goods and services[110] with respect to the prices of French exports (p_{x*}/p_x, where p_{x*} is the weighted price of exports of competitors, and p_x the price of exports, dashed line). Thus, the latter can be seen as a relative disadvantage for competitors.

The long term trend of both series coincide, whereas during certain episodes (i.e. the first half of the eighties) shows that both series have different levels. Both indexes measure competitiveness in alternative ways. The first from the import side, the second from the export side.

According to our results, from 1980 to 1984 the French economy was quite competitive, for the difference between the imports and exports price ratios was wide. This was mainly due to the appreciation of the dollar and the consequent contractionary policies implemented elsewhere. The gap narrowed in the second half of the eighties, and in 1987 it even reached levels comparable to those observed in 1980. This is second stage is clearly consistent with the devaluation of the dollar. Competitiveness went up again from 1987 to 1989, but it then started declining and remained at a low level (at least lower than those observed in the early eighties) throughout the nineties. In 1999 the French economy regained its competitiveness for two more years, but with the corresponding revaluations of the euro it found itself again in an unfavorable position.

1.3 Concluding remarks for the chapter

The current discussion is certainly far from being comprehensive, for the broad description of a given economy deserves a lot more than a thesis chapter. However, we tried to be as comprehensive as possible in our exposition of the main stylized facts of the French economy since the collapse of the Bretton Woods system, at least under a long term perspective and focusing almost exclusively on its main macroeconomic fundamentals. Several avenues of research may emerge from this discussion, but we content ourselves with what has been said so far[111].

To summarize, we saw that the key variables in determining the faith of the French economy since the gold window closed have been interest rates. These were in turn calculated as apparent for two main reasons, one of which was to distinguish (as banks do) lenders by type and treatment. For instance, households pay a much higher interest

[110]For ease of treatment, and also due to an initial error in the construction of the series p_{x*}, we used the competitiveness indicator from the *OECD* (which considers changes in consumer prices) in order to construct the corresponding series. I wish to thank Jacques Mazier for insisting on this issue.

[111]This is also due to time constraints and for pragmatic and financial personal reasons.

rate than firms, and the evolution of both is not uniform. The other reason was for modeling purposes. The stock-flow consistent literature deals with these in order to embed them directly into an accounting framework.

Banks have played a major role. Before the control of inflation was set in motion in France, firms financed their investment contracting debts, but as interest rates increased sharply and prices fell, they turned to the stock market to get funding. As this was happening, banks granted easier access to credit to households, thus making this institutional sector an integral part of the process. Financial and housing crises, at home and abroad, have become the norm rather than the exception. Therefore, stock and housing prices (particularly those of land) fluctuated wildly in an environment of deregulation. During this process disposable income and wage shares have stagnated, and debt-to-*GDP* ratios and inequalities soared, even as taxation became more important.

It is not uncommon to hear/read commentators and so-called specialists say/write that the *cause* of the current crisis are public debt and rigid labor markets. The logic behind this is that crowding out and paternalistic government officials, more beliefs than actual phenomenons, create disturbances that impede the smooth working of markets. In the previous pages we have aimed at proving that this logic is far from being so, and instead we want to prove that the liberalization process that was unchained by the Volcker shock has been the main cause of the troubles in the French economy, and that the debt problems are rather one of its main *consequences*.

The model described in the second part of the present document aims at providing some policy proposals that support our diagnostic. But before getting there, let us first describe the theoretical backbone of our work in the next chapter.

Chapter 2

Survey of the Literature and Theoretical Issues

We would be better off if we spent more time in reading each others' work and less in thinking up grand excuses for ignoring it.
Sims 1996, p. 119.

2.1 Theoretical references

In the current chapter we provide a review of the literature that shaped the ideas set forth in our analysis and model. The influence of Keynes was evident from the start. However, in the following section it will be shown that, in our discussion, Kalecki's insights are as important as those of Keynes. Our arguments are clearly based on the theory set forth by these two great economists and their followers. Subsections 2.1.2 and 2.1 are dedicated to complementary works that deal with more specific issues, such as income distribution, and other subjects related (directly or indirectly) to the *principle of effective demand*. In the second section we discuss the works that inspired the construction of our model. This discussion is divided into structural modeling, stock-flow modeling and statistical methodology.

2.1.1 Keynes and Kalecki

Our model and discussion are inspired by the works of John Maynard Keynes, Michal Kalecki and their followers. Despite some theoretical discrepancies between the two, these authors are the founding fathers of the principle of effective demand[1], the theoretical backbone of our work. The very basis of our analysis rests upon the enormous legacy of these economists.

The timelessness of the General Theory

As we saw in the preceding chapter, one of our main arguments is that movements in interest rates have played a central role in economic policy in France, with other also important policy instruments either reinforcing the underlying objective of the direction of interest rates, or at times pursuing different objectives, in that case making goals more difficult to attain. More specifically, before 1979 interest rates in France were kept at low levels, and this was coupled with important current and productive public expenditures and low tax rates, which in turn meant that the economic policy implemented by the corresponding authorities (the government and *Banque de France*) suffered an inflationary bias. Following the restrictive measures taken by the central bank after that date, consisting mainly of raising interest rates, and despite some initial resistance in the fiscal front from the then recently elected socialist government, commodity price increases were contained. Accordingly, since then both economic authorities changed their initial inflationary stance for an anti-inflationary one. Along with this change in the policy stance came major changes in the French economy, already discussed.

What we want to highlight in this part is the importance and timelessness[2] of Keynes' *General Theory* which has as a goal to set the basis to promote employment by means of control over the interest rate and money. Now, Keynes (like ourselves) was of the idea that interest rates should be kept at low levels[3]. Indeed, he used the term "euthanasia of the rentier" to refer to this proposal (Keynes 1936, p. 376). As is well known, interest rates across the developed world are now at low levels. This may lead some (clearly misinformed) analysts or opinion leaders to think that Keynes was plainly wrong for the simple reason that because interest rates are low today and the economy is doing

[1] See Kalecki 1937a, Keynes 1939, as well as López and Mott 1999.

[2] This adjective should be interpreted as an assertion that Keynes' work is relevant independently of a particular period, instead of it being static (clearly, it is not).

[3] Important note, as we saw in chapter 1, interest rates paid by households fell sharply in the first half of the eighties. This may seem to contradict our argument, whereas in fact, it even reinforces it. As household units perceived that credit was *becoming less expensive as before*, they increased their demand for it. However, the story would have probably been different, had the decline not been as brutally quick as it was. Now, the second credit and housing boom took place with interest rates already at low levels, but at the same time a stock market boom fueled the housing bubble. This subject alone deserves indeed a lot more attention than just a footnote but due to time and space constraints, we can only highlight it.

worse than, say, during the internet boom[4] (when the interest rate, the growth rate and employment were higher). Needless to say, this would not only be extremely reductionist, but it would also ignore the much deeper (and indeed much more useful) insights of Keynes' work.

In fact, today's economic situation has not improved thanks to quantitative easing simply because loose monetary policy (basically what QE is) coupled with a restrictive fiscal stance are two forces pushing in different directions. With low interest rates, firms are able to borrow at a low *current* cost - the nominal interest rate - but if commodity prices are expected to remain at low levels or even fall further, then the burden of debt for firms will not decline[5] (or, worse, it may even increase). More debt issuing, as opposed to equity issuing, would be a solution for them[6]. However, with the ECB doing French firms a favor by keeping interest rates at low levels (seemingly promoting inflation), while at the same time asking governments to pursue fiscal consolidation (clearly promoting price stability) there is no clear sign of what the value of firms' debt is going to be a year or two hence.

Debt is likely to be preferred above equity these days because, with the strong fall in stock prices since the 2007-2008 crisis[7] firms were unable to sell a good number of these[8] (clearly because they were worth much less than before), while at the same time by keeping these instruments on the asset side of their balance sheets, the value of their financial assets fell drastically. With the value of financial assets falling but with that of liabilities unchanged or even increasing (for instance to pay back debt or dividends) firms' net worth was strongly hit. Clearly, with more liabilities than assets, surviving firms naturally cut down expenses, an important part of which go to pay workers (though this proportion is less than that prevailing before the 1980s). If, however, firms do not have a cheaper alternative to equity (the preferred instrument before the global financial crisis) so that they can finance their investment, and if other sectors are clearly no more profitable than their own, then they may decide to no longer invest domestically[9], and

[4]For an interesting related debate see the following link http://www.bloomberg.com/bw/stories/2010-06-29/keynes-vs-dot-alesina-dot-alesina-who.

[5]This is in stark contrast with the situation of the early eighties. During that period fiscal policy was *still* inflationary, whereas monetary policy was loose.

[6]This proposal seems to be at odds with the current perception that debt (either public or private, or both) is bad. More on this below.

[7]With 2005 being the reference year, the price of equity was 137 in 2007q2, but by 2009q1 it was only 73.

[8]Of course, immediately after the collapse of the bubble, nobody would want to buy equity. However, once prices start recovering, it is likely that their demand does so as well.

[9]It could even be the case that, if inflation is kept at low levels, former capitalists may decide to become

continue to do so abroad (for instance in emerging markets).

The analysis of the stock of debt issued by French firms as a proportion of the stock of liabilities (our measure for the capital structure of firms) may present a drawback, mainly that the price of equities is part of the denominator of such indicator. As a consequence, with volatile prices, the relative demand for both types of liabilities may be altered by the three stock price bubbles described in the preceding chapter. Nevertheless, by dividing the stock of debt by the level of production (not shown), we were able to see that before 1986 firms' debt was larger than their production (about 1.14), close to 1 for the next two years, and higher than 1 again until 1994. For the next 15 years the stock of debt was much less as a ratio of their production, reaching as low as 0.76 in 1998, but growing slowly since then. After 2007, this ratio rises strongly, reaching 1.27 in 2012. In fact, the strong rise in interest rates paid by firms (which discouraged debt issuing) that were coupled with the bull markets (which encouraged equity issuing) prevalent in this period (1980-1995) played an important role in the shift in the capital structure of firms towards equity. But following the stock market crash in 2007, the demand for credit by firms increased dramatically as a proportion of their output.

Public vs private debt

Our diagnostic of the problem in the French case *seems* to be at odds with more common (although not mainstream) ones. For instance, an article published in *The Atlantic* by Richard Vague entitled "Government Debt Isn't the Problem - Private Debt Is"[10], as its title indicates, clearly supports our view that the problem *is not* the public debt, but instead of breaking down private debt into household and corporate debt (as we do), the author carries out his analysis in terms of the outstanding debt of both sectors. This in turn may be misinterpreted as a suggestion (perhaps not intended by the author) that *households and firms* should curtail their demand for credit and/or get debt relief. Of course, as the author suggests, if households reduce their demand for credit this would turn out to be a good thing because their disposable income would then be spent on goods and services produced in the economy. However, another solution would be rather to give households (1) higher (as opposed to lower, as the French authorities are now promoting) revenues in the form of wages, social security benefits, other forms of social spending, and (2) the possibility of contracting cheap loans today so that they can pay them back

bankers, as long as there are sources of credit demand (in which case these would be found mostly in emerging markets or other solvent (or seemingly solvent) economies).

[10] See the following link http://www.theatlantic.com/business/archive/2014/09/government-debt-isnt-the-problemprivate-debt-is/379865/#disqus_thread.

at a time when they are affordable (i.e. when prices are allowed to rise). On the other hand, we do not believe that firms should reduce their demand for credit. As mentioned throughout the present work, we recommend the opposite.

Our analysis suggests that, before 1979, private banks perceived important losses out of the assets (a part of which comes from deposits held by households) they lent to firms and households. On the one hand because the nominal interest rate at which they gave away these resources was low, and on the other because the *time value* (to paraphrase Davidson, in Flassbeck et al. 2013) of their assets was less at maturity than at the moment they changed hands. Perhaps the widespread belief that loose monetary and fiscal policies were the main causes of all economic problems of the time further enhanced the will to push policy in the opposite direction, while at the same time addressing (and even reverting, or so it was hoped) the 'euthanasia of the rentier' that had been going on since the end of WWII.

Paradoxically, once the interest rate was high and the inflation rate fell (say, past 1982), private banks did not enjoy the advantages that this policy shift brought about, mainly because firms strongly reduced their demand for credit. As a consequence, banks granted easier access to credit for households and the rest of the world, and since then we have seen important capital inflows and outflows in Latin America (early 1980s and 1990s) and South East Asia (second half of the 1990s), also passing through Japan (1980s), Russia (1990s), etc., which were often aided by higher interest rates in the countries of destination than at home, free capital movements, and a set of structural reforms promoted by international organizations (notably the *IMF*) aimed at stabilizing prices and slashing government spending in order to guarantee that these investments made by banks and other financial firms are profitable.

Having mentioned the importance of the direction of movements in interest rates and the complementary policies that go with them, and despite much (often unjustified) criticism, it is important to take a second look at Keynes' *General Theory*. As was mentioned in chapter 1, an important criticism raised on this path-breaking work was that it did not include explicitly the financial sector. Without discussing the author's motivations or reasons for doing so, in the remaining of this section we will try to draw on some key concepts (perhaps some will remain unknown) that go in the direction of building a bridge between Keynes' *General Theory* and the financial system. In our opinion, this link is possible through the capital structure of firms which, contrary to what Franco Modigliani and Merton Miller claimed (and many of their followers still claim) more than half a century ago, does matter.

Kalecki's degree of monopoly

Whereas we base our analysis of the importance of the interest rate on Keynes, we also rely heavily on three major ideas developed by Kalecki, two of which were already mentioned. The first is the *degree of monopoly*, which is linked to the distribution of national income, as in Kalecki 1938 "The Determinants of Distribution of the National Income", and (following our arguments) with the capital structure of firms. The second theoretical aspect used in this work based on Kalecki is his "Principle of Increasing Risk" (Kalecki 1937b), further studied in the first two chapters of Steindl's Economic Papers (Steindl 1990). The third is a natural ally of the former two (and even of Keynes' work), and is Kalecki's seminal paper entitled "The Political Aspects of Full Employment" (Kalecki 1943). Let us deal with each subject at the time.

The degree of monopoly is useful in that this concept is directly linked to income distribution at a macroeconomic level. "In short, Kalecki's theory of pricing and distribution consisted of positing a link between what he called the 'degree of monopoly' of firms and the functional distribution of income. The former was the determinant of the pricing decisions of firms, which set their prices by marking-up their average prime costs (comprising wages and materials)" (Rugitsky 2013, p. 448). Since, as we saw, prices did not increase but instead fell strongly in France in the first half of the 1980s, we interpret this as a redistribution of income in favor of capitalists at the expense of workers.

Figure 2.1 shows the share of wages paid by firms[11] out of *GDP* (solid line) and the profit rate of firms (dashed line, right scale). The asymmetry of both series is almost perfect from 1980 to 1991, period during which wages increased their share from 37.5 to 38.7% (1980 to 1981) and then drastically fell to 35% (1982 to 1989). At the same time, profits first fell from 4.5 to 3.4% (1980-1981) and then rapidly increased to 8.6% (1981-1989). Clearly, following the 1980-1981 recession the wage share increased due to, among other factors, frictions in the labor market (for instance, waiting for short-term contracts to end). Once these frictions were overcome by firms, and with a helping hand from the economic authorities' restrictive policies, at the moment when enterprises severely curtailed their demand for credit (and with it their preference for productive labor-intensive projects), the share of wages fell drastically, at the same time that firms' profits settled at a high level (more than double the 1980 level) that would last until the end of the millennium.

From 1989 to 1991 both series kept on evolving counter-cyclically, but the following two years both increased (the profit rate from 7.6 to 8.1%, and the wage share from 52.5

[11] The evolution of wages received by households follows the same overall trend.

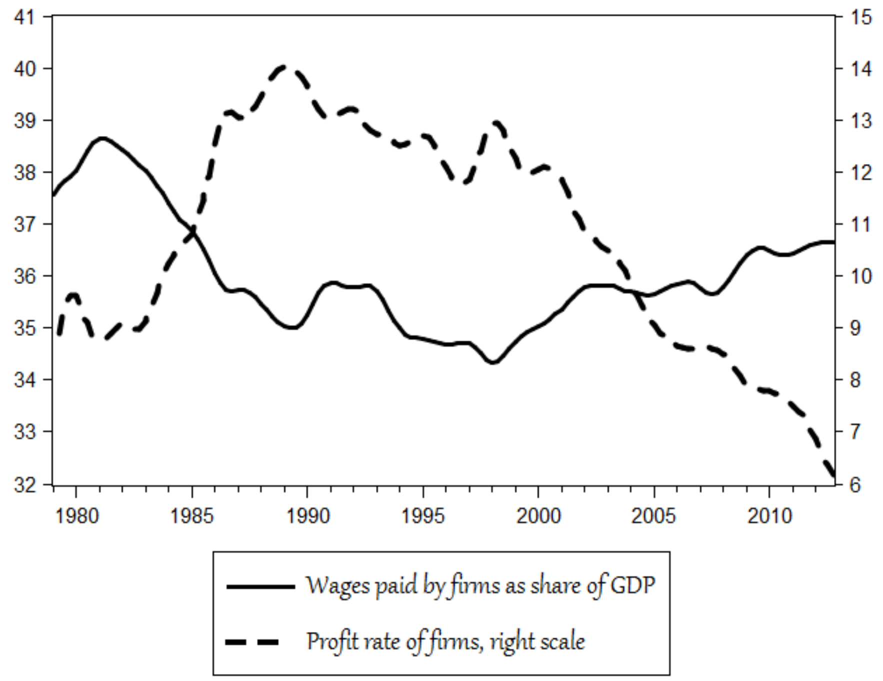

Figure 2.1 – Wages received by households as share of *GDP* and profit rate of firms (self-financing divided by stock of physical capital), both seasonally adjusted and as %; 1980-2012. Source: author's calculations based on data by *INSEE*.

to 53%), in order to fall to previous levels the next two years. From 1995 to 1998 both series followed the expected opposite paths, which again roughly coincided prior to 1999. Since that year, however, the profit rate went back to its 1980 level, reaching as low as 3.6% in 2012. As for wages, these increased faster than *GDP* following the two crises (2000-2001 and 2007-2008) but fell during the recovery that spanned from 2002 to 2008, when they started rising again, mainly due to the fall in output. A word must be said about the profit rate. The denominator of the remuneration to capitalists includes the price of non-financial assets which, as we mentioned in chapter 1, follows the evolution of the price of land. From 1999 to 2008, this price increased sharply (at a 5% annually on average), which in turn made the profit rate fall.

These trends support our claim that, in spite of the restrictive measures implemented in the early eighties, the share of wages accrued to workers[12] steeply fell, making French

[12]It must be noted that we are analyzing here aggregate wages, including those received by the high-skilled, as implied by Rosen 1981. However, as Atkinson, Piketty, and Saez 2011 (p. 58) point out "[t]he dominant paradigm in labor economics explains rising wage dispersion in terms of skill-biased technical

unskilled wage-earners worse-off, at the same time that the profit rate first rose then stagnated. This in turn implies that the degree of monopoly has risen. Now, as argued in the last part of the previous chapter, we are of the idea that the shift in the capital structure of firms (from debt-based to equity-based) is closely linked to movements in the distribution of income, as measured in the Top Incomes Database. Furthermore, these two phenomenons are in turn related to the degree of monopoly.

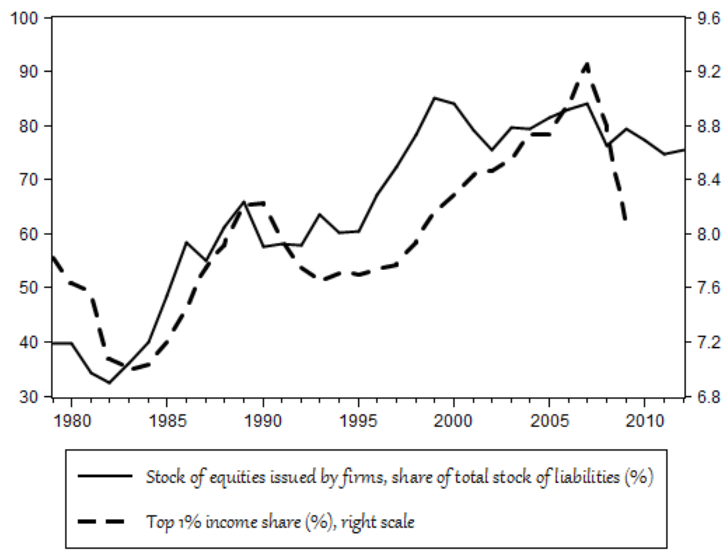

Figure 2.2 – Annual share of equities issued by firms out of total liabilities and Top 1% income share (%); 1979-2012. Source: author's calculations based on data by *INSEE* and Top Incomes Database.

Figure 2.2 shows the capital structure of firms but from the point of view of own funds[13], superposed with the top 1% income share in France since 1979. As mentioned in chapter 1, the timing of both series (with roughly a year lag for top 1% share) is impressive. From 1979 to 1982 own funds fell from 40 to 33% out of the outstanding stock of liabilities of French firms. From 1979 to 1983 the share of income of the richest 1% in the French economy went from 7.8 to 7%. During this same period, as seen above, the share of wages in total *GDP* was rising and the profit rate of non-financial firms

change. While we agree that this literature offers important insights about the premium to college education (...), we do not feel that it has a great deal to say about what is happening at the very top of the earnings distribution because dramatic changes have taken place within the top decile of the earnings distribution, i.e., within college educated workers".

[13]Naturally, since the sum of the shares of equities and debt issued out of total liabilities is always unity (because this is how we built the series), this ratio equals 1 minus the ratio shown in chapter 1.

falling. The period 1983-1990 saw a rise in income inequality between the richest 1% and the remaining 99% that went from 7 to 8.2%. Coincidentally, from 1982 to 1989 own funds doubled its share of the stock of liabilities from 33 to 66%. Also during this period, the profit rate increased from 3.4 to 8.6%, whereas the share of wages in *GDP* was falling sharply.

From 1989 to 1995 the share of own funds in the capital structure of firms was reduced (from 66 to 61%). From 1990 to 1995 top 1% income share went from 8.2 to 7.7%. Both series increased sharply during the internet boom (1995-1999), but only own funds remained at a more or less stable (though slowly declining) level, that revolved around 80%. Income inequality kept on rising until 2007, when it suddenly fell from 9.25 to 8.8% in 2008, and further to 8.1% the year after[14]. Despite the fact that the relationship between capital structure and inequality since 2000 is not as clear cut as before that date, the reader must bear in mind the brief description of the debt-output ratio some lines back. This ratio started rising in 2003 and met a much more acute rise right after the crisis. This is in turn linked to the reduction in income inequality between the top 1% and the remaining 99% and the rise in the wage share.

At this point, given that we have no theoretical or solid empirical evidence, we are unable to draw any clear causal relationship between income inequality, the functional distribution of income (i.e. the wage share or the profit rate) and the capital structure of firms. However, we strongly suspect that a key determinant of inequalities in France since at least the late 1970s was the demand for credit by firms, relative to the amount of own funds in their stock of liabilities[15]. At this point, we are not able to tell which variable should be empirically tested for the capital structure, but as we just saw, there are close ties in the evolution of the series analyzed. This discussion provides, or so we think, support to Kalecki's theory of the degree of monopoly. As it turns out (at least in France since 1979), the degree of monopoly can also be seen as the proclivity of firms to issuing equity and their preference in financing their investment with this instrument rather than with debt.

[14]At the time of downloading the series, these were available only up to this year.

[15]A drawback of this analysis is that, in 1961 the income share of the top 1% was 9.9%, and since then it gradually fell until it reached 7% in 1983. At a first glance, this would suggest that before that date the structure of capital was predominantly equity-based but, as we mentioned in chapter 1, this was not the case. Under the assumption that the Top Incomes Database is accurate, we prefer to interpret this as the fact that income inequality was *not* influenced by the capital structure of firms before 1979.

The principle of increasing risk revisited

Kalecki's principle of increasing risk is closely related to the size of the firm. In the first part of this article, the author says "[t]he subject of this paper is the determination of the size of investment undertaken in a certain period by a given entrepreneur" (Kalecki 1937b, p. 440). After arguing that the assumption underlying the standard neoclassical producer theory concerning the size of the firm (*dis-economies of scale*) is plainly unrealistic, he moves on to discuss some issues of how the argument concerning *imperfect competition* (at least as it was stated up to then) is not very convincing. The second part of the article deals directly with the relative amounts of debt and own funds undertaken by the entrepreneur which, in Kalecki's view, are the determinants of risk that in turn determine the size of the firm. In Kalecki's own words:

> There are two reasons for the increase of marginal risk with the amount invested. The first is the fact that the greater is the investment of an entrepreneur the more is his wealth position endangered in the event of unsuccessful business. The second reason making the marginal risk rise with the size of investment is the danger of "illiquidity". The sudden sale of so specific a good as a factory [issuing equity, LR] is almost always connected with losses. Thus the amount invested k must be considered as a fully illiquid asset in the case of sudden need for "capital" (ibid., p. 442).

He then moves on to set forth his arguments by means of a model, in which the amount invested is given by the condition that the marginal efficiency of investment is equal to the sum of marginal risk (given by the size of the firm) and the rate of interest. Again, it is worth quoting Kalecki's words in full: "[t]he smaller is the own capital [or own funds, LR] of an entrepreneur investing the amount k the greater the risk he incurs. For his possible losses bear a greater proportion to k his wealth and – since the amount of credits k_0 considered by his creditors as "normal" is in a certain proportion to his own capital – the danger of 'illiquidity' is greater too" (ibid., p. 443).

Now, with respect to the interest rate and the principle of increasing risk, the last paragraph of the third part of the article reads "[t]he classical thesis of the low rate of interest causing the *use of more capitalistic method of production* was often applied not only for long run equilibrium position but also for entrepreneurs' planning in 'disequilibrium'" (ibid., p. 445, italics added). This phrase is contradictory to what we argued in chapter 1, as a consequence it deserves further analysis.

According to Kregel 1994, it is perhaps Josef Steindl the first economist to put forward the notion of the relevance (rather than irrelevance as in M&M) of the financial structure of firms[16], which was analyzed in his 1945 book *Small and Big Business: Economic Problems of the Size of Firms*. Steindl was not only Kalecki's student and close collaborator, he was also an important figure in the economics profession of his own right. In his article 'Capitalist Enterprise and Risk' Steindl "suggested that in the joint stock system, 'over-capitalization' or the *issue of stock in excess of 'the cost value of real assets' is used to give 'inside' shareholders controlling the company a higher rate of profit and a greater influence over the company vis-à-vis 'outside' shareholder*" (Toporowski 2005, p. 119, italics added).

In our opinion, Steindl's work on the financing of firms re-vindicates Kalecki's principle in that it takes a step forward in considering the possibility of a firm running important risks even when debt is held at low levels which, as we saw above, Kalecki did not consider. Moreover, Kregel's articles "Operational and financial leverage, the firms, and the cycle: reflections on Vickers' money capital constraint" (Kregel 1989-90) and "Some Reflections on technical progress in financing small firms" (Kregel 1994) provide a bridge between Keynes *General Theory* and Steindl's reinterpretation of Kalecki's principle of increasing risk. According to Kregel:

> ROE [Return on Equity] and the rate of interest on debt capital represent the ratio of present prices of financial assets to future values of two types of financial assets (the firm's liabilities) shares and fixed interest debt when corrected for risk.
>
> The "forces for change" in the General Theory may thus be located in those factors that determine the marginal efficiency of capital (MEC) and the rate of interest, i: the state of expectation and liquidity preference (Kregel 1989-90, p. 230).

To conclude our arguments concerning Kalecki's principle of increasing risk, in support to our claims with respect to the financial structure shift than took place in France since the first half of the 1980s from debt to equity, Kregel mentions that "debt financing is only advantageous to equity owners when the cost of debt is less than the return on the investment, i.e. only when MEC > i adjusted for risk" (ibid., p. 231).

[16] In fact, Steindl notes that large firms will have smaller-debt-equity ratios (Kregel 1994, p. 229). That is, large firms will tend to attract more buyers of their equities than small ones, which in turn rely more on debt (at least once they make it introduced to public offering, IPO).

Kalecki's political aspects of full employment

Let us now turn to what we consider Kalecki's major contribution to social sciences: his article "Political Aspects of Full Employment"[17] (Kalecki 1943). While Keynes' contributions on the control of the economy through the interest rate are of the utmost importance for economic policy, and as Keynes' and Kalecki's notion of the supremacy of *effective demand* provide economists with a powerful theoretical framework with which to understand and tackle key economic issues, Kalecki's *political aspects* provide the social scientist with a bridge between politics and economics by means of an analysis of class struggle *à la* Marx.

Clearly, the *paradigm shift* (in the Kuhnian sense of scientific revolutions) that took place in the late 1970s and early 1980s in the developed world did not occur from one day to the next. As argued in chapter 1, the Volcker shock was the response to / result of (1) the oil shocks of 1974 and 1979 (in turn a byproduct of the end of the Bretton Woods system), and (2) the ideas promoted and later implemented by central bankers[18]. The description of the economic consequences of the so-called Washington consensus were described in chapter 1. Let us now deal with the ideological part of the policy and paradigm shift.

As mentioned before, the raising of interest rates provoked an inter-sector leveraging shift between firms and households, a strong rise in the unemployment rate, and an important reduction in the inflation rate. Perhaps since then, the political regime shift can be associated to the capital composition of firms. Central bankers' dream of taming inflation[19] came true, but clearly at a very high price. We interpret this employment cycle similar to Kalecki's *political aspects*. In Kalecki's own words[20]:

[17]To our knowledge, Kalecki was the first to put forward the notion of the link between business cycles and political cycles, being these independent of electoral cycles. In our opinion, the ideas expressed in this brief masterpiece of economic poetry are much more powerful and timeless than, for instance, the tons of articles and books dedicated to what came to be known as the *social choice* literature that try to analyze the same link by means of standard neoclassical utility and production functions.

[18]Our work relies heavily on the idea that central bankers are indeed (at least up to today) the most influential economic authority. Now, given that the largest economy in the world was (and still is) the United States, it comes as no surprise that the individuals in charge of this important institution have a major influence on (1) future presidents of the Fed, and on (2) public opinion. It was argued in the previous chapter that a key *opinion shaper* was Arthur Burns, who was president of the Fed from 1970 to 1978, and who had clear influences on Paul Volcker and Alan Greenspan (his successors), as well on the press and public opinion of his time. Our point of view is that his legacy (for good and bad) persists today.

[19]See for instance Feldstein's interview with former Federal Reserve chairman Paul Volcker (Feldstein 2013). See also "The Anguish of Central Banking" by also former chairman of the Fed Arthur Burns (Burns, Cirovic, and Polak 1979).

[20]The reader must bear in mind that this article was published during WWII. So that, for example, as Kalecki and Koo 2009 highlight, in 1937 the Roosevelt administration aimed at fiscal consolidation, thus

> It should be first stated that although most economists are now agreed that full employment may be achieved by Government spending, this was by no means the case even in the recent past. Among the opposers of this doctrine there were (and still are) prominent so called "economic experts" closely connected with banking and industry. This suggests that there is a political background in the opposition to the full employment doctrine even though the arguments advanced are economic. That is not to say that people who advance them do not believe in their economics, poor though these are. But obstinate ignorance is usually a manifestation of underlying political motives (p. 324).

As apocalyptic as these words may sound, Kalecki's prediction of the falling from grace of full employment doctrine can be clearly observed in the long term evolution of the French economy, that is, in the timing of the shift in the capital composition of firms, the rise in unemployment, the taming of inflation, and in the inter-sector credit demand shifts described above. It is worth noting that this shift took place (and has not yet been reverted) independently of whether left or right wing governments are in office.

We interpret the raising of interest rates by the Fed in 1979 as being the crucial decision that marks the beginning of the new policy agenda. As for the ideas underlying this policy decision, they had clearly been there for a while (even before the collapse of the Bretton Woods system). However, the very moment when the paradigm shift at an intellectual level began (which, up to now, we are unable to trace) deserves further research.

Having dealt with the *core* theoretical ideas that shaped our economic analysis of the French economy since the collapse of the Bretton Woods system, let us now move on to review the literature related to income distribution and the behavioral equations used in our model.

2.1.2 Income distribution

What income distribution research *ought to* be

In this work, the study of income distribution and the role of economic policy in dealing with the former is based on two main (in our opinion related) research agendas: the demand regimes literature and the personal income inequality literature. Before getting

reverting the policies implemented since 1933 up to then. This clearly contradicts the main principle of the New Deal, though it must be noted that this contradiction was mainly due to political pressure.

to these, let us first go over two standard definitions of income distribution. The first comes from Tibor Scitovski 1964, who says that:

> There are at least four possible subjects that a theory of income distribution could cover: first, the level and changes in the level of incomes earned in particular *occupations*; second, the distribution and changes in the distribution of *personal incomes by size*; third, the *functional distribution of income* among the owners of different productive factors; and fourth, the relative size and changes in the relative size of the various components of the official *personal income accounts* (p. 15, italics added).

In our opinion, this definition resembles a nails/hammer problem (often attributed to Mark Twain) whereby "if your only tool is a hammer then every problem looks like a nail". As we see it, according to Scitovski a successful theory of income distribution (the nail) should lie within the acceptable limits of a standard neoclassical model (the hammer). In contrast to classical economists (who viewed class struggle as being central to the theory of value), neoclassical authors tend to carry out their analysis not in terms of classes, but in terms of selfish consumers and producers aiming at maximizing utility and profits[21]. For example, despite Scitovski's recognition of the relevance of the functional distribution of income (which we acknowledge too), he also mentions that "[t]he numerous theories of the *division of income between labor and capital* can be classified according to their approach and according to what they are trying to explain. As to the former, the distributive shares depend partly on the behavior of *individual decision-makers, entrepreneurs, and consumers*, and partly on the magnitude and *pattern of demand and the relative supply of the different factors*" (ibid., p. 16, italics added).

After reviewing short-run macroeconomic explanations[22] Scitovski dedicates only two pages to describe long-run explanations, after which he dedicates six pages and a half to microeconomic theories, and four more to macroeconomic ones. Now, despite the author's harshness towards the 'implicit' theory set forth by Keynes and Keynesians, in the third part (microeconomic theories) Scitovski recognizes the merit of Kalecki's

[21]For a thorough discussion on the scope of the classical and neoclassical schools, see Colander and Freedman 2011.

[22]In this part the author contrasts what seems to be his preferred type of analysis and the 'so-called Keynesian theory'. The former is based on the work of Burkhead, who distinguishes three effects for the anti-cyclical behavior of labor's share; the 'capacity effect', the 'lag effect' and the 'compound effect', to which Scitovski adds a fourth one (the composition of output). As for the latter (the 'so-called Keynesian theory'), its *rudiments* "are contained in the *Treatise on Money* and which has been further developed by Boulding, Hahn, Kaldor, Kalecki, and Robinson" (Scitovski 1964, p. 19).

theory[23], which resides in its relating income distribution to the entrepreneur's pricing policy. Nevertheless, the author also mentions that this explanation "suffers from lack of a satisfactory and integrated theory of monopolistic and oligopolistic competition" (ibid., p. 27).

Let us leave Scitovski's insights on the side for a moment and focus our attention on another set of requirements for a theory of income distribution that strives at being successful. This definition is provided by Atkinson and Bourguignon 2000, who mention that such theory "must draw on the union of what is known about the *pricing of the assets* whose services individuals can sell on the market, to which we should add the possible *rents and quasi-rents that may accrue to individuals* for noncompetitive positions that they may hold and the dynamics of the competitive structure of an economy" (p. 26, italics added). They go on to mention that the fact that there is no unified economic theory of income distribution should be seen as a reflection of the complexity of the world in which we are living.

Several pages before the previous quote, the authors provide an interesting discussion of the role of income distribution in economic theory. In their own words:

> Income distribution assists our understanding of various fields of economics (...) It would be difficult to ignore the distribution of income when dealing with political economy mechanisms (...) Aggregation is the methodological bridge between many distribution issues and more standard economic analysis (...) It was clearly central to Marxian economics. It has always been prominent in development economics and it is now featuring in growth economics (ibid., p. 4).

It is worth noting that an overwhelmingly majority of the works and authors cited in the introductory chapter of the *Handbook of income distribution* edited by Atkinson and Bourguignon (written by themselves, and from which the previous quotes were obtained) come from a mainstream background. However, in one of the few passages dedicated to heterodox approaches, Kalecki's theory of income distribution is seen as relevant. In particular, the authors highlight his theory of monopoly power[24].

As is clear from the previous examples (drawn from two different periods, i.e. 1964 and 2000, respectively), Kalecki's studies on income distribution were and still are major

[23]"This is a *first cousin of the marginal productivity theory*, from which it differs, in a formal sense, by dropping the assumptions of perfect competition and long-run equilibrium" (ibid., p. 26-27, our italics).

[24]"In the macroeconomic theory of factor shares there has long been a strand of thinking that has emphasised the role of monopoly power (Kalecki, 1938)" (Atkinson and Bourguignon 2000, p. 13).

references in economic theory[25]. The definitions of what income distribution theory *ought to be* seen above provide support for the approach proposed in this work as a good candidate for a *complete* theory, given that it addresses key issues of factor shares and effective demand. Kalecki's seminal article "The Determinants of Distribution of the National Income" (Kalecki 1938) laid the foundations of what came to be known as the Post Keynesian theory of functional income distribution, or simply the "Demand Regimes" literature. Since we went over Kalecki's functional distribution theory briefly in the previous section, we will now focus on the former sub-strand.

The 'demand regimes' approach

The demand regimes approach is based on the also seminal work of Bhaduri and Marglin 1990 and Marglin and Bhaduri 1990), as well as Bowles and Boyer 1988, further analyzed and extended by, among others, Blecker 1999, Lavoie 2004 and Nikiforos 2015. The theoretical basis of our approach in dealing with income distribution relies likewise on Kalecki 1991 'Money and Real Wages', in which the author notes that "[t]he assumption of a given general price level or a given aggregate demand is totally unfounded. We know only too well that in the course of the business cycle both magnitudes are subject to violent swings. Why then should we assume [as neoclassical theorists do] that they remain unaltered in the aftermath of a wage reduction? If, however, we reject these assumptions a quite new theoretical construction is required in order to enable us to appreciate the consequences of changes in money wages" (ibid., see also Toporowski 2010, p. 10).

In our opinion, the previous quotation from Kalecki provides a very good summary of the 'demand regimes' approach (inspired in this author's work) first developed formally by Stephen Marglin and Amit Bhaduri in 1990 in two seminal papers: "Unemployment and the real wage: the economic basis for contesting political ideologies" and "Profit squeeze and Keynesian theory". The authors depart from Keynes and Kalecki in that they (MB) treat real wages as given, rather than as endogenous variables[26]. Their reason for doing so is to focus on issues stemming from movements in distributive variables (i.e.

[25] In fact, virtually all of Kalecki's research agenda has been the subject of interest for several economists worldwide. See for example the works of Kalecki's students, collaborators and/or followers Joan Robinson, Josef Steindl, Adam Szeworski, Kazimierz Laski, Tadeusz Kowalik, Zdzislaw Sadowski, Ignacy Sachs, Amit Bhaduri, Jan Toporowski, Julio López, Tracy Mott, Heiner Flassbeck, Phillip Arestis, Malcolm Sawyer and Jayati Ghosh, to name but a few.

[26] However indefensible this procedure may seem (it is not), we will see that in our model wages are not taken as given, they are rather determined within the model just like most variables. The advantage of our model is that in it we are able to analyze a change in wages (be it exogenous or endogenous) and see its effects on output and other variables, while this change may have repercussions on wages themselves.

wages, profits and the exchange rate) on key aggregates like private accumulation and aggregate demand.

In Bhaduri and Marglin 1990 the authors first focus their attention on a closed economy and then move on to analyze open economy issues by means of a Hicks-style IS curve[27]. In that model they distinguish between *stagnationist* (or 'under-consumptionist') and *exhilarationist* (or 'over-accumulationist') demand regimes, where the former refers to a situation in which a rise in the real wage leads to higher demand (which in turn offsets the increase in firms' costs), and the latter refers to a regime in which an increase in the profit share (alternatively, a fall in the wage share) leads firms to invest more without aggregate demand being severely curtailed. The question may ultimately boil down to a dichotomy in which a demand effect is compared to a cost effect. Their analysis of an open economy is complicated by external factors, such as foreign prices (raw materials, consumption goods) and the exchange rate, which may (or not) have an effect on the economy under analysis.

A deeper survey of the up-to-then existing literature and with a somehow different methodology of the previously discussed model (although still loyal in spirit) is carried out by Blecker 1999 who, following Marglin and Bhaduri, distinguishes between stagnationist, cooperative, conflictive, exhilarationist, wage-led growth and profit-led growth regimes, with cooperative and conflictive ones lying in middle grounds closer to (or farther away from) one regime or another. For instance, a cooperative regime would be an economy found in a stagnationist phase (with high real wages and wage shares) but in which capacity utilization profit shares are rising (thus real wages are falling). In contrast, a conflictive regime would be an economy in a stagnationist phase but in which both capacity utilization and profit shares are falling.

Our analysis of the French economy is also inspired by this discussion, but we will put forward these arguments in the following subsection, where we deal with some issues concerning the form of the behavioral equations included in our empirical stock-flow model, which is described in chapters 4 to 6.

Personal income distribution

The second strand of literature which is linked to our analysis of income distribution is the *personal* sub-category that Mr. Scitovski referred to in his list. At this point, it is

[27] Their model is set on an (h, z) plane, where h is the profit share and z is the degree of capacity utilization. This must be contrasted to Hicks' original IS curve which is set on the (Y, i) plane, with Y being national income and i the interest rate.

worth mentioning that the first two subjects mentioned in his list of what a theory of income distribution could cover (occupation and size), according to Scitovski, have not received much attention in the profession. As a consequence, the author deals mainly with the other two subjects (functional and personal income distribution) in his review, just like most of the existing literature. Now, up to here, we have referred to functional income only, and it may seem as though there is no clear link between functional and personal income distribution. We believe that the relationship between the two is much more important than it appears to be the case.

In support to our claims, Atkinson 2009 identifies three reasons for studying factor shares, or what is the same, the functional distribution of income[28]: "to make a link between incomes at the macroeconomic level (national accounts) and incomes at the level of the household; *to help understand inequality in the personal distribution of income*; to address the concern of social justice with the fairness of different sources of income" (p. 5, italics added). To our surprise, in his article there is no mention whatsoever of the works of Kalecki or Marglin and Bhaduri, although there is a brief citation concerning Kaldor. This suggests, in our opinion, either that this research line remains unknown or even that it is neglected (except in 'dissident' circles).

The dynamic analysis of income distribution at a personal level is useful for several reasons, some of which are that (1) it allows for a study of income and wealth inequalities, (2) it provides us with a guide for economic (particularly incomes) policy, (3) it is useful to explain the link between everyday life and economic theory (which is still to be developed), and (4) it serves as a benchmark of [the evolution of] fairness, as Atkinson stressed in his 2009 article cited above.

Although it would be highly desirable to have at our disposal disaggregated data on the distribution of income for *all* percentiles for as many economies as possible and for the longest time span, up to now this has proven to be a challenge at a methodological level. It must be also mentioned that such study may also turn out to be costly and, despite the usefulness and desirability of a project of this type, affordability and cost-efficiency are still important to consider. As a consequence of this data unavailability, we content ourselves to work with data for France from the tax-based Top Incomes Database by Facundo Alvaredo, Anthony Atkinson, Thomas Piketty and Emmanuel Saez, as well

[28]Interestingly, Atkinson also mentions that "[s]ince the 1960s, factor shares have been downplayed. The textbooks no longer give them much space. The books assigned for courses in macroeconomics seem happy to comment on the relative constancy of factor shares and to draw the conclusion that they can be explained by factors of production being paid their marginal products with a Cobb-Douglas aggregate production function" (Atkinson 2009, p. 4).

as some of the works related to such database (mainly concerning France). It is worth pointing out that we see the authors' effort in providing researchers and public opinion with this type of data (for free) as a laudable goal, which we can only celebrate.

Despite some limitations on the construction of the series, the authors themselves admit[29] (and which many critics ignore, several because they have not even read their works), "[i]n contrast to existing international databases, generally restricted to the post-1970 or post-1980 period, top income data cover a much longer period, which is important because structural changes in income and wealth distributions often span several decades (...) Moreover, the tax data typically allow us to *decompose income inequality into labor income and capital income components*" (Atkinson, Piketty, and Saez 2011, p. 4, italics added).

Now, as was seen from the discussion on the functional distribution of income above, the Keynesian/Kaleckian model proposed by Bhaduri and Marglin focuses on the conflict between labor and capital, if only from a slightly different perspective than Marxian economists (for instance, Richard Goodwin's seminal 1967 article "A Growth Cycle"[30]). Since the Top Incomes Database also focuses on the dichotomy between labor and capital, it seems all the more natural that both personal and functional income distribution are (or should be) analyzed simultaneously. As we have stressed several times now, our model aims at doing so from an empirical perspective, while at the same time taking into account the financial and real sectors.

At this point, something worth highlighting is that income inequality and distribution have been at the core of the debate (at least) ever since the global financial crisis imploded[31]. Along with trendy subjects such as *finance* and *the environment*, *inequality* ranks high in popularity these days[32]. Despite this seemingly careless fashionable trend, we see this as a sign of concern in modern-day society. We believe that our discussion is useful in making the link between the financial and real sectors, whereas at the same time tackling the problem of inequality[33] by means of a Cowles Commission type (empirical

[29]They mention that the series measure top incomes only, whereas it would be more interesting to see how income inequality evolves elsewhere in the distribution; series are largely concerned with gross income before taxes; comparability is difficult among countries and sometimes subject to personal interpretation; and, more importantly, the series might be biased because of tax avoidance and tax evasion (Atkinson, Piketty, and Saez 2011, p. 4-5).

[30]The interested reader is advised to take a look at the discussion in Goodwin 1983.

[31]By way of example, see the discussions of Anthony Atkinson and Paul Krugman (https://www.youtube.com/watch?v=3l6E3mUNW70), and that of Joseph Stiglitz and Martin Feldstein (https://www.youtube.com/watch?v=P1W4AtNRbkk).

[32]See, for instance, a list provided by the Peterson Institute for International Economics: http://www.iie.com/research/topics/topics.cfm.

[33]To be fair, ours is not the only model of this type. See, for instance, the proposals set forth by Dafermos

stock-flow) model, the theoretical bases of which are described in section 2.1. However, at least up to this point, our model does not consider environmental issues. Let us now discuss our sources of inspiration for the behavioral equations estimated and included in the applied part of our work.

2.1.3 Theoretical references for behavioral equations

As mentioned in chapter 1, we *tried* to keep the specifications for the model's equations within what we consider to be a standard Keynesian approach. Evidently, the emphasis on the word 'tried' is justified by the fact that this is a colossally difficult task. That is, within the broad and thorny spectrum of possible theoretical specifications available in the Keynesian approach[34], we based most of our behavioral equations on *what we consider* to be a standard Post Keynesian framework[35]. In spite of there being no clear consensus on what a *pure* (New-, Neo- or Post-) Keynesian economic model *is* or *should be*, it is all the more important to realize that even within each sub-strand there is hardly a well unified or accepted framework. These philosophical aspects are left aside, given that the nature of our work is applied rather than epistemological (at least up to this point).

Our model is of *medium size*. It contains 372 equations[36], 315 of which (the relevant ones) are explicitly shown in the Appendix, 48 are estimated[37], several others are plain identities, and the remaining are simple specifications (ratios for the most part). In this subsection we focus on the theoretical consideration of the estimated behavioral equations which are, in our opinion, the most important defining elements of our model

and Papatheodorou 2013 and Dafermos and Papatheodorou 2015.

[34]On this, see the first chapter (or better yet, the whole book) of Leijonhufvud 1968 *On Keynesian Economics and the Economics of Keynes*. Our recommendation is based on the subject treated by the author, which by no means implies that we agree on everything he mentions in that book or afterwards.

[35]To be fair, also because of some technical aspects. For instance, in the accumulation function we used the output gap calculated by the *IMF* instead of a measure of capacity utilization from *INSEE*. We did so because the evolution of the latter gives the impression that there is a recovery in the productive capacity in France, whereas Jacques Mazier and myself have good reasons to doubt this has actually been the case.

[36]By way of comparison, as of 2012 the model *Mésange* (built by the French Treasury) consisted of close to 40 behavioral equations, out of a total of 500 equations, see Cabannes et al. 2012. It must be noted that this is one of the main Neo-Keynesian models that is currently in use and has so far not been very successful at providing the accurate forecasts of the French economy.

[37]We remind the reader that our procedure is carried out in two steps. That is, for each equation we first estimated the long term specification by means of a *VAR* model, in order to integrate the corresponding vector of cointegration (i.e. the residuals of the long-term series of interest) in a reparameterized version of the former in differences, with the vector of cointegration lagged one period as a determinant. However, it must be noted that not all *vc*s were significant, so that we consider the corresponding equations only for the short term. As a consequence, the number of estimated equations is close to a hundred. Details on the estimates are detailed in chapter 5.

from a theoretical point of view. Let us deal with these equations in an orderly manner, separating the description by institutional sector[38], and leaving a much more detailed description of the estimations and other technical details for chapter 5.

Consumption function

The most obvious starting point of th description of the theoretical basis of our behavioral equations is the controversial (still somehow standard) consumption function. Following Case, Quigley, and Shiller 2003 and Case, Quigley, and Shiller 2012 personal consumption is a standard Keynesian consumption function augmented of housing and financial wealth. That is, real quarterly consumption[39] is a function of deflated disposable income, the stock of non-financial assets and the stock of equities held by households (both deflated using the consumer price index). The expected signs for each element are positive, given that any accrual in income or wealth tends to increase consumption by the size of the corresponding coefficients. See part 5.2.1 for the values of the estimates.

According to Case, Quigley, and Shiller 2003, there are "many reasons why consumption may be differently affected by the form in which wealth is held" (p. 173). They mention five main of these reasons as being (1) the rise in wealth may be seen as temporary (i.e. in the case of equity), (2) the bequest motive, which is strongly motivated by tax laws, (3) households may view the accumulation of of some kinds of wealth as an end in itself, (4) wealth may be difficult to measure (capital gains, for instance), and (5) people may separate kinds of wealth by "mental accounts".

Equipped with a large panel of data for all 50 states (except one) in the United States, the authors compute the parameters linking income and wealth to consumption. They carry out a standard two step procedure, beginning with plain ordinary least squares and generalized least squares for the series in levels, in order to proceed with the same specification in differences. Their results are consistent with a standard positive effect of income and housing wealth on consumption, but mixed in the case of stock market wealth.

Additionally, house prices enter the equation (since they multiply the stock of non-financial assets held by households), and this has as an implication that, as Duca, Muellbauer, and Murphy 2013 point out (p. 9) "the impact of rising house prices on consumption is likely to be negative in countries with less active mortgage markets(...). The

[38]Reminder, there are five sectors in our model: households, non-financial firms, banks (or financial firms), the government and the rest of the world.

[39]All *real* variables in the remaining of our work are measured at 2005 prices. This is also the reference year for all price indexes.

opposite holds for countries (...) where easy availability of home equity loans made housing into a more liquid asset and higher housing collateral values boosted spending". We have reasons to believe France falls into the first category, thus higher prices tend to depress consumption and, as a consequence, aggregate demand[40].

Demand for dwellings

When modeling the demand for homes in a stock-flow model, we have the choice of either using the stock or the flow concept. We opted for the *stock* (in volume) specification since this is commonplace for France, as mentioned in Egebo, Richarson, and Lienert 1989 (p. 157). The authors also provide a list of possible choices of determinants for this equation. The first one is demographic factors, and we take this into account by dividing the corresponding dependent variable by population, so that the left-hand side of our demand for dwellings equation is in per capita terms.

The second determinant according to the authors is income and wealth. The former is included in real terms in the equation, whereas the second is present through lagged effects of the dependent variable on the right-hand-side of the estimated equations, so that per capita housing wealth (the dependent variable) is determined by itself in past quarters. It must be noted that population and income are also present in the work of Zezza 2008, as well as in Duca, Muellbauer, and Murphy 2010.

Egebo, Richardson and Lienert also mention that house prices and inflation are important determinants in this specification. As a consequence, they recommend using the ratio housing prices-consumer prices, which we also included on the right-hand side of the equation. Finally, they include the unemployment rate as a proxy for consumer confidence. This variable is present in the long-term specification only.

Price of housing and capital

Jacobsen and Naug 2004 empirically study the determinants of house prices in Norway. Despite the fact that there are differences between the Norwegian and the French economies, we believe their specification is quite standard and easily applicable to other cases. Thus, like these authors, we define housing prices as a function of housing stock per head (i.e. the dependent variable in the demand for dwellings) and the unemployment rate. The first determinant represents the demand for homes, and its sign is expected to be positive given that, following a rise in the demand for dwellings, prices will tend to rise.

[40]In chapter we deal with this issue, for we apply a shock to the price of non-financial assets, and the results confirm that this has a negative effect on aggregate demand.

As in the case of demand for homes, the unemployment rate is a proxy for expectations of future developments in the budgets for households and their ability to repay dent. As a consequence, a rise in the unemployment rate makes housing prices fall.

These two determinants are no doubt important in the determination of home prices. Nonetheless, even more important determinants are its own lagged values. The fact that the sum of the coefficients is positive (though less than unity), indicates that an initial movement in this series in any direction will tend to be reinforced in the subsequent periods[41]. Therefore, an important determinant of home prices are lagged values of themselves, which is an indicator of market conditions whereas they keep their random nature (for example see chapters 1 and 4 of Enders 2015).

Another feature of our model is that we also provided equations for the price of capital (i.e. non-financial assets). Since we assumed that there are only three sectors involved in the production process (households, firms and the government), we had to estimate three capital prices. In the case of households, we treated their capital price as if only house prices mattered. This is unrealistic, for there are also individual entrepreneurs included under the heading of this institutional sector. However, as a first approximation, we believe this is not too restrictive as assumption. In the case of firms and the government the treatment consisted in assuming that their capital prices depend on (1) their lagged values, (2) the prices of homes, (3) the price of investment (from the national accounts), and (4) the interest rate paid by the given sector.

The fact that we made these prices depend on those of dwellings is based on two notions. The first is that, given that an important determinant inherent in home prices are land prices (see the discussion in the third part of section 1.1.2), and as property is most important for households, it does not seem too ludicrous to assume this dependency. The second notion is empirical, and has to do with the fact that the evolution of the three capital prices evolve following the same long-term trend. That is, they clearly go up and down according to the evolution of the housing bubbles described in chapter 1.

Households' demand for credit

Households' leverage ratio (stock of credit liabilities divided by the stock of non-financial assets) is a function of disposable income (also as ratio of the stock of physical capital), the real interest rate and financial return. The form of the left-hand-side variable and the presence of the interest rate and financial return are standard in the *SFC* literature,

[41] This, of course, applies to all the other estimations for which their lags were found to be statistically significant, and thus retained in the estimations, particularly prices.

in which financial instruments are modeled as shares of the corresponding sector's wealth, and depend on the price of the instrument (the interest rate in this case) and on that of competing instruments, which in this case is the financial rate of return of equities held. For a thorough and recent study of the link between housing demand, the consumption function and credit demand, see Duca, Muellbauer, and Murphy 2010) as well as Muellbauer 2007 and Muellbauer 2012.

Firms' accumulation rate

The rationale for the inclusion of the profit rate and capacity utilization in the accumulation function stems from Kalecki's theory of economic dynamics and from Bhaduri and Marglin 1990, respectively. This specification can be found in several existing stock-flow models, such as Lavoie and Godley 2001, Zezza 2008, Treeck 2009, Reyes and Mazier 2014, and many other following the same theoretical approach. However, it must be noted that, despite the existence of the utilization series (available from *INSEE* for the manufacturing sector) our proxy for this determinant is rather the output gap. This is so because, following the 2007-08 crisis, the evolution of this indicator is such that the existing series for French capacity utilization rise strongly, whereas we believe that it should have actually fallen. This is the case for the output gap calculated by the *IMF*, the series we retained in the model.

Financial markets play a crucial role for the determination of accumulation. This is reflected in our equation through the inclusion of the rate of financial return on equities issued by firms (an endogenous variable in the model) and the interest rate (exogenously determined). A rise in either of the two series impacts negatively on accumulation, given that both represent the 'costs of financing', from the point of view of the two main liabilities in the books of firms: equity and debt. The nature of the relationship between the two and the consequences in the shifts in the capital structure was dealt with in the preceding chapter.

Firms' indebtedness and own funds

As we saw above, corporate debt is a key variable to analyze, given its role as a financing instrument. Its issuing has clearly changed over time, and this has had important consequences for the French economy, and possibly also for emerging markets[42]. We

[42] As we mentioned in the first chapter, our explanation of the imbalances created by the Volcker shock have been that, as firms curtailed their demand for credit, banks sought for alternative sources of demand for this instrument. The list included households, and we hypothesized that, given the frequency of

posit the leverage ratio (stock of debt / stock of non-financial assets) as the dependent variable.

One of the key determinants of loans contracted by non-financial firms is clearly the interest rate, which bears a negative relationship with the former. Since debt and own funds are not independent of each other, the rate of financial return of equities issued is also included as a determinant, and its coefficient has a positive sign. Another key determinant of debt is the profit rate, under the logic that when firms' income increases, their desire to increase their level of indebtedness rises as well. This specification is the same as in Reyes and Mazier ibid.

The equation defining the equities issued by firms is also central to our work. Own funds, that is the left-hand-side of this specification, are defined as the ratio of the stock of equities issued by firms to the total assets held by them (non-financial assets, deposits and equity on the asset side). Its determinants are the same as in the case of the previously described indebtedness norm, with the important difference that a rise in the interest rate has a positive effect on own funds, and a rise in the financial rate of return has a negative one on this instrument, given that debt and own funds are two competing sources of funding.

Prices in national accounts

Following Kalecki's mark-up pricing theory (Kalecki 1954) the price level (or *GDP* deflator) is a function of unit cost, the price of imports and the output gap computed by the *IMF* as proxy for capacity utilization, where all expected signs are positive.

The logic behind this specification is that any increase in wage per worker (a key component of unit cost) will tend to make prices rise as well. Our specification also implies that, when actual output grows faster than its potential, this will tend to make prices rise, whereas when potential grows above actual output the opposite will occur. We also included the price of total French imports as a proxy for the prices of raw materials imported. This is not very realistic, but what matters in this first prototype model is to take into account the fact that, when imported capital goods become more expensive, capitalists will tend to transfer this increase into prices.

As in the case of the price of capital, we made other prices from the national accounts on the evolution of the *GDP* deflator. Thus, the price of value added, the consumer price index, investment prices (for firms, households and the government), as well as the price

currency crises in the developing world (and some developed in some cases), another important source of credit demand was the rest of the world.

index of public expenditure are a function of the price level described and, of course, on its determinants. At this point, it is perhaps worth reminding the reader that investment prices are not equivalent to capital prices. This is so because the former (which stem from the national accounts) do not take into consideration some elements that are actually treated in the balance sheets (*comptes de patrimoine*), and are thus comprehended in capital prices.

Notice that we did not describe the prices of exports or imports in this part. This is so because we describe them below, together with two other foreign exchange equations.

Wages

This specification has in its left-hand side the amount of wages per salaried worker, and its determinants are the consumer price index, output per worker (or labor productivity) and the unemployment rate.

Interestingly, in this equation the lagged effects of wages were not statistically significant, which in turn implies that there is no 'rebound effect' given a shock on wages. In contrast, consumer prices have an important positive (contemporaneous and lagged) effect. This naturally implies that wage per worker reacts strongly to changes in consumer prices, which is not surprising given the (still) relative progressiveness of wage bargaining in this country. Increases in labor productivity have positive consequences for wages, as in the framework proposed by Keynes in chapter 2 of his General Theory. The inclusion of the unemployment rate in this specification obeys the logic of the Phillips curve, whereby demand-pull inflation is caused by increases in employment.

Employment

Employment is defined as a function of output. The treatment of this variable is a little peculiar, in the sense that, unlike for most of the other equations estimated in two steps, we did not estimate a *VAR* model for this series. Instead, in order to have an endogenous equation for employment, we took as dependent variable the inverse of output per worker, and estimated it using plain *OLS* as determined by a trend, a couple of dummy variables and a structural change dummy that takes the value of 1 from 1988q1 to 2008q1. The negative sign of the latter indicates that output per worker was significantly higher during that period than otherwise, which is in line with the timing we proposed concerning the strong rise in unemployment that was combined with the new financialized regime (i.e. after the stock market crash in 1987).

The other side of the employment story (the unemployment rate) lies in our estimation of active population. This equation is inspired in Jacquot 1997, who is particularly interested in measuring the *flexion* effect in the French economy. That is, in the language of labor economics, whether the *additional worker effect* or the *discouraged worker effect* prevails in the economy. The former is the idea that "when individuals become unemployed, hitherto inactive household members may be driven to seek work in order to limit the loss of financial resources for the household" (ibid., p. 137). The author proves that this is not the case in th French labor market. On the contrary, the effect that dominates is that in which "an increase in unemployment intensifies competition in the labor market among job seekers, whereas every unemployed sees the probability of getting a job offer reduced" (ibid., p. 137).

Our methodology is the same as that used by the author, and our estimates confirm his results while at the same time extend the period under analysis until 2012.

Exchange rate

A key policy instrument in most economies nowadays is the exchange rate. Unfortunately, this is no longer the case for the French economy since the introduction of the euro. The theory concerning the determination of this macroeconomic fundamental is quite vast (see for example Mussa 1984), and certainly its role as a key determinant of growth should receive more attention (see Eichengreen 2007). However, given that our model is already quite large, and that the introduction and endogenization of this series was done at a relatively late stage of the design of the model, we were unable to delve deeper into the corresponding empirical literature[43].

Nonetheless, we estimated an equation for the nominal effective exchange rate, which is determined by two main variables; the interest rate differential and a proxy for the capital account balance. The first is standard with the interest rate parity literature (for a review see chapter 4 of Gandolfo 2002), and has to do with the fact that an overvaluation of the exchange rate is related to a widening of the gap between the domestic and the foreign interest rates, given that the profitability offered by the home country exceeds that from abroad. The second determinant of this series is the ratio of the total stock of financial assets with respect to the total stock of liabilities for the French economy with respect to the rest of the world[44]. The underlying idea is that, when there is (say) a

[43]This is definitely a key aspect on which we shall focus in the future.

[44]We tried several specifications with, for example the current account as share of *GDP* (see for instance Dornbusch and Fischer 1980), but with no success.

devaluation, the demand for financial instruments denominated in national currency will fall, both in absolute terms and in relation to the counterpart (the liabilities). Clearly, the opposite will happen when there is an appreciation. As a consequence, the link between this ratio and the exchange rate is direct.

Despite the drawback in the number of determinants of the nominal exchange rate, we were able to estimate and integrate two interesting equations related to the behavior of financial actors in international markets. The central idea is taken from De Grauwe and Rovira Kaltwasser 2006, Beine, De Grauwe, and Grimaldi 2006, as well as a stock-flow version in Lavoie and Daigle 2011, and has to do with the distinction between so-called fundamentalists and chartists. The former base their forecasts (or expectations) for the exchange rate on macroeconomic fundamentals, whereas the latter focus solely on charts.

Following the literature mentioned above, fundamentalists estimate the changes in the exchange rate as deviations of the observed series with respect to a "fundamental" one. On the other hand, chartists base their expectations on the past evolution of the observed exchange rate. We estimated the latter in standard Box-Jenkins (*ARMA*) form.

Foreign trade

This block of equations is quite standard with the international trade literature. It consists of four two-step estimations for exports and imports, both in volumes and prices. these four equations were estimated in logarithmic form.

The volume of exports are a function of the volume of foreign demand, which is defined as an index of *GDP* of France's trade partners[45], and was built as the corresponding countries' output, weighted by the proportion of these economies' exports directed to France. *GDP* series were obtained from *AMECO*, and exports from *OECD DOTS*. A second determinant of the level of exports is competitiveness. Our indicator for this series is the ratio of French export prices and those of trading partners (correspondingly expressed in euros). The idea is clearly that, when export prices rise above those of competing parts, exports will fall. Therefore, the expected sign for the coefficient linking both series is negative.

Export prices are a function of the general price level and the price of exports of the core main trading partners of France: Belgium, Germany, Italy, Japan, Netherlands, Spain, UK and US. Since this function is estimated in log form, the corresponding sum of the coefficients of its two determinants is close to unity. This is so because, following our

[45]These are: Austria, Belgium, Canada, China, Denmark, Finland, Germany, Greece, Italy, Japan, Mexico, Netherlands, Portugal, Spain, Sweden, Switzerland, Turkey, UK and US.

notation in chapter 4 and the Appendix, the basic equation[46] is

$$p_x = p_y^{1-\alpha} p_{x*}^{\alpha}$$

where p_x is the price of exports, p_y is the *GDP* deflator, and p_{x*} is the price of exports of the main trading partners mentioned above expressed in national currency. After taking logs, it is evident that the sum of the terms serving as powers (which in log-form are the given coefficients) of the right-hand-side variables is unity. This is confirmed in our estimates.

The volume of imports are a function of French *GDP*, and of the ratio of the domestic price with respect to the price of imports (denominated in euros). Naturally, this is the mirror equation of the exports specification, in which French domestic demand for foreign goods and services depends on the income of the home country, as well as on the relative price of domestic goods with respect to those available from abroad. The expected sign of both terms in the equation are positive.

Finally, the price of imports (in log form) is a function of domestic prices and the price of imports of France's competitors just listed. Similarly to the export price equation, and for similar reasons, the sum of the long-term coefficients of these two determinants must be close to one, which is also confirmed by our estimates.

Demand for financial assets denominated in foreign currency and interest rate parity

Another important feature of our model is the fact that it distinguishes between stocks, flows and revaluation effects expressed in national currency, and those denominated in foreign currency. This has the advantage that it allows us to analyze the effects of changes in the exchange rate on the demand for foreign-denominated financial instruments, given the expected exchange rate (which is calculated as the average of the one expected by fundamentalists and chartists).

The procedure followed is quite standard, and can be found in a modified version of chapter 12 of Godley and Lavoie 2007 in Lavoie and Daigle 2011. The left-hand-side of the portfolio equations denominated in foreign currency are all in stock form, and are defined as a proportion of the total of the corresponding instrument, and depend on the interest rate differential, where the interest rate paid by the rest of the world is corrected for changes in the exchange rate.

By way of example, the value of the stock of deposits held by the rest of the world in

[46]For a more complete explanation of this issue at a European level, see Bellando and Pollin 2003.

foreign currency are defined as a proportion of the total value of the stock of deposits (i.e. the sum of the deposits held in national and foreign currency), and this term is a function of the interest rate differential, corrected for changes in the expected exchange rate, as defined above. The coefficient linking both series is always positive, implying that a widening between the interest rate paid by France and that paid by the rest of the world brings about a higher demand for instruments denominated in (say) dollars, pounds, euros and/or yen. This is so because, for instance, following a depreciation of the euro, this will bring down the interest rate paid by the rest of the world to France, and the gap between these two rates widens, so that French financial instruments become dearer, given that they are more profitable than its competing counterparts.

The same procedure was carried out for the bonds issued by the government, the securities held by banks, those held by the rest of the world, credit issued by firms, that held by banks, equities held by firms and those held by banks. This will all be detailed in chapter 5.

Prices of financial instruments

Another major innovation of our model is the computation and explicit inclusion of financial instruments' prices in the model structure which, to our knowledge, is rather uncommon.

These prices were obtained from the flow-of-funds accounts (*comptes de patrimoine* and *comptes financiers*), and the details of their construction are shown in chapter 4 and the Appendix. Their inclusion in the model serve at least two purposes. On the one hand, they allow us to separate the value of the corresponding assets into price and volume for specific instruments and sectors, which in turn implies that we can differentiate effects stemming from a rise/fall in either price or volume. On the other hand, this separation further allowed us to estimate an equation for almost all prices, mainly as a function of their corresponding interest rates, inflation and/or other fundamental determinants.

We proceeded in this way for roughly all instruments except the deposits held by firms. This is so because, when we started working on the model we made some assumptions concerning the structure of interest rates, one of which was the fact that the interest rate paid by firms on loans was net of the deposits they held[47]. This has as an implication that, by definition, there is no interest rate for deposits held by firms. Thus, it seemed unnecessary to compute it.

[47] At this point it should be reminded that we work with apparent interest rates, as is mostly done in stock-flow models.

Another important remark concerning the financial instrument prices is that we did not estimate equations for the prices of bonds and securities. This seemed rather a difficult task, given the volatile nature of derivatives and bond prices since the early nineties. By way of example, taking 2005 as the reference base year, in 1993 the price of securities held by banks was around 3260, whereas it reached only 30 in 2008, just three years after the reference year in which it is 100. The only exception is the price of bonds issued by the government, whose evolution goes from around 80 in the early eighties, to 100 in the 2010s (again with 2005 as a reference year). Clearly, the high volatility of these securities price series is due to the enormous amount of barely-regulated speculation in the so-called shadow banking system, a subject which is beyond our reach and interests (up to here) to deal with.

In the case of deposits, four prices were estimated. On the asset side of households and of the rest of the world, and on the liability side for banks[48] and for the rest of the world. We are well aware of the fact that, when it comes to currency and deposits (which we treat indistinctly) "[t]he 'price' of such an asset is always unity while the quantity is given by the number of units of the currency in which they are denominated." (E. C. Eurostat 2010, p. 165). However, we decided to separate price and volume for deposits in order to link this series to the general price level and interest rates in our estimations. The deposit prices of the rest of the world and banks are a function of the corresponding interest rate and of the inflation rate, so that any increase in prices (or any fall in the interest rate) is translated into the nominal value of financial instruments. For the deposits held by households we could only find a significant relationship between their price and the interest rate received, but not for inflation. This could be due to the fact that French banks set deposit rates independently of the evolution of the price level.

Another implicit price that we were able to compute and analyze was that corresponding to loans. As we saw in chapter 1, the evolution of credit demand has been crucial in the French economy, particularly so for firms and households. Interestingly, the prices calculated confirm that the price of credit paid by firms became more expensive at the beginning of the eighties, whereas that of households remained flat until 2000, when

[48] Note, international reserves are by convention treated as a negative item on the asset side in the balance sheets of central banks. Indeed, as Gandolfo 2002 (p. 62, emphasis added) mentions, "the concept of reserves, which requires these *assets to be strictly under the central authorities' direct and effective control*, usually limits the consideration to foreign claims actually owned by the central authority" (on this point, see also Banque-de-France 2011 and E. C. Eurostat 2010). However, since an important feature of the model is accounting consistency, we decided to treat these 'negative assets' as 'positive liabilities'. Therefore, international reserves and *SDR*s are included in the deposit liabilities of banks, contrary to the established convention.

it started rising considerably and led to the second post-Volcker shock housing bubble. Both series are a function of the corresponding interest and inflation rates.

The price of credit set by banks follows an interesting trajectory. For, as expected, this price goes up from 1981 to 1985, falls from the up to 1995, and goes up again until 2000, date after which it falls again and climbs back up only after 2008. Therefore, the evolution of this price follows the business cycle, which is in turn closely followed by the ratio price of equities-price of capital (see Figure 1.6). We justify the relationship between these two series by saying that this is a key variable that supports our claim about the important role played by credit before the control of inflation, and its falling from grace since then. The close association of this price with the q price-ratio (and indirectly with the accumulation rate) is indeed interesting to look at in the future. The prices of the credit granted and contracted by rest of the world are determined by the corresponding interest rates.

The prices of equity are more straightforward to find. In principle we could have used the existing series for *CAC 40* index as a leading price. However, since we are interested in accounting consistency[49], we decided to calculate equity prices for each sector in the same way as we did for the other three instruments, with the advantage that our calculated price index of the equities held by firms closely follows the evolution of the *CAC 40*.

The leader equity price in our model is the one paid by issuers of this instrument, and it is defined as a ratio of the price of capital, which follows closely the evolution of the accumulation rate and the price of loans made by banks, as mentioned a few lines above. The rationale is also close in spirit to Tobin 1969 and Tobin and W. Brainard 1977, who propose a study of q in either stock form (that is the value of the stock of equity divided by the value of the stock of non-financial assets) or in price form. We opted for the latter, for the reasons given above, and found that this ratio is determined by the evolution of the S&P 500 index and the nominal interest rate paid by firms. The other equity prices[50] are defined as dependent on this key fundamental, so that a shock affecting the relevant stock price will have an impact on all equity prices and volumes.

Functional distribution of income in the empirical literature

Now, let us go back to the demand regimes literature that we mentioned in the previous subsection, although from an empirical point of view. A number of econometric models

[49] Had we chosen not to follow this approach, the equilibrium in the *revaluation effects* matrix would not hold.

[50] On the asset side of firms, banks, the government, households, and on the liability side of banks.

following this line of research have been estimated since the seminal work of Bhaduri and Marglin. One of the first estimations following this theoretical framework are Bowles and Boyer 1995 who, like more recent empirical works, find (using *OLS* estimates) that France is wage-led. Stockhammer and Onaran 2004, Hein and Vogel 2008, Naastepad and Storm 2007, Hein and Tarassow 2010 and others[51] arrive at the same conclusion for the country under analysis, though using somehow different *VAR*-based methodologies (except Naastepad and Storm, who also use plain *OLS* estimates). A common feature of their models is that their results stem directly from their estimated equations[52].

Our results confirm these works' conclusion that France is a wage-led regime (see chapter 6). Under a similar approach, López, Sánchez, and Assous 2008 study the consequences of labor market flexibility in France and conclude, via a *VAR* methodology[53], that "higher wages stimulate demand and output" (p. 61). We reach similar results with our model. Nevertheless, what is different in our modeling exercise is that we built a full structural stock-flow consistent (*SFC*) model to provide the corresponding evidence. *SFC* modeling is the main methodological pillar of our model.

As mentioned above, the description of each equation has been rather brief, for the simple reason that we provide a much more detailed explanation of each specification in chapter 4. Now, having exhausted (or so we think) the economic references, let us no turn to the applied ones.

2.2 Empirical references

Since our work is a mix of several empirical methodologies currently in use in the economics profession, our presentation of the literature concerning these is divided into two main axes: structural and stock-flow modeling and statistical methodology. These are dealt with in that same order.

[51]See also Stockhammer and Onaran 2013 for a full review of the empirical results concerning France and other economies.

[52]This is the approach also followed by López and Reyes 2013 for the United States, although the statistical approach is somehow different.

[53]Interestingly, in a footnote the authors argue that "[w]hen we include the variables (and we omit others) we can try to capture the underlying economic model, and we can interpret the statistical results with a theoretical reasoning" (p. 50). This is discussed below, where we allude to the critique on structural models.

2.2.1 Structural modeling

Structural econometric modeling was commonplace from the second half of the 1930s and up until the 1970s. Its birth was largely due to the Cowles Commission founded in 1932 (see Christ 1952), and its replacement by what came to be known as *Dynamic Stochastic General Equilibrium* (*DSGE*) models that was in part due to the Lucas 1976 critique. At about the time that the Cowles Commission was being created, the Econometric Society was also founded, and since then both institutions have had close ties, beginning with their members, among which there were Irving Fisher, Charles Roos and Ragnar Frisch.

The Cowles Commission

The Cowles Commission benefited from (and in turn promoted) the work of Nobel laureates Tjalling Koopmans, Lawrence Klein, James Tobin, Franco Modigliani, Trygve Haavelmo, Harry Markowitz, James Heckman, Joseph Stiglitz, Paul Krugman, Christopher Sims and Robert Shiller, to name but a few. The approach of the Commission (in its early years at least) consisted mainly of macro-econometric models, that is, of a set of estimated behavioral equations based on economic theory under an accounting framework[54]. One of the purposes of these works was to provide insights of economic policy based on theoretical reasoning and actual numbers. This was possible thanks to the "national accounting revolution" going on since the early 1930s, promoted by other important economists such as, for instance, Richard Stone (see his Nobel lecture in Stone 1986) and Michal Kalecki (who from 1946 to 1954 worked at the United Nations).

Unfortunately these models were subject to several criticisms, some of which were proper of the technical and/or theoretical (statistics- or economics-wise speaking) constraints of their time, although often these problems would be acknowledged by the authors themselves. For example, when discussing the treatment of prices in one of his models, Klein 1947 notes that "[t]he most glaring deficiency is in equations to determine the various price levels. To a certain extent, this deficiency is a result of the fact that *there are not sufficiently detailed data available to construct*" (p. 131, italics added).

Moreover, these works were also criticized on the economic front. Again, taking the example of Klein's 1947 article, the author mentions that "[m]odels like those of this paper have often been criticized for including only the demand side of the national market to the neglect of the supply side (...) however, the models have not been criticized for

[54]See, for instance, Koopmans 1945, Klein 1947 and Haavelmo 1947. These articles are, in our opinion, representative of the work done during in the early years of the Commission.

leaving the supply of labor out of account. The critics had the supply of commodities in mind rather than the supply of labor" (ibid., p. 136-137).

Another deficiency of Klein's models is again highlighted by the author himself. In the concluding part of his article, he begins with a powerful message which critics seem to have ignored[55]. Again, his words are worth quoting in full: "Those engaged in the construction of econometric models know only too well the limitations on these models" (ibid., p. 138). A few lines below, he goes on to touch upon an improvement which has been made (relatively recently) thanks to the superiority of today's data gathering techniques. "We can get more data and better data, both of which give additional information and help to establish the parameters of the system with a greater degree of accuracy. For example, *if we could get good quarterly observations for all series used in this paper* (...) we should have more information from which to estimate the parameters of the system" (ibid., p.138).

As time went by, the use of this type of models became the mainstream of their day and, unfortunately, (as it is customary of most 'fashions') in some cases this would even come at the expense of a lack of understanding from some modelers. Some apparently *major* methodological problems, judging from the point of view of the impact of the critique, came from Robert Lucas 1976. Taking as an example a model by Tinbergen from 1952 in a book entitled "On the Theory of Economic Policy", Lucas argues that "these models can, in principle provide *no* useful information as to the actual consequences of alternative economic policies" (p. 105, emphasis in the original). This critique is too well known nowadays, not only for its aggressive attack of large-scale models[56], but also because its arguments were useful in dethroning Keynesianism (the mainstream of the time) in a matter of a few years, in part thanks to the failure of Keynesian-inspired macro-econometric models to accurately predict the rise in inflation, and the relative success of the critics (monetarists) in providing answers to the problems of their time.

The incredible restrictions critique and its misuses

In 1980 Christopher Sims put forth his 'incredible identifying restrictions' critique on large-scale models (Sims 1980). By way of example of this harsh critique, the author mentions that "when we estimate a complete system of demand equations, in which each

[55]Indeed, this is one of the reasons why we chose the quotation from Sims at the beginning.

[56]Ironically, a few lines below from where the previous quotation was extracted it can be read "I hope I can succeed in disassociating the criticism which follows from any denial of the very important advances in forecasting ability recorded by the econometric models, and on the promise they offer for advancement of comparable importance in the future" (Lucas 1976, p. 105).

quantity appears only once, on the left-hand side of one equation in the system, and all prices appear on the right of each equation, is no more than one of many possible normalizations for a system of equations describing demand behavior" (Sims 1980, p. 2). Instead of suggesting improvements in the same line of research, the author proposed the use of "unrestricted reduced form models treating all variables as endogenous" (ibid., p. 15), thus paving the way for what Spanos and McGuirk 2006 (p. 2.) called the *unit root revolution* initiated a year before by Dickey and Fuller 1979 and culminating in cointegration (Engle and Granger 1987). We come back to this debate in subsection 2.2.3.

Paradoxically, the defense of large-scale models would come from Sims himself, first in his 1980 article "Macroeconomics and Reality" (where the incredible restrictions critique appeared), then in two other important papers: "Policy Analysis with Econometric Models" (Sims 1982) and "Macroeconomics and Methodology" (Sims 1996). In "Macroeconomics and Reality", Sims' defense of structural models is dwarfed by his own arguments against it. His words in "Policy Analysis" are the following: "I have argued elsewhere that the existing large-scale models embody identifying restrictions that are not in fact believed, even as approximations, by most economists. I also argued, though, that *they represent a valuable summary of a great deal of historical experience and that forecasts from them are useful*" (Sims 1982, p. 122-123, our italics).

In "Macroeconomics and Methodology" Sims addresses key issues in the history of macroeconomics, in which he attacks Lucas' 1976 arguments by saying "[n]othing in the explicit logic of that critique suggests that probabilistic inference is in itself invalid or problematic" (Sims 1996, p. 109). Interestingly, a few pages before Sims mentions that "[b]ecause *noneconomists often favor one policy or another based on their own interests* (...) *there is an incentive for economists to become contending advocates of theories*" (ibid., p. 107, italics added). This is indeed sad but true.

Taking stock of the discussion up to here, we can see that large-scale models were popular from the 1930s to the mid-1970s, and fell from grace since then. At this point, a couple of things are worth mentioning. First, the time span during which structural models were predominantly used by policymakers (1930s-1970s) almost perfectly coincides with the dawn and temporary dusk of Keynesian-inspired policies and the beginning (in 1945) and end of the Bretton Woods system. The replacement of the latter by what came to be known as the Washington consensus was coupled with the replacement of Keynesianism by Monetarism on the economic policy front and of structural models by *VAR*s and/or *DSGE*s on the empirical front. It may seem as though a new global financial order (the Washington Consensus) came along with a new set of policies (Monetarism) and a new tool for analysis (*VAR*s and *DSGE*s).

Time, models and ideology

To put the first issue in simpler terms, Table 2.1 summarizes what we consider to be the corresponding sequence of events. The second row of the table corresponds to the period known as Keynesianism which, broadly speaking, coincides with the period during which large-scale (or structural) econometric models were used (which, as we saw, began at around 1932). **Timing is certainly not perfect**. We are well aware of the fact that the Bretton Woods system does not span from the 1930s to 1979, but was the outcome of the agreement reached after WWII. However, we decided to associate this period to the Bretton Woods system as a pedagogical oversimplification which we hope will not disturb the reader.

Period	Global Fin. System	Policy	Empirical Model
1930s-1979	*Bretton Woods**	*Keynesianism*	*Structural*
1980-2007	*Washington Consensus*	*Monetarism*	*DSGE*
2008-present	*Washington Consensus*	*Keynesianism*	*?*

Table 2.1 – Ideology by ages. * The Bretton Woods system actually goes from 1945 to 1971.

Keynesianism (in the form it is known today) may have already existed before the publication of the *General Theory*, date after which we presume the set of policies proposed by Keynes were in vogue[57]. However, we decided to treat Keynesianism as having begun after the publication of the *General Theory*. This first sub-period is particular in that the New Deal was in force since 1933, in which case one may have the impression that Keynesianism and New Deal-ism were two separate and different movements. Strictly speaking they were independent, but since both belong to a time when a change in the then existing mindset took place, it is commonplace to associate both as being one and the same thing. At this point at least, we do not feel confident enough so as to contradict this possible misconception[58].

The third row from the table is in stark contrast with the second one. The replacement of the Bretton Woods system with the Washington Consensus was described in the

[57] If we were to be more meticulous with dates, we would then have to say that this influential movement would have to wait until the beginning of the war, given that Roosevelt pursued fiscal consolidation (not considered very Keynesian, at least not back then) in 1937.

[58] For a more complete discussion of this issue see Marcuzzo 2010.

previous chapter. What was actually not discussed in that part was the replacement of Keynesianism by what came to be known as Monetarism promoted by, among others, Milton Friedman (in his fierce attacks on Keynes[59]), Robert Lucas (with his 1976 critique), Arthur Burns (whom we consider the intellectual leader of this movement), Paul Volcker (the person who 'pushed the button') as well as several other academic economists, policymakers and opinion leaders of the time advocating the same ideas. Equipped with the promise of an improved brave new world and with what Sims called the "incentive for economists to become contending advocates of theories", the mindset change (from Keynesian to Monetarist) took place at an incredible speed. Unfortunately, this mindset refuses to change again, at a time when it is all the more necessary for this *ideological reshuffle* to occur (which in any case, we believe should turn back to its previous Keynesian status).

While this was happening, structural Keynesian/Hicksian-inspired models were being gradually replaced by *DSGE*s. This favorable trend for the latter type of models gained much strength particularly during the second half of the 1990s, at a time when the efforts of the advocates of liberalism were finally being materialized in a booming capitalist society that was in full swing. Keynesianism was definitely a thing of the past; inflation had been victoriously tamed, stock markets around the world were soaring, the unemployment rate was reduced, growth resumed... until most of these trends were reverted (i.e. during the 2000-2001 crisis). Waves, no matter how high they can get, eventually die out. Even more, if the tide does not come with it, a tsunami is all the more likely and the consequences are of course catastrophic. Two major financial tsunamis (2000-2001 and 2007-2008) have already hit the developed and developing world, and there are but a few signs of the tide, which in any case has come only thanks to Keynesian policies back in the agenda, although rather shyly.

The apparent success of *DSGE*s was due to several things[60]. Despite the fact that oftentimes these models took for granted what they ought to explain explicitly, they had the strength that they were acceptable by soft-core, non- and anti-Keynesians altogether. However, what was apparently a virtue became a drawback that is hard to overcome past the most severe crisis since the period 1929-1933. To put it in terms of someone who knows these models better; "[a]fter the onset of the crisis, DSGE models were criticized for not modeling a financial sector and hence missing all the non-linear realities of boom-and-bust cycles" (Dullien 2012, p. 18). This is what leads us to place a question mark on

[59]See for instance https://www.youtube.com/watch?v=7yDVvsP2dmk. Ironically, the channel from which this video was extracted is called "Common Sense Capitalism".

[60]For a thorough discussion of the success or otherwise of *DSGE*s see Juselius and Franchi 2007.

the fourth column of the last row in the table. With the falling from grace of *DSGE*s as a workhorse (which are somehow still used), it is perhaps time that an improved version of Keynesian large-scale econometric models replaces the former[61].

Now, before concluding this subsection, we want to raise two more issues. The first has to do with the fact that, as we saw above, it was the same person, in different periods and circumstances, who promoted first the *disuse* and then the *use* of large-scale models: Christopher Sims. Not that Sims has the last word on what should or should not be done, but we believe that he is a key figure in the debate given his proven expertise in both econometrics and macroeconomics. After all, he is a Nobel laureate and proponent of data-meaningful models.

We ignore Sims' reasons for contradicting widespread (often mistaken) beliefs or dogmas. However, what we are sure of is that his arguments have a strong influence in academic circles and among policymakers, perhaps even more today than in, say, 1980 when he published the article containing his 'incredible restrictions' critique. In any case, the point here is that, despite apparent argumentative inconsistencies, Sims' defense of meaningful and correctly identified large-scale models[62] (which nothing impedes these to be coupled with reduced form models), provides theoretical support to our chosen econometric methodology. Moreover, it is our belief that the empirical model that *should* be put back in the computers of central bankers are well-defined Keynesian structural models, an example of which is shown in the following chapters[63].

2.2.2 Stock-flow consistent modeling

As mentioned several times now, the empirical part of our work consists of a stock-flow model using historical data for France. The purpose of this subsection is to explain what this methodology is about. But before getting there, it is worth taking a look back at the pioneer works of this kind. Our purpose in doing so is twofold. On the one hand this will be complementary to the previous discussion on structural modeling, as well as informative in its own. On the other hand, it will provide the reader (or so we hope) with

[61]Somehow provocatively, Sims defended *DSGE*s at a 2010 INET conference. See the following link: https://www.youtube.com/watch?v=TH6QexRT0Fg. Ironically, it was Sims himself who launched an aggressive attack on these models in Sims 1996. Now, as much as we do not encourage the use of these models, his arguments are worth listening and reading. Again, this discussion is closely linked to the quotation (from Sims himself) at the beginning of the present chapter.

[62]Pages 123-137 of his 1982 article "Policy Analysis with Econometric Models" deals largely with the issue of identification.

[63]By this we do not imply that our model is unique or even original; quite the opposite! See the models OPALE (Bardaji, Loubens, and Partouche 2010) and MESANGE (Cabannes et al. 2012) for France.

the core elements needed to understand how this methodology works, as well as some of its technical details simplified at a maximum. In order to do this, we use up considerable space in describing the first stock-flow model published in the late 1960s.

The 'pitfalls' approach

To our knowledge, one of the first serious attempts to empirically deal with *financial phenomena* on a macroeconomic perspective, combining stocks and flows rather than dealing with one set of variables at the time, was that of Brainard and Tobin in their 1968 article "Pitfalls in Financial Model Building", then extended by the authors themselves and other economists, who for the most part were from the Yale school. Interestingly, the opening paragraph of that path-breaking article contains the following words:

> Most monetary economists agree that the financial system is a complex of interrelated markets for assets and debts. The prices and interest rates determined in these markets and the quantities to which they refer both influence and are influenced by the "real economy", the complex of markets for currently produced goods and services. *These interdependences are easy to acknowledge in principle but difficult to honor in practice, either in theoretical analysis or in empirical investigation*. All of us seek and use simplifications to overcome the frustrating sterility of the cliché that everything depends on everything else (W. C. Brainard and Tobin 1968, p. 99, italics added).

In that paper (which is characteristic of the approach in general) the authors set up a model for a fictitious economy that respects an accounting framework at two levels (stocks and flows) and contains six assets (currency and bank reserves, Treasury securities, private loans, demand deposits, time deposits and equities) that are held/issued by three sectors (the government, commercial banks and the public). In contrast to this, most existing large-scale models (which were estimated rather than simulated) were carried out in terms of transactions (the "real sector") and flows (the financial sector), and remained silent on whatever happened to stocks[64].

It must be noted that Brainard and Tobin did not estimate the parameters of their behavioral equations, nor did they base the value of the shock parameters on any "true"

[64] This does not mean at all that modelers ignored the existence of stocks. See for instance Klein's critique of Fellner and Somers 1949 model, which appeared in an article published in Econometrica entitled "Stock and flow analysis in economics" (Klein 1950).

values. Instead, they recognized that "[t]he numerical values (...) embody some preconceptions of the authors" (ibid., p. 109). One of the main difficulties the authors faced back then was unavailability of data, which was particularly lacking on the financial side, at least in a consolidated manner[65]. A second difficulty was that, in order to build an empirical model of the size set forth in that article, the authors would have had to either 'assume away' some of the series that make up the full accounting framework (which would be hardly defensible), or else they would have to make the number of elements in the theoretical model match the actual number of elements in the books.

Screen-time and other technicalities

It is worth stopping for a moment here and point out that this second difficulty alone was the object of several hours of discussion and screen-time spent on spreadsheets and EViews. Indeed, this task alone is colossal and should not be overlooked in further research. Although simplifications were made on the accounting structure of our model, we cannot but stress the difficulty this involves. This is so because, as anyone familiar with the work of Godley and Lavoie 2007 knows, any movement in an item of the system implies four corresponding changes across lines and rows. As a consequence, if we wish to, say, lump the stock of reserves and deposits on the liability side of banks into a single line (as we did), this implies not only augmenting the size of the corresponding item (say, deposits), it would also imply (1) increasing the assets of one of the holding counterparts (for instance, households), (2) reducing the outstanding wealth of households *pro tanto* (in which case an *ad hoc* item has to be chosen), (3) increasing the outstanding wealth of banks by the same amount as the reduction in households' wealth, and finally (4) carry out the exact same procedure for the other matrices other than stocks (that is, flows, revaluation effects and other changes in volume).

Having pointed out this technical detail in a somehow apologetic way, let us now proceed with our review. As we were saying, Brainard and Tobin did not attempt at building a realistic model. On this point they say "[w]e have tried to formulate a model we believe in qualitatively, though of course the numerical values of the parameters are arbitrary" (W. C. Brainard and Tobin 1968, p. 99). So, if the authors built a 'simulation toy', what was the purpose of their doing so? The answer was: unit impulses. That is, "[t]he system is displaced from equilibrium by a once-for-all increase of 10 per cent in a single exogenous variable, holding all others at their initial equilibrium values, and the paths of the endogenous variables to the new equilibrium are traced" (ibid., 113).

[65]On this point, see the fifth part (*Statistical Problems*) of Stone's Nobel lecture.

Another unrealistic feature, also due to technical limitations, is that Brainard and Tobin's "pitfalls" model regards income account variables as exogenous for balance sheet behavior (Fair 1984, chapter 3). The model presented by Tobin 1982 in his Nobel lecture overcomes this limitation. In that model, both income and financial accounts are accounted for endogenously and, despite Ray Fair's criticism on the awkwardness of the interpretation of models following this approach from a utility- and profit-maximization perspective[66], we believe these theoretical constructs are not at all necessary for an empirical model to be based on solid economic theory. As will be seen, our system of equations is devoid of maximizing behavior from the institutional sectors included.

Unfortunately, this approach did not make its way into mainstream economics because, as we saw, it lacked micro foundations which explained the mechanism by which agents allocated their financial resources (something *DSGE*s do). When asked about the abandonment of *SFC* models, Tobin's reply was "Well, people would rather do the other thing [computable, numerical or applied general equilibrium models] because it's easier" (Dimand 2003, p. 19).

Stock-flow modeling à la Godley

A couple of decades later, a group of researchers from the Post Keynesian school took over *SFC* models[67] and, thanks to the ease of access to large(r)-scale reliable computational techniques rapidly evolving, gave them further solidity and more realism. Instead of a general equilibrium taste, these authors gave it a Keynesian/Minskyan flavor that aimed at explaining endogenously created disequilibrium without optimizing behavior from economic agents which, under this approach, is rather redundant and difficult to deal with in a realistic way. Lavoie and Godley 2001 and Godley and Lavoie 2007 account for the most influential works on this type of analyses[68]. On the empirical front, the large-scale model built by the Levy Institute of Bard College accounts for the most representative real-data example of these type of models of the Post Keynesian school.

As said above, stock-flow consistent models consist of systems of simultaneous equations which combine stocks (of deposits, securities, debts, equities and non-financial assets) with flows (liquid assets, mainly) and transactions. Commonly, though not exclusively, these models use experimental (simulated) data. A particular feature of this models

[66] "From the point of view of a utility-maximizing model, Tobin's model is awkward (...) [in his] approach time is spent searching for the estimated equation that best explains *A* [end-of-period assets] (...), similar considerations apply to models of firm behavior" (Fair 1984, p. 42-43).

[67] See, for instance, Godley and Cripps 1983.

[68] For a thorough review of Godley's contributions to macroeconomics and modeling, see Taylor 2008.

is that, like Cowles-type models, they are based on a realistic accounting framework. Considering the fact that all form of wealth[69] in an economy comes from somewhere and goes somewhere, these models have an advantage above other techniques (for instance, reduced form models): they are capable of describing the mechanism underlying a shock, either coming from the financial or the real side of the economy, and its effect on macroeconomic aggregates. They are especially well suited to study a finance-led growth regime, which is the object of the model presented in the following chapter.

Now, focusing on the discussion of the preliminary simulation exercise shown in the next chapter, it is important to note that in Minsky 1986 model, the surge in investment in bull phase of the business cycle is allowed by an increase in external financing (debt only in the model), which in turn explains the endogenous fragility of firms, i.e. the increase in default risk. In the ascending phase of a cycle, the reduction of investors' liquidity preference on financial markets, that is to say, the decrease of the risk perceived by the investors, allows the increase of the debt share in firms' balance sheets. Firms thus take advantage of this situation to increase their financial leverage. But this process reaches an end because of an endogenous reversal of the liquidity preference which corresponds to a reversal of collective opinion in financial markets. As a consequence, credit risk is revised upward, which generates the fall of investment. When investors in financial markets begin to have doubts about the value of collateral (the sum of retained earnings in the model) liquidity preference starts rising and this generates a fall of the prices on financial markets. These doubts generate a revaluation of credit risk. Investors run towards liquidity, which thus leads firms to run strong insolvency risks since the refinancing of debt becomes extremely difficult.

The *SFC* approach is well suited to analyze these (and other) questions. Thanks to a complete description of the balance sheets of each agent and of the associated flow-of-funds, the main components of Keynesian-inspired macroeconomic models can be incorporated in a consistent way: relations between capital accumulation and income distribution, wealth effects (especially for rentiers), valuation effects (due to capital gains or losses), and a debt-led growth regime with a Minskyan perspective.

Lavoie and Godley 2001, Godley and Lavoie 2007, Taylor 2004b, Taylor 2010, Dos Santos and Zezza 2008 have proposed *SFC* models including most of these factors. Although close, these models differ in some points. Godley-Lavoie use computer simulations to study the nature of growth regimes, whereas Taylor and Dos Santos-Zezza study analytically the dynamics of their models. Beyond this methodological divergence, the models

[69]This includes capital gains and valuation effects.

differ in the way they deal with debt and equity issuing. These are actually two alternative closures of the model; to represent how firms finance capital accumulation, which we consider in the simulations of the next chapter, and that were mentioned in the discussion of the capital structure of firms in the previous one.

Godley-Lavoie, Dos Santos-Zezza, as well as Taylor in some of his models, retain an equation describing equities issued. Consequently, credit demand by firms is simply determined as a residual of the firms' financing account. In Taylor 2010 asset prices display positive feedback but must eventually be reversed by other forces. The growth rate of asset prices depends positively on the return to equity and the valuation ratio[70], and negatively on the dividends-capital stock ratio. The growth rate of the amount of equities depends positively on the accumulation rate and the share of newly issued equities on the capital stock, and negatively on the valuation ratio. Growth of the capital stock can stabilize the valuation ratio which negatively affects equities, but positively their price. Alternatively, Taylor 2004b, in two other versions of his models, retains an explicit firms' credit demand equation with no issued equities or with equities determined as a residual of the firms' budget constraint. These questions are not discussed in detail in the *SFC* literature and may not be central for the models' properties. However, this trade-off between debt, equity and retained profits is important in the growth regime which prevailed since the 1990s. Under this perspective, a simplified *SFC* framework is outlined in the next chapter with two versions of the model corresponding to the main closures previously discussed, one with an indebtedness norm (or loan demand), the other with an own funds norm (or equities issued).

Without attempting to provide a full list of all other relevant stock-flow models, we content ourselves in mentioning a few of these. Early models proposed by the Yale group include Tobin 1969, Tobin and W. Brainard 1977, Tobin and Macedo 1979, Backus et al. 1980, Tobin's Nobel lecture (Tobin 1982), W. C. Brainard and Tobin 1992, and several others.

A second generation of models include Godley 1999a, Godley 1999b and Godley 2004, which pave the way for the construction of broader *SFC* models and highlights important paths towards which future *SFC*ers could improve their research. Treeck 2009 proposes a synthetic model of 'financialisation'. Shedding light on open economy issues, Taylor 2004a proposes an alternative Mundell-Flemming type model, and Lavoie and Daigle 2011 incorporate exchange rate expectations in a two-country simulated model. Duwicquet and Mazier 2011 analyze the implications of a monetary union.

[70]Value of equities divided by the capital stock.

The system of equations developed in chapter 4 is inspired by some parts of the works mentioned in this subsection, and in turn proposes new lines of research either applied in this work, or to be further developed.

2.2.3 Statistical methodology and other curiosities

As seen in subsection 2.2.1, large-scale macro-econometric models were criticized[71] (among other things) on the basis of their 'incredible restrictions'. These restrictions deemed unlikely the simultaneous determination between dependent and explanatory variables. As a consequence, Sims proposed reduced form systems of equations, which should even be a-theoretical.

Macro-econometric modeling issues

The way macro-econometric modeling is carried out has no doubt evolved. In particular, according to Adrian Pagan 1999 (p. 17): "the natural [Cowles Commission] strategy was to extend univariate approaches to multivariate series, and this meant a vector of AR [autoregressive] processes (...). Later, vector ARMA [autoregressive moving average] processes became popular in time series analysis, although less so in macroeconomics where (...) VARs have been the dominant way of summarizing the multivariate dependence seen within the data".

Seen under this light, our model is an extension of the Cowles tradition. Instead of univariate models we use simultaneous multivariate techniques, attempting in this way to avoid making 'incredible restrictions'. The most standard type of models used for long run estimations are of the *VAR* family. However, for a procedure to carry out short run dynamics there is no clear consensus. In fact "[d]ifferent approaches to the identification of the short-run dynamics in macroeconometric models have been attempted, but so far no consensus has emerged. In contrast, identification of the long-run relationships and the extent to which the economy deviates from its long-run equilibrium is less controversial" (Garrat et al. 2003, p. 413).

Before delving into more technical details, let us first say a few words about the treatment of the long-run and the short-run. Our preferred procedure for the former,

[71]Given that the Lucas critique relied more on arguments concerning expectations rather than on econometric analysis proper, we do not deal with it in this section. Moreover, as Sims pointed out "The public's expectations depend on the mechanism they use to learn about policy formation, but in the absence of direct observation of the psychology and politics of policymaking, their price expectations will be based only on the history of prices and unemployment" (Sims 1982, p. 117).

in line with the standard *VAR*-inspired literature, is done through unrestricted *VAR*s, most commonly known as Vector Error Correction Models (*VECM*s). We chose this methodology for two main reasons. First, as it does not make any theoretical restrictions (which may seem arbitrary), it is not subject to the Sims critique. Second, once the corresponding long-run equations are estimated, the next almost natural step is to estimate from these Error Correction Models (*ECM*s), which are in turn interpreted as short-run dynamics.

The structural-type modeling exercise presented here allows us to analyze, for instance, the link between interest rates and investment, credit demand from firms and households, as well as how these interact with prices. The interconnection between credit demand, housing demand and consumption for the US and other countries has been analyzed by Duca, Muellbauer, and Murphy 2013 through what they call a LIVES (Latent Interactive Variable Equation System) approach, which attempts at providing such link by means of a set of estimated equations without embedding them in a full structural model. Perhaps this article represents a good summary of the authors' (and other co-authors') research concerning the housing market[72]. The title of their article[73] as well as some passages from it suggest that empirical econom(etr)ic models have failed to take into account flow-of-funds data, which in turn provide a clear link between stocks, flows and revaluation effects. This reinforces our claim, also made by Vanoli 2002 (p. 383), that stocks have received unequal attention with respect to flows in the recent past. Moreover, accounting consistency is more often the exception rather than the rule[74].

Therefore, our approach is different to (though somehow in line with) that of Duca and Muellbauer. While their approach relies on latent variables in order to study the link between households' current and capital accounts, ours does the same but by means of a set of estimations, accounting identities and ratios, which are embedded in a water-tight accounting framework *à la* Godley-Lavoie.

The way we carry out our estimation procedure, although standard (see Brillet 2010),

[72]It must be noted that their approach also relies on that of Case, Quigley, and Shiller 2003 and Case, Quigley, and Shiller 2012. For Duca and Muellbauer use the same consumption function.

[73]"Tobin LIVES: Integrating Evolving Credit Market Architecture into Flow of Funds Based Macro-Models".

[74]There are, of course, compelling arguments in favor of using small size models. For instance, no less an economist than Solow (humbly) mentions "I tend to resist the suggestion that I ought now to propose some particular, better orientation for macroeconomics, because I know that I have my own prejudices. My general preference is for small, transparent, tailored models, often partial equilibrium, usually aimed at understanding some little piece of the (macro-)economic mechanism" (Solow 2008, p. 246). However, he immediately goes on to say "I would also be for broadening the kinds of data that are eligible for use and estimation and testing" (ibid.).

is far from being the only possible way. For instance, Fair 2013 estimates long-run equations using the two-stage least squares (2SLS) method in his model for the United States (see p. 2). Garrat et al. 2003 propose a methodology which embeds some key accounting identities into a small long-run macro-econometric model for the United Kingdom. Our model is different from these two in that it allows for a *general* (as compared to a *particular*) method for estimating systems of simultaneous equations, and that it incorporates *all*[75] (as compared to *some*) identities available in the flow-of-funds and the national accounts[76]. Another key difference is that, as mentioned several times now, our model does not contain maximizing behavior from consumers or firms.

Modern time series analysis as a complementary (not competing) tool and other details

*VECM*s allow for inference of cointegration, as in Johansen 1991, and causality in the sense of Granger 1969. The virtues of this methodology are well-known among economists nowadays. Its limitations are, however, less well-known. Without pretending to review the whole literature on this interesting subject, the interested reader is referred to Juselius 2006 for a thorough review of the approach, and to Wickers 1996 and Spanos and McGuirk 2006 for some critical comments on some aspects of the methodology.

Depending on the perspective of the modeler (and sometimes even more importantly, that of the reader) structural models may lack realism and feasibility. The reduced-form alternative (alone) overcomes the latter, but not the former, since it does not explain (among other things) inter- or intra-sectoral imbalances, given its common lack of explicit accounting identities. A statistical tool, no matter how accurate and mathematically solid it may be, may not predict, for instance, financial crashes if it does not take into account (1) assets *and* liabilities, (2) inter-sectoral transactions, as well as the fact that (3) wealth is generated, not given (the Lavoisier principle in economics). The stock-flow methodology provides most of this on its own. However, a majority of the models of this type are still simulation exercises, which does not allow them (yet) to replace *DSGE*s as workhorse. Perhaps the reason why Sims defends the latter is that, despite their lack of realism, they still represent a better alternative because of their *completeness*, in the sense that they are

[75] Even though we simplified our accounts in order to make it less unpalatable, our system contains *all* data and corresponding identities available in the French accounts.

[76] In fact, Garrat et al treat stocks and flows (of government debt, high-powered money and bonds) explicitly. However, their model is silent on any possible revaluation effects or even on the category 'other changes in volume', which are key in flow-of-funds equilibrium and which we model explicitly.

more sophisticated[77].

Let us now dedicate a few words (if only briefly) to some other technical details. Given that some of the series we used in the model were not available on a quarterly basis, we made use of the technique proposed by Denton 1971 to bring annual figures to quarters. In order to avoid confusion on the treatment of "quarterlized" data (mostly stocks), the use of this type of data treated in this way is explicitly considered throughout the model. This technique has also evolved since it first saw the light. However, given the sheer size of the technical details of the model, we were unable to improve upon this in the treatment of our data.

Finally, in order to extend all series used beyond their last date available, they were subject to an exponential smoothing method. This technique was proposed by Hyndman et al. 2002, in turn based on the Holt-Winters method and is available in EViews 8 (the software we used at all steps). This method takes into account three out of four components of time series (trend, seasonality and cycle) under the possibility that the corresponding components are either additive or multiplicative. Again, due to the size of the model (which was by the way worked out by a single person), we are forced to leave this issue for further research.

[77]As mentioned above, sophistication in itself may not be an advantage, but may even represent a drawback. Indeed, if a model reaches such a high degree of sophistication that it becomes incomprehensible, then other less sophisticated alternatives may become appealing for the sole reason that they are much simpler. Bearing this in mind, we tried to make our exposition as clear as possible (even if at times this proves difficult).

Chapter 3

Simulation of a finance-led regime

... when I wrote that passage, God and I knew what it meant.
It is possible that God knows it still;
but as for me, I have totally forgotten
Johann Paul Friedrich Richter.

3.1 Introduction

Although we do remember the passages we wrote, and not only God as the quote atop says, we decided to begin this chapter with these words from the eighteenth century German writer J. P. F. Richter because there is something worth highlighting as we elaborate on our simulation of a finance-led regime. Curiously, this phrase has been around in different forms and in different contexts since it was first written (probably it was also a restatement made by *Jean Paul*, Richter's most famous pseudonym). One of the most recent contexts in which this phrase made it through to modern day culture was in programming, and the actual quote is more like "When I wrote this, only God and I understood what I was doing. Now, God only knows" (preceded by anti-slashes so that it looks even more geeky). To put it in simple terms, when a programmer writes a code, the latter may become so large that the former may run the risk of forgetting some parts of it, or even the whole thing.

As perhaps only computer scientists, [God] and other *aficionados* (like ourselves) know, developing a computer code can sometimes make you feel like Mary Shelley's Victor Frankenstein. Not that you literally resuscitate a corpse that turns into a monster and hunts you later on until it kills everyone you love or anything like that. Rather, what we want to stress here is that, when you design a *tool* for analysis (i.e. a code), you are never fully aware of where the difficulties of the design itself will lead you. Since computer programming is *not* the goal, but rather a very useful instrument, you might not want to spend too much time in it so that you can focus on the goal itself (in our case, an empirical *SFC* model). The sad truth is, you do.

Computer programming is a discipline in itself, just like economics and econometrics in their own right. For this reason alone, countless hours were spent in figuring out certain technical details, whose result can hardly be seen by the naked eye. It would be uninteresting or, even worse, useless to describe in detail every single step in the making of the system of equations, the estimations, the techniques used to handle the data, the extraction and analysis of the data itself, the methodological discussions surrounding all this and many other "little things". All these steps are usually performed by teams where every member's contribution lessens (at least in theory) the workload of her/his peers. Nonetheless, our team consisted of only two persons, so that some weaknesses (hopefully not many) in either our arguments or model are more than likely to appear throughout these pages, although this should be comprehensible given the number of topics our work touches upon (the theory and the model separately are each worth a thesis, let us just leave it at that). One of our hopes is that, in the future, we will be able to rely on a team (clearly, made up of more than two individuals) in order to improve on this colossal work, either for other economies and/or for the same economy but with more realistic features.

As we mentioned in the previous chapters, the model and discussion presented in this part were published in an article in *Revue de la Régulation* last year (Reyes and Mazier 2014), so that in presenting it here we will try to be loyal to our purposes when we first worked on it. Nevertheless, it must be noted that, since we tried to link this model for a fictitious finance-led economy to the discussion of the functional distribution of income, we applied, for instance, one-time shocks to key distributive variables (wages) and saw what happened with national income and other important variables under two different models.

Last note before (finally) getting to the details of the model[1], we present the article almost in its entirety, except for the literature review, mainly because we have already described extensively our theoretical and empirical references in the previous chapter. Therefore, we omit this part, but we decided to keep the section "stylized facts" intact, given that in it we touch upon some topics we did not go over in chapter 1. So, even if

[1] By the way, the code for this simulation exercise is "simple", especially when compared to the one used in the next three chapters (i.e. the 'monster').

the discussion may appear to be redundant, in our opinion, it is not the case because we focus on different aspects. Some minor corrections were also necessary to make this work an integral part of the rest of the chapters.

3.1.1 Abstract and note

The financialized growth rate that settled in most developed economies in the nineties is characterized by the quest for higher shareholders' profitability, increased financial accumulation at the expense of productive accumulation and the use of leverage effects. Stock-flow consistent models *à la* Godley-Lavoie are well suited to analyze this growth regime. We retain two types of closures for non financial companies, either an indebtedness norm or an own funds norm. The paper studies the dynamics of these two models with the aid of simulations and supply or demand shocks, or stemming from the financial sector. Their fitness to take into account financial cycles and over indebtedness typical of financialized growth may thus be analyzed. The model with the indebtedness norm generates short-term financial cycles which appear as the regulation mode of this growth regime with an asset price serving as an adjustment variable. The model with the own funds norm generates a financial bubble with growing indebtedness and no self-stabilizing mechanism.

Note: In order to make the program work[2], it suffices to open the corresponding file using EViews 7 or a more recent version. Once open, the program shows 'dialog boxes' with default values (text or numbers). If the user wishes to change these values, she/he may easily do so (however, this does not guarantee the model will work).

3.2 Financialized growth regime: lessons from Stock Flow Consistent models

Since the 1980s liberal reforms (particularly in the financial and labor markets) have set up a financialized growth regime in most developed countries (Aglietta 1998; Boyer 2000). This financialized growth regime is characterized by the quest of a high return on own funds, large leverage effects and increasing financial accumulation, even at the expense of long term growth and an increasingly unequal distribution of income. These transformations have generated unprecedented macroeconomic instability and, in many

[2]See the following link: http://luisreyesortiz.org/resources/.

cases, weak growth despite the restoration of profits to a high level[3]. In the present paper we try to describe the mechanisms which produce the macroeconomic instability of these growth regimes. This instability seems to be caused by wealth and leverage effects. This is the main reason why we focus on the financing mode and the financial structure of non financial companies (*NFC*s henceforth).

Stock Flow Consistent (*SFC*, henceforth) models, as in Godley and Lavoie 2007, are well suited to represent a financialized growth regime because the wealth and leverage effects are integrated in coherent social accounting matrices where the price of equity, i.e. an index such as the *CAC 40*, may be (as is in the present model) endogenized. In order to characterize financialization, two alternative closures of the *SFC* model are considered with alternative ways in which *NFC*s finance investment: the first with an indebtedness norm, where equities appear as a residual; the second with an own-funds norm where, on the contrary, loans are determined as a residual. The results of simulations in these two configurations describe financial cycles due to leverage and revaluation effects, but with contrasted mechanisms. Our main objective is to compare the nature of these two regimes by carrying out demand or supply shocks as well as shocks on the financial side.

The paper is organized as follows. Section 3.3 describes the stylized facts for France from 1979 to 2011 (the longest available time span given official data at the time of writing). The model is then presented in the following section. We present the results of the model and some scenarios (or shocks, as these are known in the literature) in section 3.5. Lastly, section 3.6 concludes.

3.3 Stylized facts

Liberal reforms implemented in the decade of the eighties, which gained considerable strength during the nineties, have had major consequences in the way economies behave today, both at a national level and world-wide. National economies have suffered a drastic transformation in the capital structure of the non financial sector, largely increasing their dependence on financial instruments which, instead of boosting investment demand, have generated massive stagnation. Macroeconomic policy has played mostly in favor of capital owners' income at the expense of workers' well-being, leading to growing inequality, which has further contributed to the slowdown of economic activity via depressed purchasing power of workers.

[3]This was the case up until 2000, date after which it fell again, as was seen in the preceding chapters and will be seen below.

Indeed, globalization has played an increasingly important role in this process. In the remaining of this paper, however, we will focus on a single fictitious closed economy, leaving the aspects of an open economy for further research[4]. We do this for two main reasons, the first one being theoretical, and the second technical. First, we want to focus on the way *NFC*s are financed, proposing a model which takes into account firms' major liabilities explicitly, with the price of equity determined *within* the model. Second, as a consequence of the first, we prefer to keep this model as simple as possible and focus on open economy issues in the future, once the closed economy model is set up.

Figures 3.1-3.4 are for France which is, in our view, a good example of a typical financialized economy. We do not claim, of course, that whatever has happened in this particular economy has had the same timing or peculiarities elsewhere. We claim instead that the overall trend is about the same in other major advanced economies, such as the U.S. and the U.K., for instance.

Figure 3.1 shows the rate of capital accumulation of *NFC*s along with their aggregate profit rate[5], one of its main determinants following the Kaleckian tradition. The former is shown as (1) Gross Operating Surplus as a ratio of the previous period non financial assets (profit rate in the figure), and as (2) firms' savings divided by lagged non financial assets (self-financing rate) which, despite the obvious scale difference, have moved (unsurprisingly) in unison. The association between the rate of profit and the rate of capital accumulation seems clearly positive, although the rise of the former since the middle of the 1980s did not lead to a permanent recovery of the latter. This also coincides roughly with the beginning of the global Neoliberal strategy. In 1993, capital accumulation grew at a rate of 0.34%, whereas profits remained relatively high (11.4%). By 2000 investment represented 2.8% of the previous year's capital stock, while profits represented 12.2% of it. From then on, and until 2011, the downward trend of both series became more evident. For, as a consequence of the financialized regime implemented along the two previous decades and a series of inadequate economic policies, physical capital accumulation and undistributed profits decreased significantly by 0.32 and 7.6%, respectively.

The rise in capitalists' share of income, in this context, had as a natural counterpart a fall in the share of wage earners. This in turn depressed demand massively, provoking and further enhancing the fall of the already weak capital accumulation rate. That is, the indiscriminate increase in capitalists' wealth at the expense of that of workers proved highly ineffective in boosting investment demand. Austerity measures, the road to – and

[4]Our model presented in the following chapters is an attempt to fill the corresponding gap.

[5]Note that the series in Figure 3.1 are presented corrected for changes in prices. That is, $\Delta K/K_{-1}$ (the accumulation rate), and $UP/p_k K_{-1}$ (the profit rate).

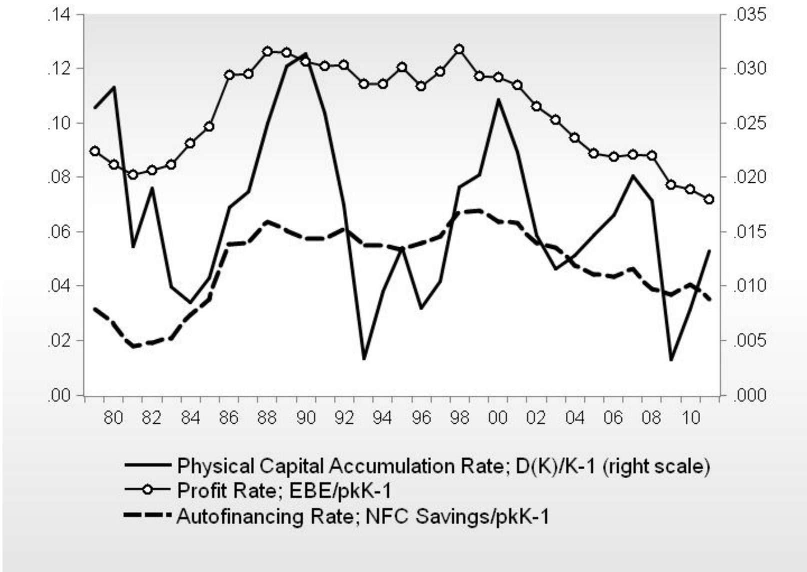

Figure 3.1 – Firms' accumulation and profit rates (as decimals). Source: *INSEE*, authors' calculations.

the introduction of – the euro, as well as policies favoring stability over growth, i.e. the Stability and Growth Pact, also played an important role in this stagnation process.

Our main contention is that this shift in the distribution of income and the fall in the accumulation rate are closely linked to the way firms are financed, either by issuing more equities or by increasing their level of indebtedness[6]. A closer look at the financial sector will reinforce our contention.

Figure 3.2 shows the evolution of the so-called Tobin's Q[7] and the index of the price of equities (base 2000). These two series move almost identically until 2000, and less equally afterwards though in the same sense. The drastic increase in the price of equities made the value of this financial instrument greatly surpass the value of the capital stock during the stock-market boom, until the bubble burst in 1999. The financial crashes of 1987 and 1990 are overly dwarfed by the gigantic magnitude of the dot-com boom and subsequent crash, though it must be mentioned that these were not minor. The price of equity fell to almost half its previous level from 1999 to 2002. A second wave of speculation led the market to value equities at a much higher level in 2007. The fall in the price of equity and of Tobin's Q from that year to the next was of about 34%. Before 2000 the price called

[6]For a review of the consequences of the current recession under a theoretical-historical context dealing with the Modigliani-Miller (Modigliani and Miller 1958) capital-structure-irrelevance theorem see Pasinetti 2012.

[7]The value of equities held, $p_e E$, divided by the value of non financial assets, $p_k K$.

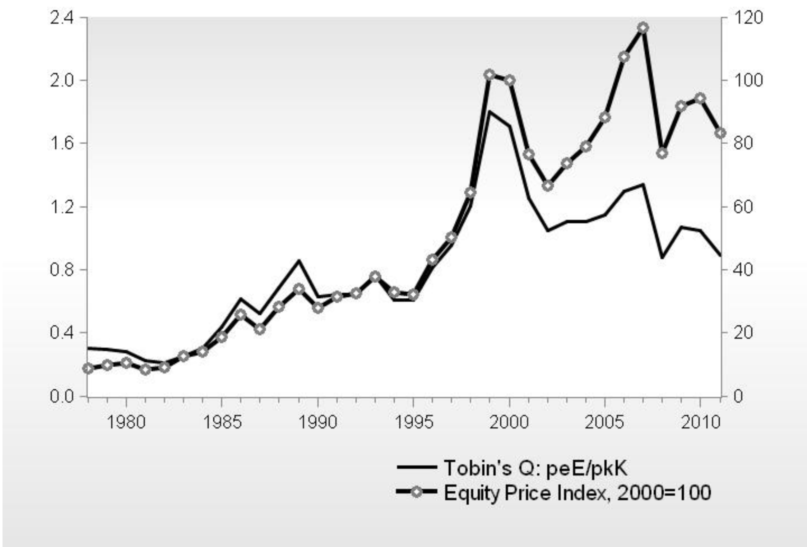

Figure 3.2 – Tobin's Q (price of equities / price of capital) and equity price index (2000 = 100). Source: *INSEE* and *Banque de France*, authors' calculations.

the tune in the equities market, but the issuing of this financial instrument was by this year no longer affordable. Therefore, after that year the retrenchment in equity issuing accounts for the path difference between Q and the equity price index. Thus, the falling rate of capital accumulation and the growing supply of equities over physical capital have come about hand in hand. As a consequence, financial accumulation has gained larger and larger shares in firms' total accumulation, at the expense of physical capital. This fall in the price of equity has perhaps been accompanied by what Richard Koo calls a "Balance sheet recession" (see below).

Indebtedness has played no secondary role in this financialization process. The timing of the evolution of the series presented in Figure 3.3 is closely linked to those of the series described above. Starting in 1986, debt as a ratio of non financial assets began a moderate upward path which lasted until 1992, passing from 0.65 to 0.75, remaining at 0.7 or higher until the arrival of the new millennium, when it began its downward path (from 0.74 in 2001 to 0.61 in 2004). This fall of the debt ratio may be explained as a consequence of the unwillingness of firms to borrow, irrespective of how low the interest rate may be. Koo (2009) explains that, following a bubble burst (i.e. 2000 in France) firms' balance sheets are most likely underwater. Firms may not want banks to know this (because their credit ratings are in jeopardy), and banks may even want to pay a blind eye to the issue (because otherwise they will be exposed as conceding nonperforming loans).

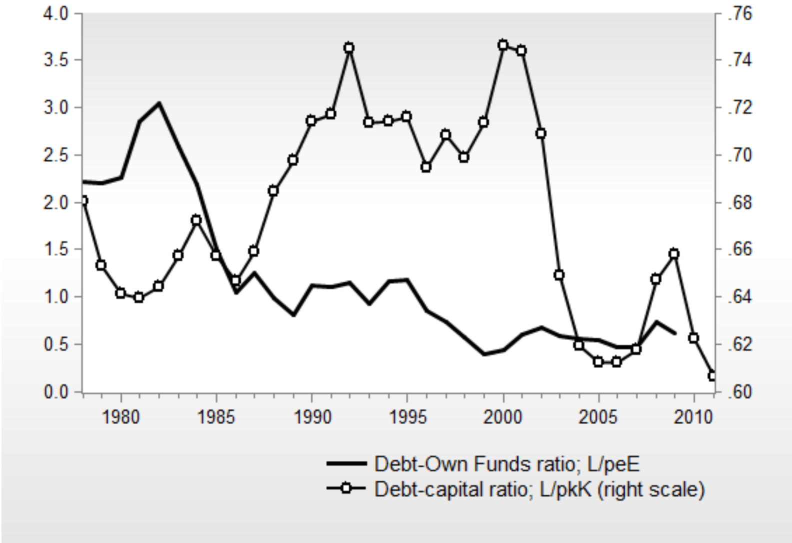

Figure 3.3 – Debt-own funds ratio and debt-non financial assets ratio (decimals). Source: *INSEE* and *Banque de France*, authors' calculations.

This dangerous combination (falling equity prices-falling credit demand-low interest rates-falling profit rates) may generate a deflationary gap, thus a recession of the kind we are experiencing today.

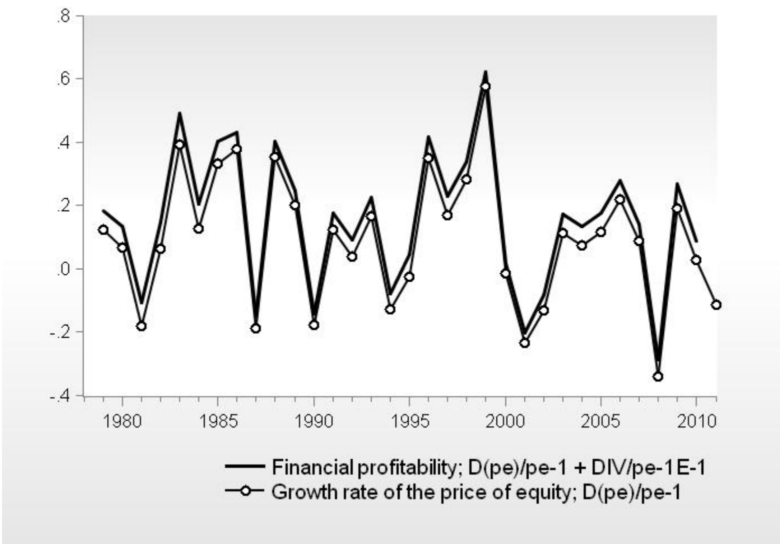

Figure 3.4 – Financial profitability and growth rate of equity price (decimals). Source: *INSEE* and *Banque de France*, authors' calculations.

Figure 3.3 also shows the ratio of debt to own funds, which gives a different picture of firms' indebtedness. By 1982 external financing (debt) was three times as large as own funds, but the debt-own funds ratio subsequently fell and remained at around 1.2 or lower as a consequence of the stock-market boom. Once the bubble burst, the value of equities issued fell, thus showing a slight recovery of the debt-own funds ratio.

The evolution of equity issuing has been mainly guided by that of financial profitability throughout the period under study, leaving a negligible role for dividends (as a share of equities issued the previous period) as determinant of the financial rate of return (see equation 3.18 below). This is seen in Figure 3.4.

As we see from the figures above, the capital structure of firms has suffered significant changes, and along with these came changes in the evolution of demand and income shares to the detriment of wage-earners, even paradoxically yielding lower profit rates. We believe that focusing on the behavior and determinants of firms' liabilities is important in order to understand a financialized regime. We also believe it is important to include them explicitly in models pretending to study financialized regimes. The model we propose is a first attempt to do this.

3.4 The model

We assume there are five sectors in the economy: households, non financial firms (*NFC*s), the government, private banks and a Central Bank. In this first highly simplified model the price level (i.e. the consumer price index) is assumed to be constant across all periods. The price of equities plays a market-clearing role, since it comes from equations describing the supply of equity (by firms) and the demand for it (from firms and households).

The second column of Table 3.1 describes the stock of wealth held by households ($-Vh$)[8], which is made up of cash (Hh), bank deposits (BD), bonds ($pb * B$, where pb is their price) and equities ($pe * Eh$, with pe their price and Eh the amount they hold). In the same vein (third column) firms contract debts ($-L$), hold equities ($pe * Ee$, with Ee the volume) and issue equities ($-pe * E$) in order to finance capital (K). *NFC*s hold an outstanding amount of wealth ($-Ve$).

The government (fourth column) issues the bonds ($-pb * B$) households retain[9] and

[8]The last row of the table is the outstanding value held by each sector, and is shown with a minus sign because the accounting tells us that assets must equal liabilities plus capital, thus as liabilities are presented with a minus sign and the total must be zero, each sector's value is also shown with a minus sign. This 'Total' row (as well as the last column, which plays the same role) is omitted in order to save space.

[9]For France this is unrealistic, given that private banks hold the majority of bonds issued by the government. Nevertheless, we prefer to maintain this assumption (at this stage) in order to make our model comparable to other *SFC* models.

	Households	**Firms**	**Government**	**Banks**	**Central Bank**
Capital		K			
Money	Hh			Hb	$-H$
Deposits	BD			$-BD$	
Loans		$-L$		L	
Bonds	pbB		$-pbB$		
Equities	$peEh$	$peEe$ $-peE$			
Bills			$-BT$	BT	
Refinancing				$-RF$	RF
Net worth	$-Vh$	$-Ve$	$-Vg$	$-Vb$	

Table 3.1 – Simplified Matrix of Stocks for a Closed Economy.

the Treasury bills ($-BT$) held by private banks. Total government debt (Vg) is the sum of the last two terms with a minus sign. Private banks (fifth column) hold a total amount of wealth ($-Vb$) which comes from holding reserves (Hb), making loans to firms ($-L$), lending to the government (BT) and getting refinanced by the Central Bank ($-RF$). To this it must be deducted the deposits they issue for households. The Central Bank (last column) in turn issues all the money (H) in the economy and holds no wealth.

Turning now to the real side of the economy, the first equation of the model is the national income identity and, as we assume a closed economy, the equation says that national income is equal to the sum of consumption (C), investment (I) and government spending[10] (G):

$$Y = C + I + G \tag{3.1}$$

3.4.1 Households' behavior

Equations 3.2-3.11 describe households' allocation decisions. Disposable income (YDh) is the sum of wages (W), interests on bank deposits ($id * BD_{-1}$) and on bonds (B_{-1}) one period before, and dividends ($DIVh$) net of taxes (T). The Haig-Simons definition of income is the sum of disposable income and households' capital gains (CGh). Taxes are a proportion (θ) of gross disposable income. The consumption function (eq. 3.5) depends on the Haig-Simons definition of income; a_0 is autonomous consumption; a_1 is the marginal propensity to consume, and a_2 is a (lagged) "wealth effect".

[10]Government spending is assumed to grow at a constant 2.5% rate.

$$YDh = W + id * BD_{-1} + B_{-1} + DIVh - T \tag{3.2}$$

$$YHSh = YDh + CGh \tag{3.3}$$

$$T = \theta * (W + id * BD_{-1} + B_{-1} + DIVh) \tag{3.4}$$

$$C = a_0 + a_1 * YHSh + a_2 * Vh_{-1} \tag{3.5}$$

Bonds as a proportion of households' wealth (eq. 3.6) is a linear function of the interest rate on bills (rb), the interest rate on deposits (id) and the rate of return on issued equities (re), with the last two affecting it negatively. The proportion of the value of equities held by households ($pe * Eh$) out of their total wealth[11] is negatively influenced by the interest rates and has positive own feedback through its rate of return. The cash held by households are a fixed proportion (λ_0) of consumption. The change (Δ) in the stock of bank deposits (or bank deposits flow) is calculated as a residual of other forms of incoming wealth. Households' capital gains are defined as the revaluation effects of bonds and equities, respectively. Revaluation effects are the change in the prices of the bonds and equities they hold multiplied by their corresponding amounts lagged one period. Total households' wealth was defined above as the sum of assets in column 2 of Table 3.1.

$$\frac{pb * B}{Vh} = v_0 + v_1 * rb - v_2 * id - v_3 * re \tag{3.6}$$

$$\frac{pe * Eh}{Vh} = w_0 - w_1 * rb - w_2 * id + w_3 * re \tag{3.7}$$

$$Hh = \lambda_0 * C \tag{3.8}$$

$$\Delta BD = YDh - C - pb * \Delta B - pe * \Delta Eh - \Delta Hh \tag{3.9}$$

$$CGh = B_{-1} * \Delta pb + Eh_{-1} * \Delta pe \tag{3.10}$$

[11] This equation is solved for pe, see the section Simulations.

$$Vh = BD + pb * B + pe * Eh + Hh \tag{3.11}$$

3.4.2 Firms' behavior

Firms' decisions are described in equations 3.12-3.16. Following a Kaleckian framework, the investment function (equations 3.12-3.14) is assumed to depend positively on the lagged profit rate (UP_{-1}/K_{-2}) and the growth rate of the economy[12] ($\Delta Y/Y_{-1}$) with k_2 being the accelerator effect. Physical capital accumulation depends negatively on the debt ratio (L_{-1}/K_{-1}, given the increasing risk effect as debt grows above the stock of capital), and on the interest rate on loans (rl). Finally, the financial rate of return on equities held (ree) also has a negative impact on accumulation, reflecting an arbitrage between real and financial accumulation. δ is the depreciation rate of capital.

$$g = k_0 + k_1 * \frac{UP_{-1}}{K_{-2}} + k_2 * \frac{\Delta Y}{Y_{-1}} - k_3 * \frac{L_{-1}}{K_{-1}} - k_4 * rl - k_5 * ree \tag{3.12}$$

$$I = g * K_{-1} \tag{3.13}$$

$$\Delta K = I - \delta K_{-1} \tag{3.14}$$

Financial accumulation might either be described via the share of the value of equities held by firms out of their total capital, real and financial, (eq. 3.15) or as financial accumulation (eq. 3.16). It is assumed a linear function of the rate of return on equities held (ree) and the profit rate which reflects the economic environment of the firms. The debt ratio also has a positive influence on financial accumulation, given that leverage effects favor financial accumulation, in contrast with the negative impact of higher risk on real investment. In this simulation exercise we retained equation 3.15, solving for Ee.

$$\frac{pe * Ee}{K + pe * Ee} = f_0 + f_1 * ree + f_2 * \frac{UP}{K_{-1}} \tag{3.15}$$

$$\frac{pe * \Delta Ee}{pe_{-1} * Ee_{-1}} = f_0 + f_1 * ree + f_2 * \frac{UP}{K_{-1}} + f_3 * \frac{L_{-1}}{K_{-1}} \tag{3.16}$$

[12] This element might be replaced, for instance, by capacity utilization.

3.4.3 Two alternative closures

As mentioned in the introduction and in the section Stylized facts, we want to focus on the way non financial companies finance their investment. We proceed in this fashion to analyze possible Minsky-type cycles when firms finance investment by external funds (debt) and by internal funds (undistributed profits or issuing equities). Analyzing both items at the same time would imply leaving either physical capital or financial accumulation as a residual for accounting consistency to hold, which we do not do in this exercise.

Equations 3.17 and 3.18 are, respectively, the debt ratio and the own funds norm equations. Model 1 uses equation 3.17, while the amount of equities issued (E) is deducted from 3.19, solving for ΔE. Similarly, Model 2 uses 3.18, while debt is deducted from 3.19, solving for ΔL. The left-hand side of 3.19 is the spending (or portfolio) decision of firms (between investing and holding equities), whereas the right-hand side represents their resources (from profits, issuing equities or contracting loans).

The debt ratio, interpreted as an indebtedness norm (eq. 3.17), depends positively on the rate of profit (as higher profitability makes it easier to borrow from banks)[13], on the rate of return on equities (as a higher cost of issued equities makes credit more attractive) and lastly, as usual, on its rate of interest.

The own funds ratio, in its turn, is measured as a percentage of the total real and financial assets (eq. 3.18). It depends positively on the interest rate on lending (because a higher cost of credit makes equities issuing more attractive), on the debt ratio (an increase of the indebtedness forces firms to use more internal funds), and negatively on the rate of return of equities (a higher cost of issuing equities discourages their creation).

$$\frac{L}{K} = g_0 + g_1 * \frac{UP_{-1}}{K_{-1}} + g_2 * re_{-1} - g_3 * rl \quad Model \quad 1 \tag{3.17}$$

$$\frac{pe * E}{K + pe * Ee} = z_0 + z_1 * rl + z_2 * \frac{L_{-1}}{K_{-1}} - z_3 * re \quad Model \quad 2 \tag{3.18}$$

$$I + pe * \Delta Ee = UP + pe * \Delta E + \Delta L \tag{3.19}$$

Undistributed profits (UP) are the difference between total income (Y) and costs (interest payments, as well as wages and dividends paid to households). Wages (W) are a constant (r_0) share of income[14]. The rate of return of equities issued (re), as in Lavoie

[13]As mentioned above, the profit rate may be treated as a proxy of the value of collateral.

[14]It must be noted here that we follow Marglin and Bhaduri (see previous chapter) in that we treat

and Godley 2001, is equal to the growth rate of the price of equities plus the share of distributed dividends out of total equities previously issued. Dividends, in turn, are calculated (also as in Lavoie-Godley, op cit) as a proportion ($1-sf$, where sf is the firms' saving rate) of profits realized the previous period. Dividends paid to firms ($DIVe$) are here defined as the share of equities held by firms out of total equities issued the previous period (Ee_{-1}/E_{-1}). Dividends paid to households, as well as the amount of equities they hold, are calculated as a residual of what firms issue and hold. Firms' capital gains (CGe) come from changes in the price of equities multiplied by the amount held by them (revaluation effect). The outstanding amount of wealth held by firms was defined through the matrix of stocks.

$$UP = Y - W - rl * L - 1 - DIVh \tag{3.20}$$

$$W = r_0 * Y \tag{3.21}$$

$$re = \frac{\Delta pe}{pe_{-1}} + \frac{DIV}{pe_{-1} * E_{-1}} \tag{3.22}$$

$$DIV = (1 - sf) * (Y_{-1} - W_{-1} - rl_{-1} * L_{-2}) \tag{3.23}$$

$$DIVe = DIV * \left(\frac{Ee_{-1}}{E_{-1}}\right) \tag{3.24}$$

$$DIVh = DIV - DIVe \tag{3.25}$$

$$Eh = E - Ee \tag{3.26}$$

$$CGe = Ee_{-1} * \Delta pe \tag{3.27}$$

$$Ve = K + pe * Ee - L - pe * E \tag{3.28}$$

the functional distribution as given, in order to see what happens with national income if, say, the wage share increases or falls. The model presented in the following chapter improves on this in that wages are endogenous while at the same time we can see what happens with the system if these rise.

3.4.4 Government

Equation 3.29 describes Treasury bills (ΔBT) newly issued by the government, which are a residual of its expenditures – on current spending (G), interests on its long- and short-term debt – and its revenues – from taxes on personal income (T), taxes on banks (TB) and taxes on the Central Bank (TCB) and from newly issued bonds ($pb * \Delta B$). The price of bonds is assumed to vary inversely with respect to the interest rate paid, which is assumed to be equal to interest rate on bills (short-run). The total wealth held by the government is equal to its debt with a minus sign.

$$\Delta BT = G + r * BT_{-1} + B_{-1} - T - TB - TCB - pb * \Delta B \tag{3.29}$$

$$pb = \frac{1}{rb} \tag{3.30}$$

$$Vg = -D = -BT - pb * B \tag{3.31}$$

3.4.5 Banking sector

Private banks make profits (BP) and pay taxes (TB) out of their income. The latter is made up of interests on loans to non financial firms and to the government minus interest paid on deposits, and refinancing from the Central Bank. θ_b is the tax rate they pay. Banks' refinancing as a flow (ΔRF) comes from the flow of mandatory reserves (ΔHb) issued by the Central Bank, loans (ΔL, paid by NFCs) and Treasury bills (ΔBT, paid by the government), minus their retained profits (BP) and deposits (ΔBD) they pay to households. This refinancing is granted without restriction by the Central Bank. Mandatory reserves are a fixed proportion (λ) of bank deposits. The change in the wealth held by them (ΔVb) is their profits, as seen in equation 3.36.

$$BP = (1 - \theta_b) * (rl * L_{-1} + r * BT_{-1} - id * BD_{-1} - ib * RF_{-1}) \tag{3.32}$$

$$TB = \theta_b * (rl * L_{-1} + r * BT_{-1} - id * BD_{-1} - ib * RF_{-1}) \tag{3.33}$$

$$\Delta RF = \Delta Hb + \Delta L + \Delta BT - BP - \Delta BD \tag{3.34}$$

$$Hb = \lambda * BD \tag{3.35}$$

$$\Delta Vb = BP \tag{3.36}$$

The Central Bank receives interests from private banks out of previous refinancing and transfers them as taxes to the government (TCB). As a consequence, the Central Bank makes no profits and its net wealth remains constant, equal to zero. Total high-powered-money (H) is the sum of cash held by households and reserves made by commercial banks, which is issued by the Central Bank. The interest rate on loans (rl) is assumed higher than the short term interest rate controlled by the Central Bank (ib) and supposed exogenous, where m_1b (here assumed equal to m_2b) is the spread. Inversely, the interest rate on deposits (id) is supposed at a lower level that the latter, which is at the origin of banks' profit. The interest rate on Treasury bills (r) is assumed to be equal to the interest rate on loans (rl), which is in turn equal to the yield on long-term bonds (rb).

$$TCB = ib * RF_{-1} \tag{3.37}$$

$$H = Hh + Hb \tag{3.38}$$

$$rl = ib + m_1b \tag{3.39}$$

$$id = ib - m_2b \tag{3.40}$$

$$r = rl \tag{3.41}$$

$$rb = r \tag{3.42}$$

In order to ensure that in our model all flows come from somewhere and go somewhere, we make sure that in both models $H = RF$ (the Central Bank's equilibrium; the unwritten equation). The final condition for the model to be consistent in its accounting structure is that the capital stock must equal the sum of all wealth held by all the economic agents in the model; $Vh + Ve + Vg + Vb = K$.

	Fixed Cap. Acc.	Fin. Acc.	Own Funds	Debt Ratio
Profit Rate	+	+		+
Real Interest Rate	−	−	+	−
Debt Ratio	−	+	+	
Fin. Rate of Return	−	+	−	+

Table 3.2 – Main financial determinants of firms' behavior. Signs of partial derivative of explained variables regarding each explaining variable according to each equation.

3.4.6 The working of the model

Table 3.2 summarizes in a simplified way the main determinants of fixed and financial accumulation on the one hand, and of equity issuing and indebtedness on the other, since they result from the outlined *SFC* model and from econometric estimations obtained in Clévenot, Y., and Mazier 2010 and Clévenot, Guy, and Mazier 2012. These relations characterize some of the main features of the finance-led growth regime regarding firms in France. They allow us to describe financial cycles under a Minskyan approach, as it is illustrated in Figure 3.5[15].

In order to illustrate the causal mechanism of our model, let us begin by assuming a rise in the financial rate of return. This will stimulate financial accumulation at the same time that equity issuing will be reduced. The fall in the supply of equity will lead to an increase in the price of equities, which will in turn further increase the financial rate of return.

On the other hand, higher financial profitability will induce firms to borrow more, thus increasing their indebtedness. The latter sustains financial accumulation through the leverage effect. In this setting, fixed capital accumulation suffers a slowdown via negative impacts of (1) the rise in the financial rate of return and (2) the debt ratio, which reflects an increasing risk.

The contrast between booming financial accumulation and the halfway recovery of fixed capital accumulation has been a common feature of the nineties and 2000s in many industrialized countries, as we saw above with French data.

In this ascending phase of the financial cycle, the main stabilizing mechanism is the positive effect of rising indebtedness (induced by higher financial profitability) which leads firms to issue more equities, contributing to impose a limit to the increase in their price. This leads to a fall in the financial rate of profit which limits financial accumulation

[15]The two closures of the model are presented simultaneously in Figure 3.5 for the sake of simplification, although equities issuing or debt are alternatively determined as a residual through an accounting equation.

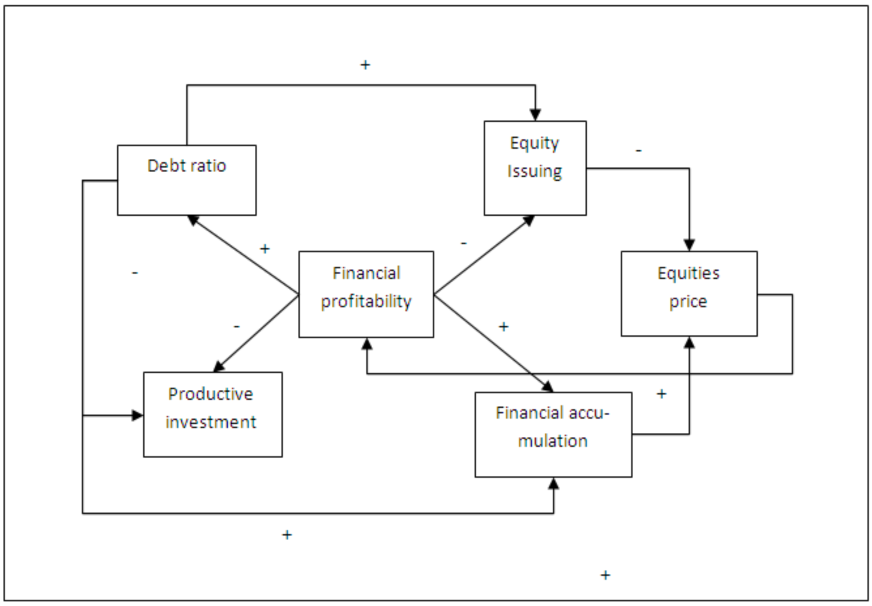

Figure 3.5 – The interaction between the main firms' parameters in the framework of a financial cycle.

and reinforces the adjustment mechanism. The impact of the financial sphere on the real sector is realized via two effects of opposite direction, one negative of the financial rate of profit on real investment, the other positive of capital gains on households' income and consumption. A last feedback of the real economic activity goes from households' demand for equities to the price of equity and the financial sphere. In that sense, our model would describe how the process could end in an endogenous reversal. But it might not always be the case if the stabilizing mechanisms appear insufficient. This can reflect the instability of financialized growth regimes[16]. Simulations in the next section will help to clarify this issue.

Three points can be added with respect to our model's properties. First, a restrictive monetary policy may contribute to stabilize the system. A rise in interest rates imposes a halt to financial accumulation, given that the cost of external financing rises. At the same time it favors the issuing of equities whose cost appears relatively more attractive[17]. A higher supply of equities helps in setting their price and financial profitability at a lower level. On the other hand, with higher interest rates, indebtedness is naturally reduced,

[16]A full description of the cycle deserves much more than a few lines. This lies, however, beyond the scope of this paper.

[17]Clearly, this aspect of our model is closely linked to trade-off theory See chapter 1 for a brief discussion of this.

which in turn limits financial accumulation. The overall effect on fixed investment and growth is, most of the time, negative due to the rising cost of credit. This also contributes to limit the dynamics of the financial sphere as the demand for equity is reduced.

Second, the economic environment and the demand side can be analyzed through our model. A rise in the price of equities induces capital gains and increases households' wealth, which in turn sustains their consumption and, indirectly, demand and fixed investment. A higher profit rate stimulates both fixed investment and financial accumulation and encourages firms to incur into higher levels of indebtedness, which indirectly favors the issuing of equities and contributes to stabilize the system.

Third, our model focuses only on the relations between firms and finance, which is a key link of a finance-led growth regime. At this initial stage, however, the model provides a simplified representation of households, since it ignores their debt and investment in housing, which (as was seen previously) has played an important role in the current financial crisis. Households' portfolio behavior would also have to be adapted with two types of households, according to the level of their wealth and income. The behavior of banks is also highly simplified and does not reflect their active role in the economy, neither in financial accumulation nor in financialization. Despite these unrealistic simplifications, the model remains rather comprehensive and allows us to take into account the capital structure of firms, which is our main objective.

3.5 Simulations

A first set of simulations of our *SFC* model is proposed to provide a better understanding of the working of the model. At this first stage, calibration has been loosely based on French national accounts in stocks and flows for 2009. For firms' equations (real and financial investment, debt and equity) the corresponding parameters are taken from Clévenot, Y., and Mazier 2010 and Clévenot, Guy, and Mazier 2012 as well as from some preliminary informal estimates.

Two models are examined; Model 1 with an indebtedness norm and Model 2 with an own-funds norm. In order to study the mechanisms of these two models, shocks on the demand, supply and financial sides are carried out. Before proceeding with the description of these shocks, it seems useful to say a few words about the reference baseline output growth and capital accumulation rates of each model. Model 1 with the indebtedness norm exhibits 5-period cycles from peak to peak (Figure 3.6), which diminish in size over time, as the series approach the steady-state. On the other hand, Model 2 with an own-funds norm also exhibits cycles, though over a much longer span (from peak to trough there is more than 50 periods), as shown in Figure 3.7.

The nature of these contrasted cyclical behaviors[18] lies in the functional forms of the two closures and their lags. In Model 1 the indebtedness norm (which is naturally excluded in Model 2) depends on the profit rate lagged one period (eq. 3.17), at the same time that undistributed profits (eq. 3.19) are reduced when firms' credit demand augments. The capital accumulation function (eq. 3.12) includes both with different lag orders as its determinants. The cycle in Model 1 may be better understood if we take as an example an increase in the profit rate, after which there is a corresponding increase in capital accumulation and indebtedness in about the same period. The latter has a negative effect on the former one period later. This fall in capital accumulation, in turn, depresses demand and profits. The fall in profits curtails credit demand but makes accumulation increase via lower leverage effects. Given that investment is affected by the lagged profit rate and the lagged debt-ratio, high growth rates of income, i.e. in period 52, coincide with low rates of capital accumulation, and vice versa, i.e. period 54. This process is carried over monotonically every five periods, as seen in Figure 3.7.

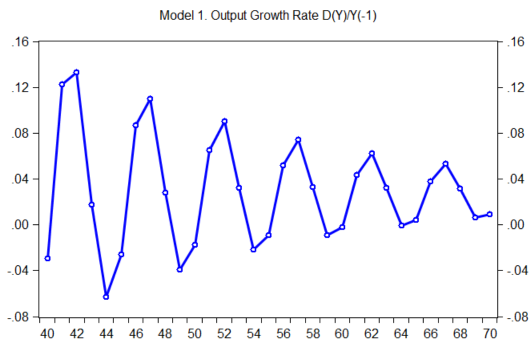

Figure 3.6 – Baseline output growth path for Model 1, with indebtedness norm.

We now carry out our simulation experiments, which consist in five scenarios, that is, exogenous increases (or shocks) in: (1) consumption, (2) the wage share, (3) the investment function, (4) the demand for equities from firms, and (5) the demand for equities from households. Shocks 1, 2 and 3 are on the demand side and Shocks 4 and 5 on the financial side. The effects of these shocks are analyzed graphically for Model 1 (indebtedness

[18]We do not claim that *any* set of parameters and/or starting values in our (or any other) model will yield cyclical monotonous behavior as ours. Indeed, the presence or absence of cycles and the behavior of the variables in any simulated model will depend (at least) on (1) the behavioral functions imposed on the model, (2) the size of the parameters, and (3) the lags in those equations.

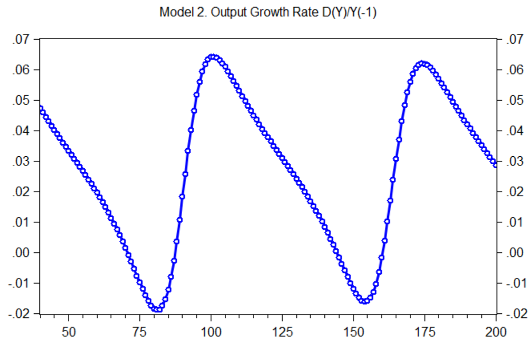

Figure 3.7 – Baseline output growth path for Model 2, with own funds norm.

norm) and Model 2 (own funds norm), as compared to the evolution of the corresponding baseline solution, on the following variables: output (Y), personal consumption (CP), the price of equities (pe)[19], capital accumulation (I/K_{-1}), the profit rate (UP/K_{-1}), the share of equities held by firms out of their total assets ($pe * Ee/(K + pe * Ee)$), the debt ratio (L/K) and the financial rate of return (re)[20]. Although shocks run from $t = 45$ to the end of the sample, the reader must bear in mind that what we analyze here are once-for-all shocks on single variables, which in turn imply no other change in economic policy or other exogenous factors. The possibility of policy responses (i.e. a 'Taylor' rule) is also left for further research.

3.5.1 Increase in households' consumption under Model 1, indebtedness norm

We begin by describing a shock on the demand side. We assume that autonomous consumption increases 2.5% out of total personal consumption ($\Delta a_0 = 1.5$).

Figures 3.8, 3.9 and 3.10 illustrate what happens in Model 1 with the indebtedness norm. As can be seen from Figure 3.8, an increase in personal consumption has the expected positive effect on output which, although less than proportional, takes place immediately and extends to the longer run, following a traditional Keynesian recovery. This brings about an increase in the price of equities, as firms gradually curtail their issuing of equity thanks to the economic recovery and the improvement of undistributed profits. Two periods after the shock the first economic downturn occurs, followed by a three period fall of profits and demand, and a subsequent recovery to lower levels than

[19]All three as ratios of the baseline solution.
[20]Since these are ratios, we present them as differences, with respect to the baseline solution.

those achieved the former peak, still higher than those achieved in the baseline model. The price of equities reaches its peaks one period after output does. The downturn of the price of equities is the consequence of the fall in output and profit which induces firms to issue new equities in order to finance investment facing the falling debt ratio. With the slowdown investment declines and firms reduce their issuing of equities. This allows a new upturn in equities' price. Consequently a financial cycle can be observed but business cycles become progressively milder.

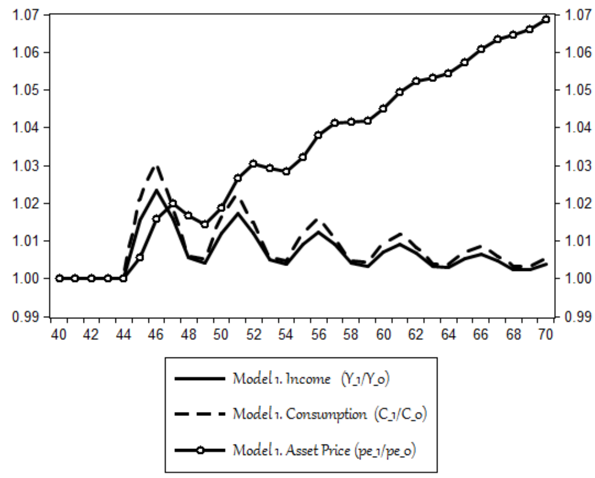

Figure 3.8 – Increase of 2.5% in consumption; impact on income, consumption and equity price. Model 1, Indebtedness Norm.

The other variables provide further information. The accumulation rate (I/K_{-1}) decreases slightly in the first period after the increase in autonomous consumption, due to the improvement in the financial rate of return which has a negative effect on it. But it then increases significantly along with the recovery, for up to four more periods until profits fall enough for firms to begin issuing equities, which again makes output fall. These differences then become less and less important. For the same reasons just described, the rate of return on equities held and the rate of financial accumulation evolve cyclically. With the indebtedness norm, fluctuations of the debt ratio are of limited size.

Overall, financial cycles can be observed in the market for equities, with acceleration and deceleration of growth in their price and in the financial rate of return. This is mainly explained by the variation of issued equities facing the financing constraint with the indebtedness norm and by the role played by equities' price to clear the market. The equity price bubble does not burst properly as the periodic price falls are unable to

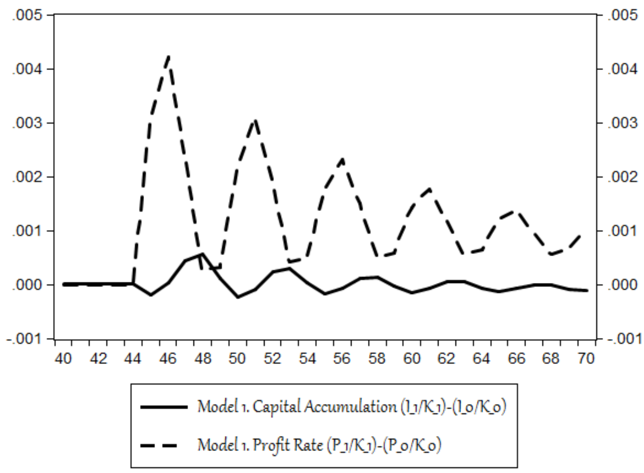

Figure 3.9 – Increase of 2.5% in consumption; impact on capital accumulation and the profit rate. Model 1, Indebtedness Norm.

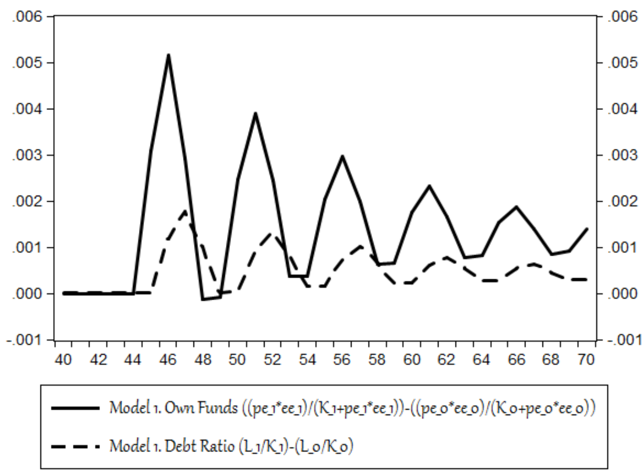

Figure 3.10 – Increase of 2.5% in consumption; impact on debt ratio and own funds. Model 1, Indebtedness Norm.

compensate for previous increases. Stabilizing forces are insufficient. It may be recalled, however, that in the real world equities prices have been growing in the long run in spite of periodic financial crises (see Figure 3.2).

3.5.2 Increase in households' consumption under Model 2, own funds norm

The same shock is carried out in Model 2, with an own funds norm. Figure 3.11 also shows, in the short term, a positive effect of an increase in personal consumption on output, although of more limited amplitude than in Model 1. The price of equities, the profit rate, the equities held by firms and the rate of return on equities are all at higher levels than the baseline. In the short term the debt ratio decreases slightly then grows above the baseline solution, unlike what was observed in Model 1. The reader must bear in mind that in Model 2 loans to firms are determined as a residual. In the short-term firms need less credit thanks to the improvement of profits with the recovery – and preservation of – equities issued with the own funds norm.

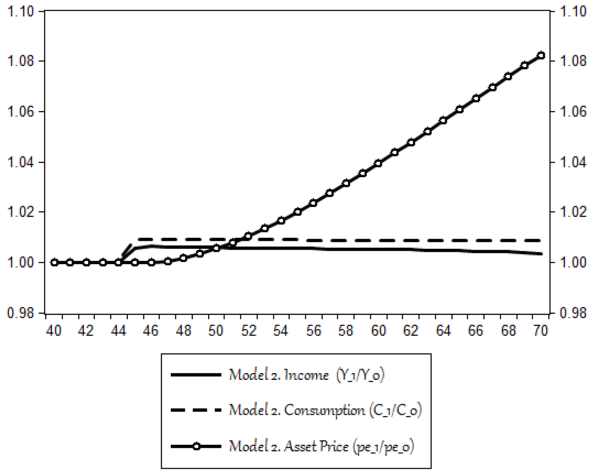

Figure 3.11 – Increase of 2.5% in consumption; impact on income, consumption and equity price. Model 2, Own Funds Norm.

But in the medium term the evolution is quite different. There is a financial bubble[21] with a higher financial rate of return, increasing financial accumulation and a permanent (though small) decline of the real rate of accumulation. This opposition between real and financial accumulation is close to what has been observed during the 1990s and 2000s (see the section Stylized Facts). Firms' indebtedness increases without limit which stimulates financial accumulation and the growth of the price of equities but reinforces the slowdown in investment and production. More than in Model 1 (with the indebtedness norm), the

[21] Financial bubble is here defined as a permanent increase in the price of equity.

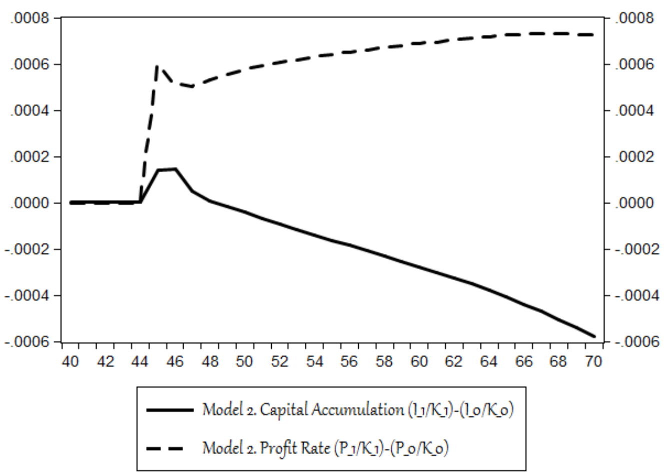

Figure 3.12 – Increase of 2.5% in consumption; impact on capital accumulation and the profit rate. Model 2, Own Funds Norm.

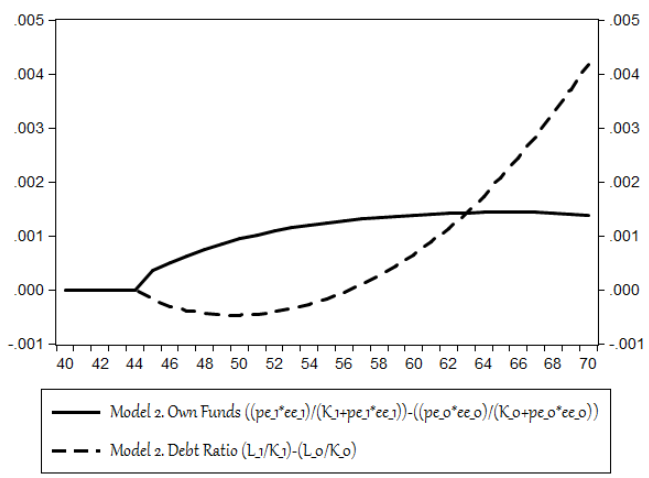

Figure 3.13 – Increase of 2.5% in consumption; impact on debt ratio and own funds. Model 2, Own Funds Norm.

feedback mechanism is insufficient in Model 2 (with the own funds norm) to make the financial bubble burst. However, the magnitude of the rise in the price of equity remains rather limited (just 0.5% higher than the baseline around period 1970).

Indeed, the two versions of the model show contrasted mechanisms. In Model 1 with the indebtedness norm, there are short-term financial cycles with equities issued determined as a residual and the price of equities clearing the market. In Model 2 with the own funds norm there is a financial bubble with increasing financial accumulation and the price of equity. There is, however, no stabilizing mechanism in the latter. Loans are determined as a residual and the debt ratio increases without limit.

3.5.3 Increase in the wage share under Model 1, indebtedness norm

In shock 2 (on the demand side) it is assumed that the wage share is 2% higher.

Figures 3.14, 3.15 and 3.16 show the after-shock evolution of the selected variables under this specification. With the indebtedness norm the increase in the wage share implies lower output because investment is sensitive to the fall in the profit rate and consumption does not increase sufficiently in order to offset the fall in investment. The profit fall, along with the diminishing debt-ratio under this specification, pushes firms to issue more equities which are here determined as a residual. This induces a decline of the price of equities to clear the market and a drastic decline in financial profitability. Indeed consumption decreases despite the increase in the wage share, because household's capital gains are drastically reduced[22]. The slowdown of economic activity and the accumulation rate reduce the supply of equities, which contributes to stabilize their price and, as a consequence, the financial rate of return. As a consequence, a financial cycle can be once again observed with a debt ratio moderately fluctuating with the constraint of the indebtedness norm. Overall, given the current calibration, the economy behaves as a profit-led demand regime with financial fluctuations.

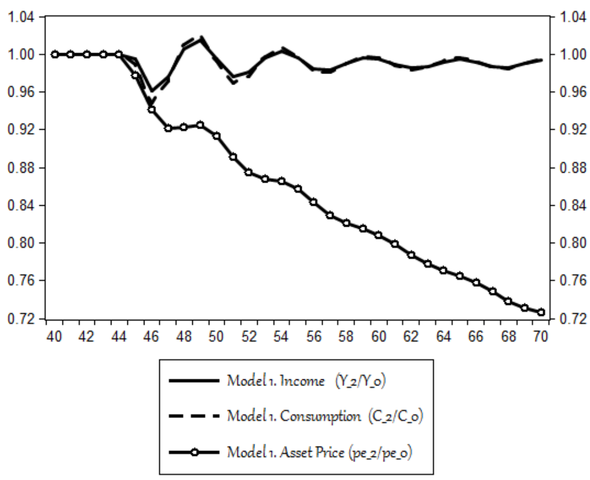

Figure 3.14 – Increase of 2% in the wage share; impact on income, consumption and equity price. Model 1, Indebtedness Norm.

[22]The wage share increase has a negative effect on consumption under this specification, but the reader must be aware that this is due to the important amount of equities held by households out of their wealth (according to our specification).

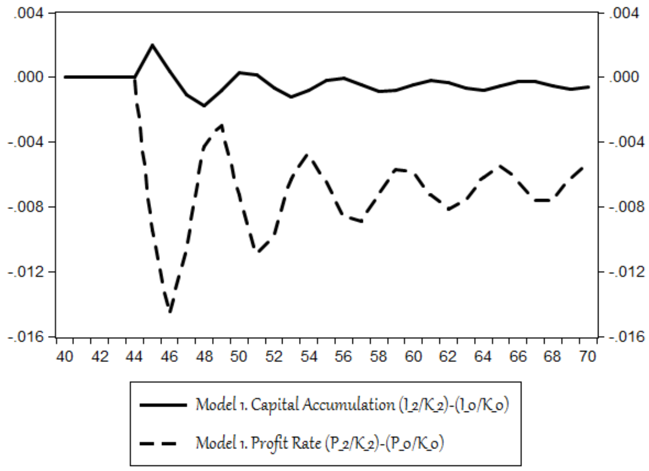

Figure 3.15 – Increase of 2% in the wage share; impact on capital accumulation and the profit rate. Model 1, Indebtedness Norm.

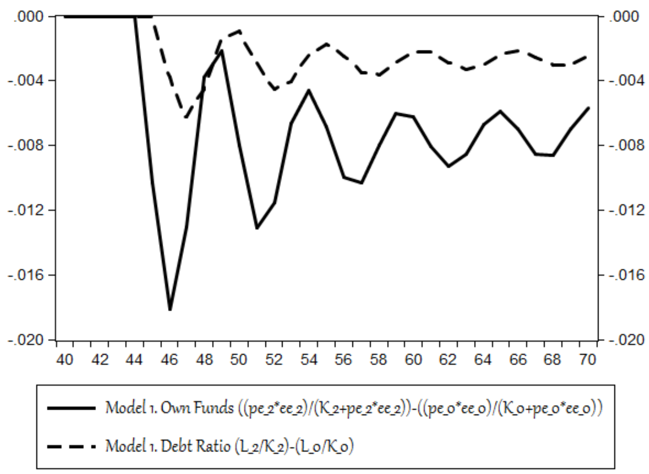

Figure 3.16 – Increase of 2% in the wage share; impact on debt ratio and own funds. Model 1, Indebtedness Norm.

3.5.4 Increase in the wage share under Model 2, own funds norm

On the contrary, Model 2 with the own-funds norm appears wage-led in the short to medium term (Figures 3.17, 3.18 and 3.19). It shows that the switch from capitalists' to workers' income implies a short- to medium-run increase in output more in line with the post Keynesian wage-led tradition. In order to offset the declining rate of profit, firms now get more indebted. This is possible because loans are determined under this specification as a residual, which contributes to limit the fall in investment. Debt also sustains financial accumulation with a growing price of equities. In the longer-run the decrease in investment weighs on output growth, which, in the absence of any appropriate policy response, falls.

Overall, the contrast between the two models is confirmed, Model 1 with the indebtedness norm is more financial-cycles driven with the price of equities clearing the market, whereas Model 2 with the own funds norm financial accumulation prevails with growing price of equities at work.

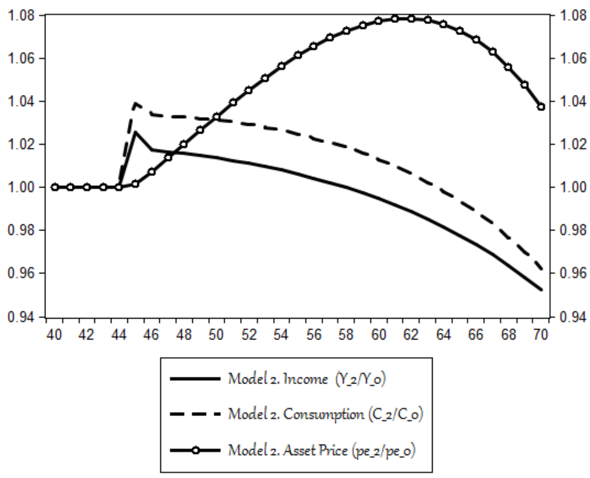

Figure 3.17 – Increase of 2% in the wage share; impact on income, consumption and equity price. Model 1, Own Funds Norm.

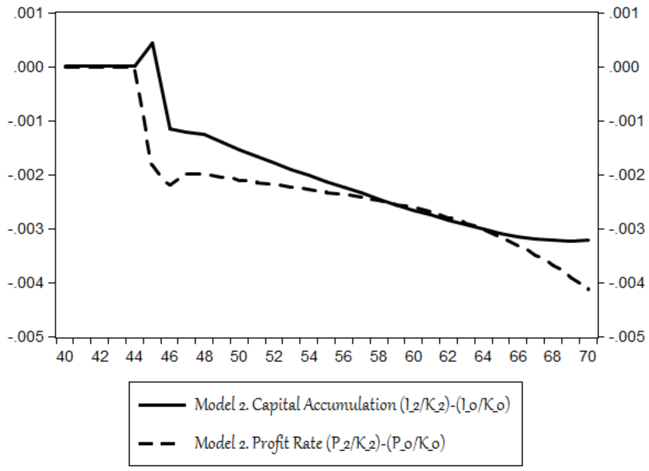

Figure 3.18 – Increase of 2% in the wage share; impact on capital accumulation and the profit rate. Model 1, Own Funds Norm.

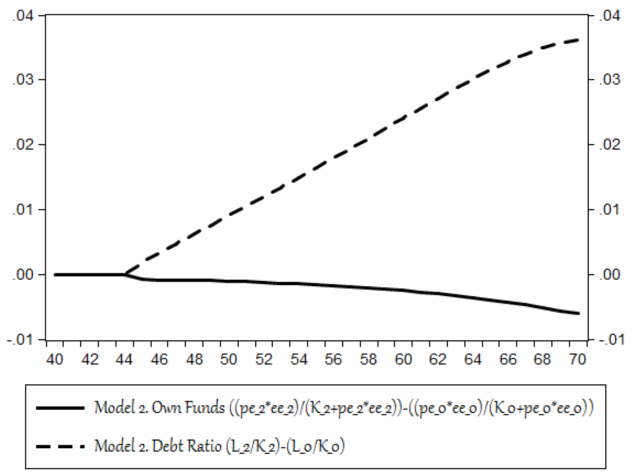

Figure 3.19 – Increase of 2% in the wage share; impact on debt ratio and own funds. Model 2, Own Funds Norm.

3.5.5 Increase in investment under Model 1, indebtedness norm

The Figures in this and the following subsections show what happens to the fictitious economy under a shock which implies a 1% increase in the rate of capital accumulation ($\Delta k_0 = 0.01$).

Figure 3.20, 3.21 and 3.22 show the after-shock evolution of the selected variables under the indebtedness norm. This demand shock implies a permanent increase in output driven by investment and a permanent fall in the price of equities. The consequent decrease in financial profitability keeps investment from falling, which in turn makes the capital stock grow proportionally more than undistributed profits, thus gradually reducing the profit rate. This is explained by the fact that firms are constrained by their indebtedness norm and issue more equities which, following an insufficient demand for these, makes their price fall. In the medium-run, financial accumulation by firms is reduced due to the worsening of the rate of return on equities issued. Demand is sustained by consumption and investment at the expense of capitalists' income coming from both the real and financial sides. In this shock the financial cyclical behavior retains the market clearing role played by the price of equities but is partly offset by the general growth trend.

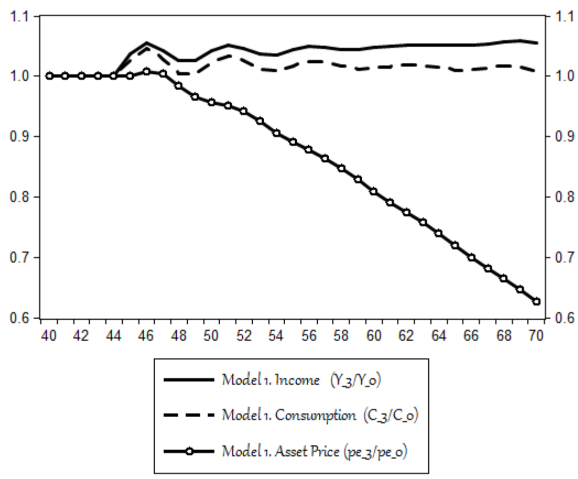

Figure 3.20 – Increase of 1% in the accumulation rate; impact on income, consumption and equity price. Model 1, Indebtedness Norm.

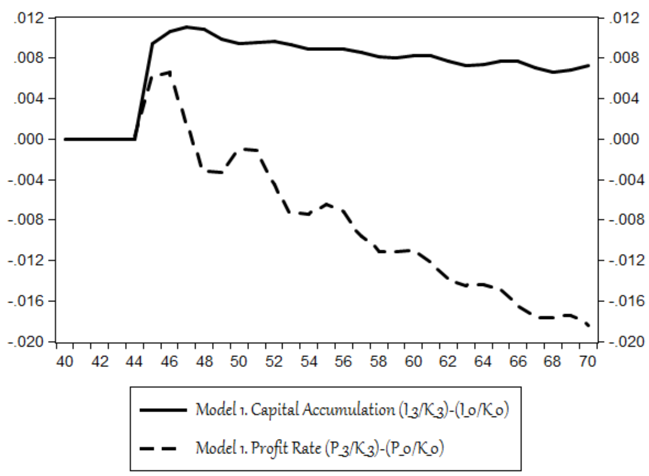

Figure 3.21 – Increase of 1% in the accumulation rate; impact on capital accumulation and the profit rate. Model 1, Indebtedness Norm.

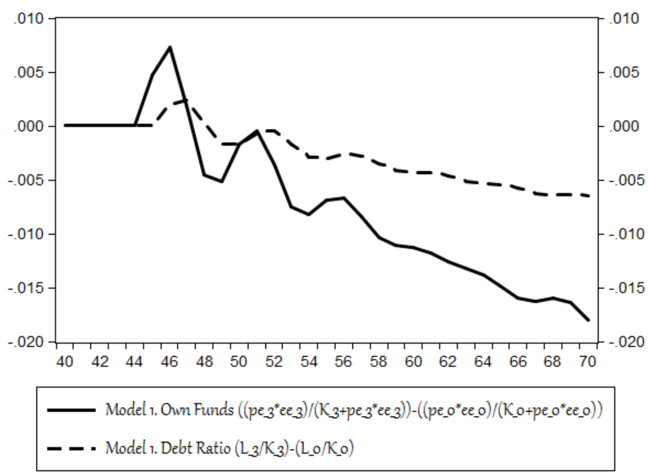

Figure 3.22 – Increase of 1% in the accumulation rate; impact on debt ratio and own funds. Model 1, Indebtedness Norm.

3.5.6 Increase in investment under Model 2, own funds norm

In Model 2 the shock on investment has a longer-lasting effect in the economy (Figure 3.23). The price of equity rises due to the own funds norm which limits their supply. This in turn implies an increase in the financial rate of return which sustains financial accumulation and the financial bubble. Firms' indebtedness grows so as to finance supplementary real and financial investment. The debt ratio grows without limit as loans are determined as a residual and can be obtained without restriction. The increase in the price of equities brings about capital gains capable of holding demand at high levels in spite of a decreasing rate of accumulation in the long run. This fall is due to the sensitiveness of the investment function to the negative effect of financial profitability and of the debt ratio, as seen in equation 3.12. The profit rate remains higher than in the corresponding baseline solution but accumulation eventually falls in the medium-run, both as a consequence of the financial boom and the growing indebtedness. Growth in the long run is sustained by households' consumption, which benefit of wealth effects[23]. This shock illustrates a combination of a finance-led growth with increasing indebtedness.

This shock on the accumulation rate provides another illustration of the opposition between the two models. In Model 1 with indebtedness norm growth is mainly driven by investment with limited financial accumulation and declining financial rate of return. The financial cyclical behavior remains under constraint in the short term thanks to the general growth trend. In Model 2 with the own funds norm growth is more finance-led with a financial bubble and increasing indebtedness which limits investment in the long run but supports growth thanks to wealth effects.

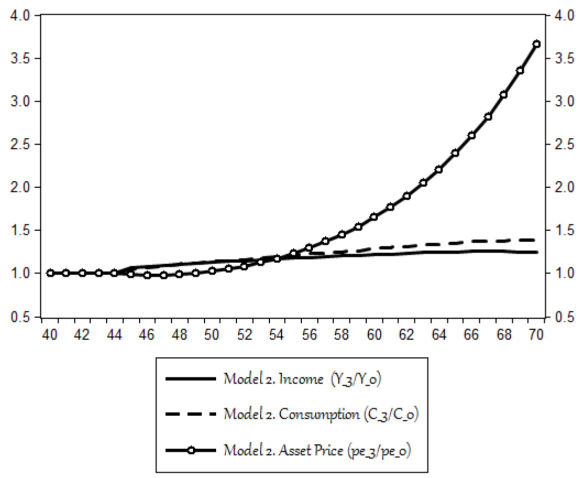

Figure 3.23 – Increase of 1% in the accumulation rate; impact on income, consumption and equity price. Model 1, Own Funds Norm.

[23]This wealth effect could potentially be revised in another calibration reducing the amount of equities held by households.

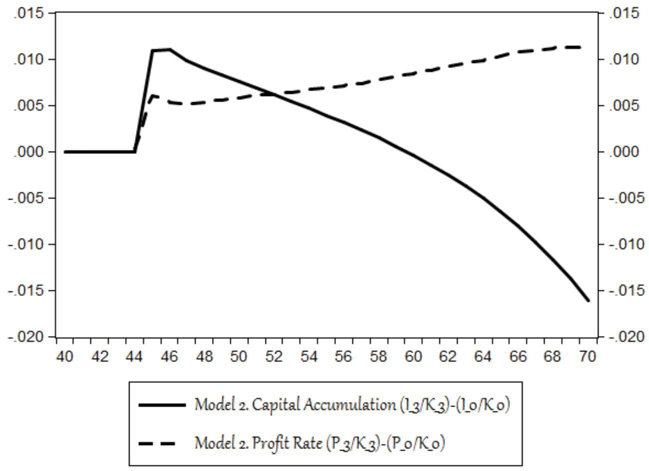

Figure 3.24 – Increase of 1% in the accumulation rate; impact on capital accumulation and the profit rate. Model 1, Own Funds Norm.

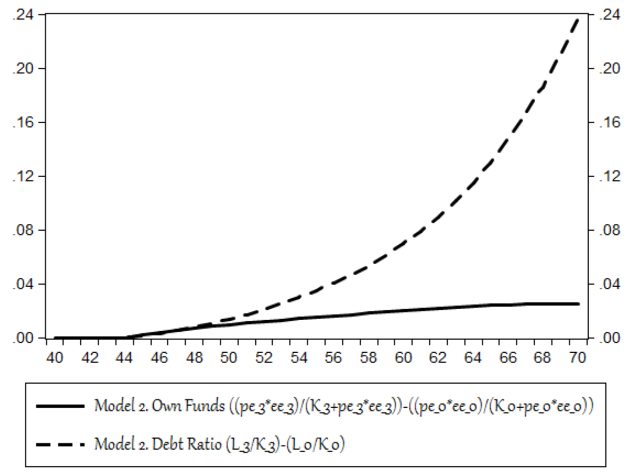

Figure 3.25 – Increase of 1% in the accumulation rate; impact on debt ratio and own funds. Model 1, Own Funds Norm.

3.5.7 Increase in firms' financial accumulation under Model 1, indebtedness norm

The Figures in this subsection and the next show the evolution of the chosen series following a 1% increase in the share of financial accumulation out of their total (physical and financial) wealth: $\Delta f_0 = 0.01$ in equation 3.16.

In Model 1 the financial shock on firms' demand for equities implies a cyclical increase in output of limited amplitude, thanks to a stock market boom seen through the rise of the price of equity and of the financial rate of return. Capital gains stimulate households' demand. However, this is followed by a gradual decline in financial profitability due to the new equities issued by firms, which is the denominator in *re* (see eq. 3.22). This is a consequence of the specification of the indebtedness norm, which makes investment more dependent on own funds. Troughs are not as deep so as to erase the initial gains achieved during peaks, and variations in the profit rate remain above the variations of the accumulation rate. A financial cycle is observed later on, as in the previous shocks, with the price of equity clearing the market.

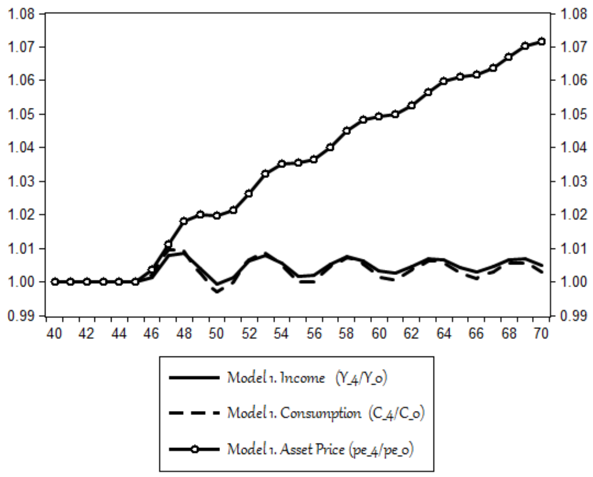

Figure 3.26 – Increase of 1% in firms' financial accumulation; impact on income, consumption and equity price. Model 1, Indebtedness Norm.

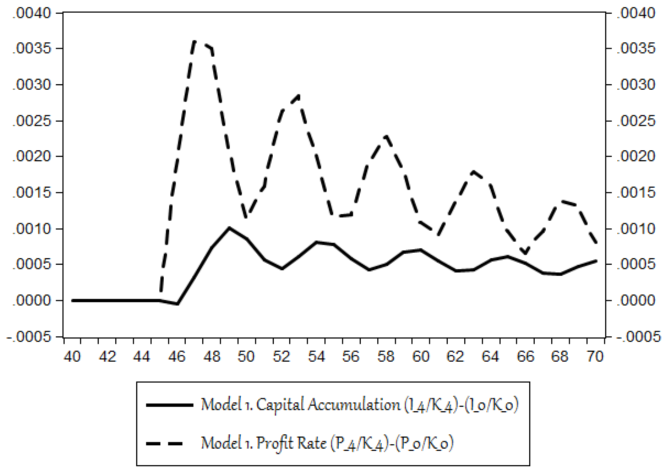

Figure 3.27 – Increase of 1% in firms' financial accumulation; impact on capital accumulation and the profit rate. Model 1, Indebtedness Norm.

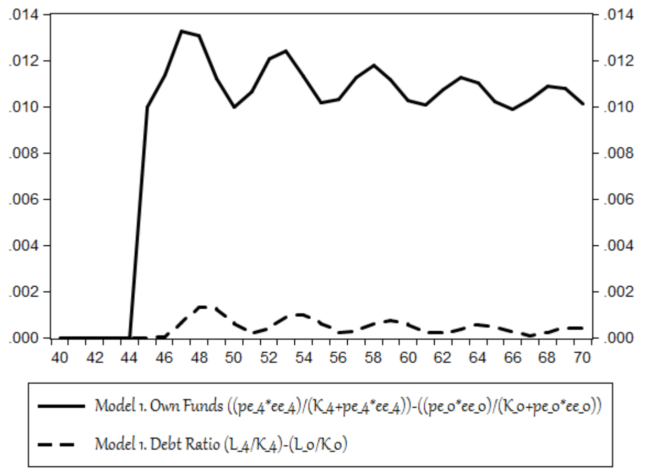

Figure 3.28 – Increase of 1% in firms' financial accumulation; impact on debt ratio and own funds. Model 1, Indebtedness Norm.

3.5.8 Increase in firms' financial accumulation under Model 2, own funds norm

Model 2 shows that, following the rise in firms' financial accumulation as a proportion of their total wealth (physical and financial, K and $pe * Ee$ respectively) under this specification, there is a drastic fall of financial profitability, mainly due to the fall in the price of equity (see below for an explanation), and a correspondingly higher rate of capital accumulation, which is more modest than the fall in the rate of financial return due to the size of the coefficients of re in the corresponding equations which it determines[24]. It must be noticed that the scale of both variables is not the straightforwardly comparable. The rate of capital accumulation (a growth rate) in the first period is 0.2% higher, whereas financial profitability (a profit rate) is 3% lower.

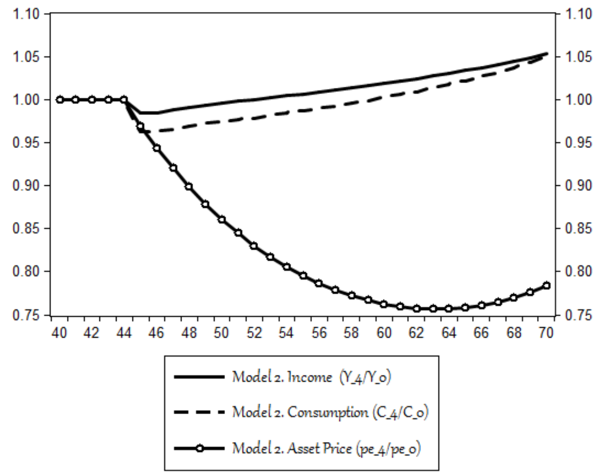

Figure 3.29 – Increase of 1% in firms' financial accumulation; impact on income, consumption and equity price. Model 2, Own Funds Norm.

With this increase in the demand for equities one would normally expect a financial bubble. This, however, does not occur under this specification. The equity price falls because of a particular property of our model. Recall that in equation 3.7 the share of equities held by households out of their outstanding wealth ($pe * Eh/Vh$) tends towards a constant f_0 and as Eh increases[25], this forces the fall in pe (for the 0.5 share to be respected), and this drags down with it financial profitability.

Despite the increase in physical accumulation, income and consequently consumption fall at first due to the financial losses suffered by households. This negative effect is reversed after 10 periods, when the continuous fall in the price of equity is more than offset by the increase in dividends, which is mainly due to the fall in debt. In period 55 and later, income and consumption rise above the baseline path. The profit rate declines slightly in the first period following the shock as the capital stock increases while undistributed profits fall (via demand) at first. This double effect is fully offset and makes

[24]The coefficient of re in the capital accumulation function is $k_5 = -0.1$, whereas the coefficient of re in the financial accumulation function is $f_1 = 0.2$. See the Appendix.

[25]Because E (the supply of equity) increases above Ee (the demand for equity from firms).

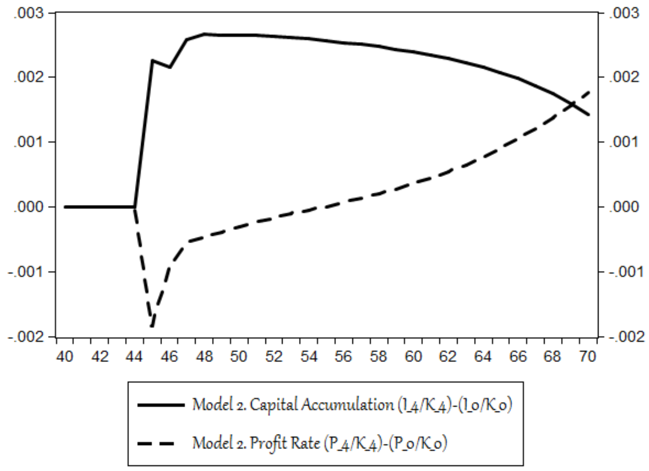

Figure 3.30 – Increase of 1% in firms' financial accumulation; impact on capital accumulation and the profit rate. Model 2, Own Funds Norm.

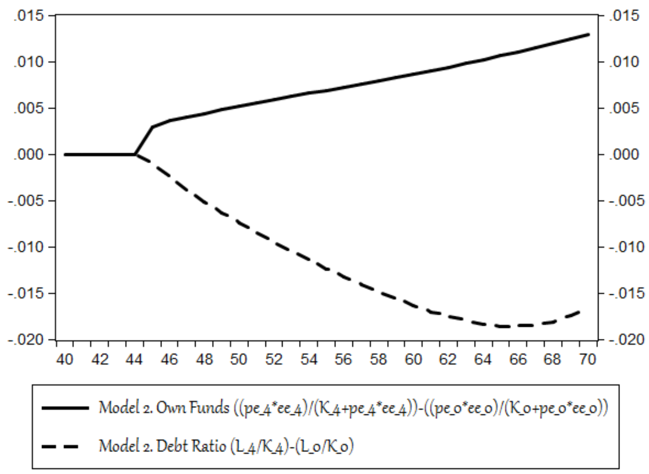

Figure 3.31 – Increase of 1% in firms' financial accumulation; impact on debt ratio and own funds. Model 2, Own Funds Norm.

the profit rate equal to that of the baseline path. Own funds fall as a consequence of the increase in K, via the capital accumulation rate, and the fall in pe. Indebtedness falls too given the initial fall in the profit rate and the rise in demand for equities.

This and the following shock (also under Model 2) share the particularity that both are led by a fall in the price of equity. This fall is followed by a fall in the debt ratio (i.e. a fall in the demand for credit) and this is at the origin of a recession (fall in aggregate demand).

3.5.9 Increase in households' financial accumulation under Model 1, indebtedness norm

This scenario assumes a 1% increase in the share of equities held by households out of their wealth. The Figures in this subsection and the next show graphically what happens for Models 1 and 2, respectively.

This financial shock generates large financial cycles with a strong impact on the real side of the economy, clearly led by the price of equity. *pe* is boosted by the stronger equity demand which increases the financial rate of return. Capital gains improve households' income and demand, while firms' investment is reduced to the benefit of financial accumulation. However, a reversal appears a few periods later. Given the indebtedness norm function the issuing of equities increases. This depresses the financial market and induces a decline of the price of equities and of the financial rate of return. This in turn has a negative impact on households' income and demand and, more broadly, on growth. Financial cycles follow as in the preceding scenarios, but in a more unstable way than in the previous cases. In the longer-run, the increase in the price of equities is unsustainable and thus tends to fall despite the peaks which occur every 5 periods. This happens because non financial firms must issue more equities to finance investment, due to the indebtedness constraint they face. Broadly speaking, what we see is a succession of financial cycles with similar effects on the real side of the economy which appears unstable without any gain in terms of output growth in the medium- to long-run.

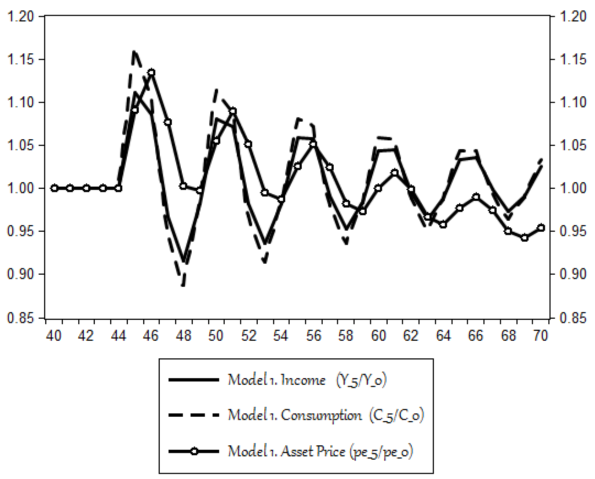

Figure 3.32 – Increase of 1% in households' financial accumulation; impact on income, consumption and equity price. Model 1, Indebtedness Norm.

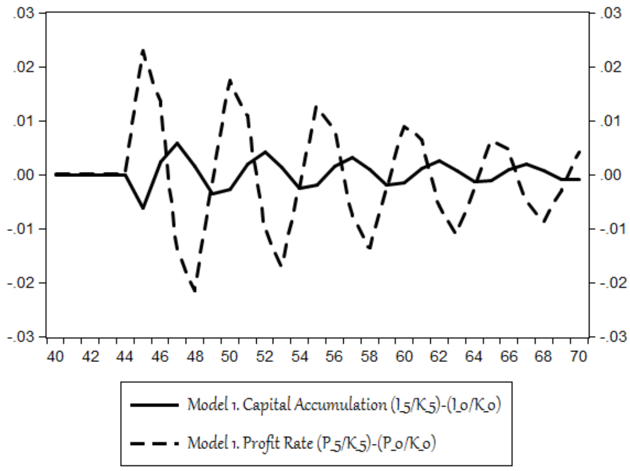

Figure 3.33 – Increase of 1% in households' financial accumulation; impact on capital accumulation and the profit rate. Model 1, Indebtedness Norm.

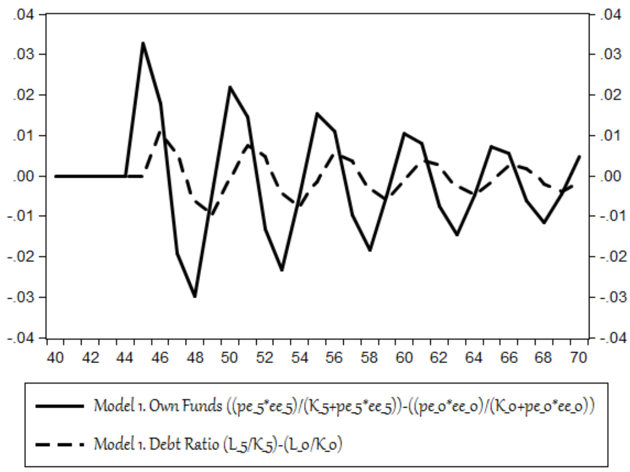

Figure 3.34 – Increase of 1% in households' financial accumulation; impact on debt ratio and own funds. Model 1, Indebtedness Norm.

3.5.10 Increase in households' financial accumulation under Model 2, own funds norm

In Figure 3.32 we see that the supplementary demand for equities from households yields identical results to those observed in case of increasing financial accumulation by firms (see above), though with a slight difference in timing, under this specification. Thus, the evolution of the price of equity is explained along the same lines. What is interesting to highlight in this and the former shock for Model 2 is the opposition between the financial and the real sectors. In this model, a falling price of equity drags down with it the real economy in the short run, but in the medium run this initial negative effect in demand is fully offset and overcome.

Under a long-run perspective, this is representative of financialized regimes. As mentioned above, the set of policies implemented in the eighties gave large predominance to the financial sector, and as it initially grew in importance it made the real sector dependent of it. As it was shown in Figure 3.2 at the beginning, by 2000 the value of equities issued greatly surpassed that of physical capital, at the same time that the aggregate profit and accumulation rates started falling (Figure 3.1). This and the former shocks under Model 2 show that higher levels of financial accumulation tend to depress the economy. As a consequence, it also suggests that if capitalists reallocate their investment towards physical capital to the detriment of financial instruments (the opposite of what we have observed for the last thirty years), this would imply short-run losses and a longer-run sustainable demand regime.

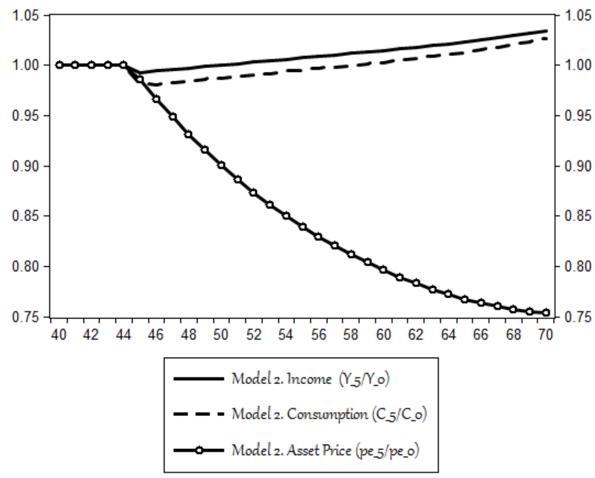

Figure 3.35 – Increase of 1% in households' financial accumulation; impact on income, consumption and equity price. Model 2, Own Funds Norm.

3.6 Conclusion

We have studied a "finance-led" growth regime using a Stock-Flow Consistent model with two alternative closures, one with an indebtedness norm (where equities issued are

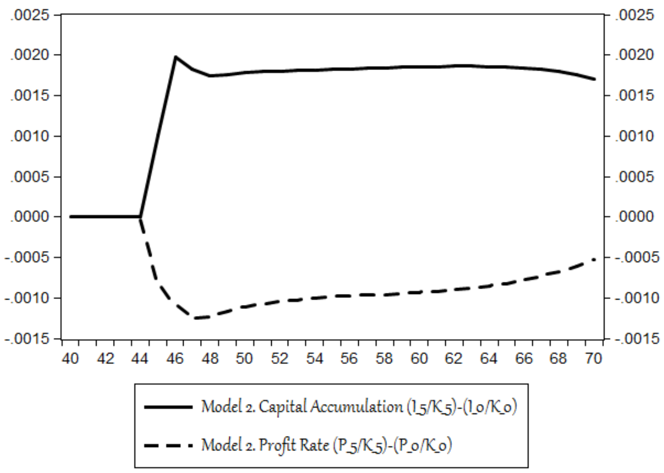

Figure 3.36 – Increase of 1% in households' financial accumulation; impact on capital accumulation and the profit rate. Model 2, Own Funds Norm.

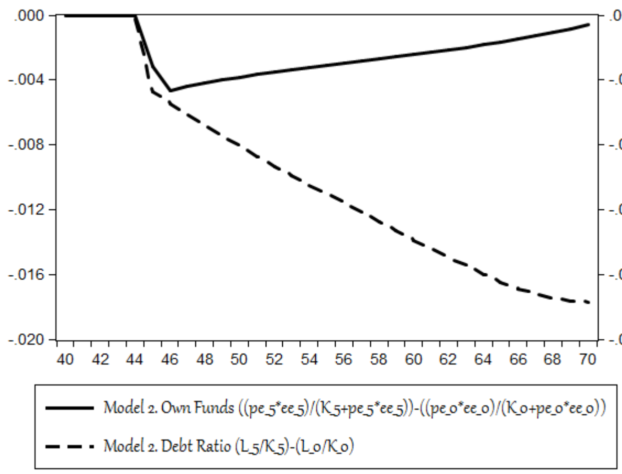

Figure 3.37 – Increase of 1% in households' financial accumulation; impact on debt ratio and own funds. Model 2, Own Funds Norm.

determined as a residual) and another with an own funds norm (where loans to firms are in turn determined as a residual). Simulations with shocks on the demand side or on the financial side have helped to give a better understanding of the working of the model.

Indeed, the two versions of the model have shown contrasted mechanisms. In Model 1 with the indebtedness norm there are short-term business cycles with equities issued (or own funds) determined as a residual. The price of equity clears the market. Consequently, financial fluctuations, with ups and downs more or less pronounced depending on the scenario and size of the corresponding shock, are the normal regulation mode of this financial regime. In contrast, in Model 2 with the own funds norm there is a financial bubble with increasing financial accumulation and a rising price of equities or a permanent financial deflation, depending on the scenario. There is no stabilizing mechanism under this specification. Loans are determined as a residual and the debt ratio increases or decreases without limit. This financial regime appears structurally unstable.

These differences have appeared clearly, both in the shocks on households' consumption demand and on the wage share. The shock on investment has given another illustration of the opposition between the two models. In Model 1 with the indebtedness norm, growth is mainly driven by investment with limited financial accumulation and a declining financial rate of return. The financial cyclical behavior remains constrained thanks to the general growth trend. In Model 2 with the own funds norm, growth is more finance-led with a financial bubble and increasing indebtedness which limits investment in the long run but supports growth thanks to wealth effects.

Shocks on the financial sector, on firms' financial accumulation or households' demand for equity, have confirmed the previous observations in the case of Model 1 with the indebtedness norm. Financial cycles with a succession of financial crises are observed in both cases. Model 2 with the own founds norm yields paradoxical, though enlightening, results, which are useful to understand Balance Sheet Recessions under Stock-Flow Consistent models.

These results must be regarded as preliminary. It would be useful to verify the robustness of these conclusions according to the specifications used to characterize the two types of indebtedness or own funds functions. The importance of the wealth effect in households' behavior is another factor to examine. Lastly, the hypothesis of a closed economy will have to be revised by introducing a foreign sector.

3.7 Parameter values and initial values

Parameter values $a_0 = 0.5658628$, $a_1 = 0.83$, $a_2 = 0.04$, $k_0 = 0.1086334242...$, $k_1 = 0.35$, $k_2 = 0.025$, $k_3 = 0.1$, $k_4 = 0.5$, $k_5 = 0.1$, $v_0 = 0.22382378$, $v_1 = 0.2$, $v_2 = 0.2$, $v_3 = 0.1$, $w_0 = 0.38973415$ (Model 1), $w_0 = 0.5$ (Model 2), $w_1 = 0.01$, $w_2 = 0.02$, $w_3 = 0.02$, $f_0 = 0.09826265506$, $f_1 = 0.2$, $f_2 = 0.6$, $g_0 = 0.2352693030...$, $g_1 = 0.3$, $g_2 = 0.04$, $g_3 = 0$, $z_0 = 0.3$, $z_1 = 0.5$, $z_2 = 0.45$, $z_3 = 0.033333...$, $\theta = 0.1$, $\lambda = 0.050005$, $\lambda_0 = 0.159143$,

$\delta = 0.0625$, $r_0 = 0.67652$, $sf = 0.34097798866$, $\theta_b = 0.2862767$.

Interest rates $ib = 0.015$, $m_1 b = 0.005$, $m_2 b = 0.005$.

Initial values $Y = 100$, $C = 60$, $I = 25$, $G = 15$, $BD = 45$, $B = 0$, $BP = 0.979955$, $BT = 0$, $DIV = 20$, $DIVe = 13.33...$, $DIVh = 6.66...$, $Vg = 0$, $E = 3$, $Ee = 2$, $Eh = 1$, $g = 0.0625$, $Hh = 9.54858$, $Hb = 2.250225$, $K = 400$, $L = 100$, $pe = 35$, $rl = 0.02$, $r = 0.02$, $rb = 0.02$, $TB = 0.393063$, $TCB = 0.176982075$, $T = 7.47687$, $UP = 23.6813$, $Vh = 89.54858$, $YHSh = 67.2918$, $YDh = 67.2918$, $W = 67.652$, $H = 11.798805$, $RF = 11.798805$, $pb = 50$.

Part II

Empirical Stock-Flow Model

Chapter 4

System of equations and model structure

In contrast to the panoply of theoretical models made available by the economics profession, evidence on the empirical importance of the factors on which theorists focus is partial and conflicting in the case of economic variables and essentially nonexistent in the case of political ones.

Eichengreen, Rose, and Wyplosz 1995, p. 23.

4.1 Introduction

The opening quotation of the present chapter comes from an interesting article that is one of those rare mixes, hard to find these days, of a well referenced and thorough historical analysis (in this case of currency crises) and a neat modeling exercise that sheds light on important theoretical concepts in international finance. In contrast to an overwhelming majority of published works (at least up to then) dealing with exchange rate mechanisms before *or* after a crisis, Eichengreen, Rose and Wyplosz (ERW) aim at analyzing the causes *and* consequences of currency crises for several economies using a graphical analysis and a multinomial logit model, relying heavily on well-founded economic reasoning of open economy macroeconomics.

An integral approach to economic analysis

Our modeling exercise described below and in the remaining of this work, combined with what we consider a thorough analysis of the French economy[1] in the previous chapters,

[1] As we mentioned before, we tried to focus on key elements, with the hope that these serve as a basis for further research. So, by thorough, we do not mean *absolute*, but rather *integral*.

aims in spirit at that same level of *completeness*. Clearly, our work differs enormously in *scope and method* (paraphrasing John Neville Keynes) from that of ERW. They study episodes prior to and following currency crises in twenty countries from 1959 to 1993, whereas we study the real and financial sides of a single economy (France) from roughly 1970 to 2012. Their statistical model consists of a panel-based multinomial logit which has as a dependent variable the occurrence of a currency crisis (taking the value of 1 in such event and 0 otherwise) and several economic and political variables as potential determinants.

In contrast, the statistical part of our model (described in chapter 5) consists of several time series estimations that are carried out for the most part in two steps. The first step of each equation is an unrestricted Vector Autoregression that describes the long-run of the corresponding variable (often the series in level). The second step is a reparameterized version of the former, and comes in the form of an Error Correction Mechanism that describes the short-run (often the growth rate of the corresponding series in level), where we also include the vector of cointegration (the long-run term estimated in the first step).

So, in spite of these differences, how come we claim that our work aims in spirit at the same level of *completeness* than that of ERW? We believe their work is complete because, as mentioned above, the authors blend theory, history and empirical evidence. It is also worth mentioning that their results are consistent with the long research program of at least one of the authors[2]. Our finance-inspired macroeconomic theoretical approach, combined with a *cause* and *consequence* description of the French economy since the collapse of the Bretton Woods system, and our Cowles-type model attempt to achieve the same degree of *completeness*. Nonetheless, we humbly recognize that, at least at this stage, several ideas are not fully developed and deserve further deepening. This is only natural, given that the current thesis will serve as a starting point for developing the subjects treated in it in the future in order to form our own research program[3].

[2]Here we refer to Barry Eichengreen, part of whose contributions we know best and were in turn important sources of inspiration for the present work. For instance, his myth-debunking analysis of the differences and similarities between the Bretton Woods system and the current non-system (Eichengreen 2004), his study of the rise and fall of the dollar (Eichengreen and Flandreau 2009, co-written with M. Flandreau), his insights on the importance of the exchange rate on economic growth (Eichengreen 2007), his ideas on the Eurozone crisis (Eichengreen 2014) and his thoughts on protectionism (Eichengreen and Irwin 2010, co-authored with D. Irwin), to name only a few.

[3]Without pretending to mention "all" subjects which *could* derive from the present document, the list includes subjects treated by contemporaneous authors whose work was a source of inspiration, such as Robert Shiller (financial bubbles, the real estate market, behavioral finance), Paul Krugman (financial crises, business cycles, competitiveness), Barry Eichengreen (exchange rates, the Bretton Woods system, the gold standard), Anthony Atkinson and Thomas Piketty (income and wealth inequality), Robert Boyer, Michel Aglietta and Jacques Mazier (*régulation* theory), Wynne Godley and Marc Lavoie (stock-flow modeling),

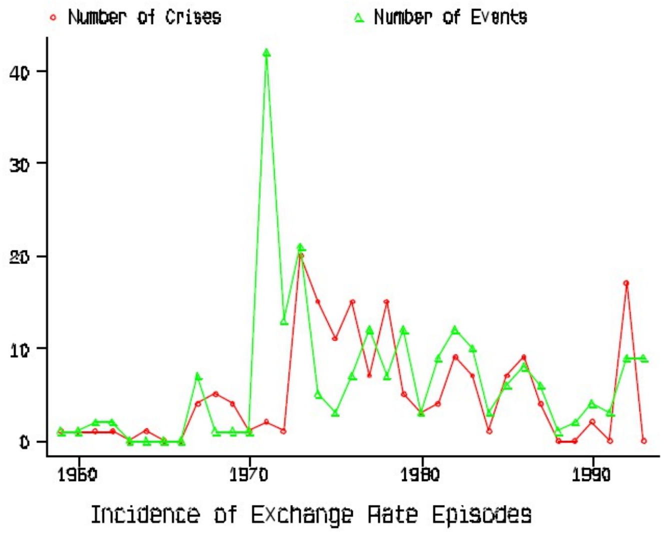

Figure 4.1 – The Timing of Speculative Attacks. Source: Eichengreen, Rose and Wyplosz (1995), p. 68.

Having said that, it is also worth highlighting that ERW provide support for our hypothesis that crises are more frequent since the Nixon shock. Figure 4.1 is a reproduction of figure 6 in their article, and it shows that the number of exchange rate-related crises –red line+circles– after 1971 (more specifically, after 1973) is substantially higher than before that year. A critical economist (sic) may argue that not all exchange rate-related crises may qualify as a general crisis. However, as our analysis in chapter 1 showed, the collapse of the Bretton Woods system allowed the dollar to depreciate, which in turn led to a fall in the dollar-denominated profits of oil-exporting countries and their consequent retaliation in the form of embargoes and price-hikes, which ultimately led the Federal Reserve to raise interest rates to exorbitant levels in order to tame inflation. Since virtually all other central banks in the world (including even the Soviet Union) held dollars in their vaults, and given that capital mobility was commonplace by then, this forced incumbent economies to do likewise in order to defend their currencies. Therefore, we believe that, even if not all currency crises are general economic crises, they do matter, perhaps more so than we would imagine.

Christopher Sims (macroeconomics, econometrics); as well as other not-so-contemporary economists such as Keynes and Kalecki (no need for a list, see chapter 2), James Tobin (macroeconomics, macro-modeling, Q theory), Lawrence Klein, Trygve Haavelmo and Jan Tinbergen (structural modeling), among others.

Modeling issues

Now, leaving this discussion aside for the moment[4], let us focus on modeling issues, other than the ones seen in the previous parts. The previous chapter aimed at providing a taste of how stock-flow models can be useful for analysis and policymaking, trying to touch upon as many technical details as possible and dealing with its advantages and limitations so that the inexperienced reader is able to follow[5]. One of the major drawbacks of this simulation technique is that it is still mostly (though not exclusively) used for theoretical purposes, rather than in an applied sense. As mentioned before, the models proposed by the Levy Institute of Bard College are an important exception.

A close methodological ally that helps building a bridge between theory-based modeling à la Godley-Lavoie and empirical estimates is the good old Cowles Commission approach to macro-econometrics. As seen in chapter 2, one of the main problems Cowles modelers faced back then (1930s-1970s) was the lack of adequate data, in the sense that some time series were not long enough (i.e. they were available for a short span and/or only annually) or they would not even exist (i.e. stocks[6]).

We are of the belief that the falling from grace of this *complete* approach (in the sense just described) to empirical modeling is linked to the Monetarist counter revolution that was thought of as having beaten the (broadly speaking) Keynesian consensus. Fortunately, however, both the lack of data and the 'whispers and giggles'[7] about Keynes and Keynesians[8] made by competing schools of thought are being seriously dealt with and challenged; the former by statisticians, the latter by the economics profession and even public opinion and politicians (with the unfortunate important exception of top ranked European Union officials).

Without further ados, let us now describe our system of equations, explanation throughout which we hope not to bore the reader. Bearing in mind that this is indeed a necessary step, readers who are not familiar with economic theory may find it more

[4]We will come back to this issue in our conclusions in the last chapter.

[5]The interested reader will find a much more thorough description in the pedagogical work of Godley and Lavoie 2007 and all the references cited therein.

[6]Clearly, we refer here to *stocks* not in the sense of equity as a financial instrument, but to an aggregate measure of *all* financial instruments in the form of accumulated wealth, from which naturally the stock-flow approach derives (see for instance Clower 1954).

[7]"Robert Lucas, famously, declared–approvingly!–that participants in seminars would start to 'whisper and giggle' whenever anyone presented Keynesian ideas. Keynes, and anyone who invoked Keynes, was banned from any classrooms and professional journals" (Krugman 2012, p. 55).

[8]Note that we do not refer here to Kalecki and Kaleckians. This is so, *not* because we ignore the size of Kalecki's legacy (clearly we do not), but because the contributions of the latter author have been olympically ignored by the mainstream, despite their relevance.

difficult to digest than a research-oriented economist and may want to jump straight to the results (in which case, see chapter 6). It must be noted that, despite the difficulty of the task, we tried to keep the presentation as simple as possible. All relevant details concerning this and other technicalities are presented in the Appendix.

4.2 Transactions, capital accounts, balance sheets and equations

A few details are in order which will make the reading of our system of equations easier. First, all equations are fully described in section A.2 of the appendix, and we focus here on the core variables of the system and on the ones that are given a special treatment, given that it would make little sense in explaining the same specification the number of times it appears in the text. Our motivation for proceeding in this way is mainly pedagogical, given the large amount of information and technical details contained in the model. Now, given our interest in providing the most detailed account of the whole procedure in the modeling exercise, we present the basics of the equations of the composed variables (ratios and products, mainly) in the same way that we introduced them in the software, which in turn ensures that the left-most and/or upper-most variable on the left-hand side of the equation is the one accounted for in the system[9]. Naturally, every variable is included only once and there is an unwritten equation (i.e. the one that ensures accounting consistency in flow form).

Closing financial accounts

In order to guarantee the equilibrium for the financial account of each sector, we selected an instrument to *close* the capital account of the corresponding institutional sector. By way of example, if sector 1 has a balance sheet made up of instruments A and B as assets, as well as C and D as liabilities (naturally in stock form), with prices p_a, p_b, p_c and p_d respectively, and if we were to close the financial account (which is in flow form) of this sector using A, then we would have to write $\Delta A \times p_a = p_c \Delta C + p_d \Delta D - p_b \Delta B + S$, where S are savings of the corresponding institutional sector. The inclusion of S in the closing

[9]As seen in section A.2, when flows (which are preceded by the symbol Δ on the volume terms, the part explained in the corresponding equation) are presented, the left-hand side of the corresponding volume is separated by the given price by a $\times$ symbol. This is done in order to avoid confusion between expressions $p\Delta V$ and ΔpV, given that the latter may give the false impression that both price and volume are differentiated.

equations is very important for the system as a whole, and stems from the accounting identity $S = KA$, where KA is the capital account of the sector.

Clearly, these closing variables are links of the financial and real sides of the economy. So, for households and firms we *closed* their financial account using the flow of equities held, for the government we closed its financial account using the flow of bonds issued, for banks the choice was equities issued, and for the rest of the world the closing variable was equities held.

Now, since all sectors are stock-flow consistent[10], we must close the system as a whole. In order to do this, we also had to select a closing variable. This was not an easy choice, given that there is no "natural" candidate variables. The closing variable selected for flows was the current account for France as a whole[11]. Stocks, on the other hand, were 'closed' using the equities issued by the rest of the world. The closure for revaluation effects was done on the debt liabilities of the rest of the world. At this point we are unable to provide another justification for the relative arbitrariness of our decision concerning the closing variables other than the sole fact that they must be present in the model, and that one must be chosen to do the job.

System properties

Even if our system of equations is considered to be of medium size (compared to existing structural models for France, such as *MESANGE* or *OPALE* built and used by *INSEE* and the French Ministry of Finance), it contains 365 equations in the software, of which only 308 (the relevant ones) are shown in the Appendix. Therefore, in order to make it easier for the reader to follow, we deliberately make omission of some equations which are not crucial for the analysis but are clearly useful for the system to be stock-flow consistent. We present in this part roughly a third of the total number of equations. The reader

[10] This is in fact another area in which we intend to innovate in the empirical stock-flow literature. In the above paragraph, we described the procedure for *closing* flows only. However, it must be noted that what we did for flows in the example, is also feasible for *stocks* (with the important difference that there is no "stock equivalent" of savings other than wealth itself), *revaluation effects* and *other changes in volume*. The inclusion of stocks and revaluation effects are well known in the existing stock-flow literature, but this has not been the case of the category *other changes in volume*; OCV. This is a reflection of the fact that (1) most models are theoretical (thus, there is no need for an equilibrating term), and perhaps also that (2) OCV have no straightforward theoretical interpretation. The second point may be a misconception which perhaps deserves further research. For ease of treatment, however, our presentation of the system ignores other changes in volume, but we do treat these elements explicitly in the EViews program.

[11] The closing line is equation A.306 (the last one in the system), which displays the French current account with a negative sign (i.e. the current account of the rest of the world), and naturally equals the capital account of the French private and public sector; another key identity. This is, of course, in line with the derivation of the *BP* curve in Mundell-Flemming like models, whereby $CA = -KA$.

interested in the detailed version of the model may have access to the program files and the database from the author upon request, with the hope that we will be able to make a public version in a website anytime soon.

The natural starting point of the presentation of our system of equations is the volume of Gross Domestic Product by the demand approach[12] (Y), which is described in equation 4.1. This item is equal to the sum of personal consumption (C), investment (I[13]), government current expenditure (G) and exports (X) less imports (M). As is common practice in the Stock-Flow literature, we drop time subscripts and add a subscript $-p$ (without the t) whenever we refer to p lagged values of the corresponding variable.

$$Y = C + I + G + X - M \tag{4.1}$$

The system provides a detailed description of each element in this equation[14], and the determinants of these elements. We carry out our presentation by sector, beginning each corresponding section by describing the uses-resources tables (transactions), followed by a description of balance sheets and consolidation tables. We also present the matrix of financial flows only for households, by way of example of what these and other matrices (revaluation and OCV) look like in the system. Once this is done, we move on to describe the shape of the equations from the corresponding tables. The complete description of the inter-linkages across and among sectors between their uses-resources and their flows of financial assets are provided in the file (available upon request at this point) labeled Model_data.xls, more precisely in the sheet "Matrix Transactions and Flows". The same file contains the database and other technical details, which might be particularly useful for modelers.

Thus, personal consumption and household investment, as well as their financial and non-financial determinants, are specified in subsection 4.2.2. In 4.2.3 we describe the equations of the items that make up non-financial firms' investment. Some general equations are then presented in 4.2.4. These correspond more precisely to the labor and foreign exchange markets, which concern all sectors. In part 4.2.5 we show the equations which determine government current and investment expenditure. Those describing the behavior of financial institutions (*Banque de France* and private banks) are presented in part 4.2.6. In 4.2.7 we show the equations defining the links with respect to the rest of

[12]Since our database is accounting-consistent, demand approach *GDP* equals output by the supply and income approaches.

[13]Note: investment expenditures are carried out by non-financial firms, households and the government. This will be detailed below.

[14]For ease of comprehension of our nomenclature, see the list provided in A.3 in the appendix.

the world. But before getting there, please read the notational issues in the next part.

4.2.1 Notation

A natural step in our explanation of the system of equations used in the modeling exercise is making it comprehensible. This subsection deals exclusively with the notation in the final output. That is, we present here the details of how to interpret each element of the system, from the point of view of the present document. A second notation corresponds to the EViews programs used in the actual elaboration of the model, which we tried to keep as simple as possible after several trials and errors (although some of the latter may remain) and in line with the former. This is so because the .pdf documentation contains subscripts and superscripts which are not (to our knowledge) possible to integrate in a statistical software package, so that these were included preceded by underscores in the database and in the programs that treat the variables.

Transactions

In order of appearance in the following subsections, we first distinguish between current transactions expressed in value and in volume, both of which are expressed with capital letters[15]. When the value of the corresponding item is made up of price and volume (for instance, consumption) we note the corresponding volume with a capital C and its price by lowercase p followed by a subscript c, so that the **value of consumption** is expressed as

$$p_c C$$

In the case of a transaction that is particular to a given sector (for instance, firms' investment) we follow the same procedure, but for items not containing prices, as well as for volumes, we simply add a subscript with the first (capital) letter of the given sector to the right of the item. Since some prices are often particular to the corresponding sector, we add the same first letter of the corresponding sector but in lowercase and as a superscript, so that firms' investment (from the perspective of the national accounts, more on this below) is expressed as

$$p_i^f I_F$$

[15]The only value item that is *not* written with standard alphabetical characters is profits, which are denoted with a capital pi (Π).

Several non-estimated parameters appear throughout the system. For instance, the very first of these is α_h in equation A.1, where $VA_H = \alpha_h VA$ means that the value added (i.e. the output) of households is a given share of total value added (VA). To avoid confusion, we do not treat α_h as a single *given* value through time, but as the ratio of VA_H to VA, which are obtained from the national accounts and, since both are times series, so is the corresponding intermediary parameter α_h. A similar procedure is done for wages, taxes, dividends, contributions, depreciation and other series.

All items INT[16] (which stands for interests) in the system contain an interest rate (except the corresponding closing line), that are written either as r or i. The former stands for an interest rate received, whereas the latter shows that the rate is paid by the corresponding institutional sector. Thus, equation 4.127 is read as the **value of interest payments received by households on deposits**

$$INT_H^r$$

with i_d^h being the corresponding interest rate, and where the subscript d stands for deposits.

On the other hand, equation 4.4 is the **value of interest payments paid by households on loans**

$$INT_H^p$$

with r_l^h the interest rate on loans, where the subscript l stands for loans. Clearly, superscripts r and p stand for received and paid, respectively. A similar reasoning is applied to dividends. See for instance equation A.8 (DIV_H^r), the dividends received by households.

Financial and non-financial instruments

The treatment of non-financial assets and financial instruments follows the same logic, although things get slightly complicated by the fact that these items are expressed in four different forms: stocks, flows, revaluation effects and other changes in volume. Let us attempt to kill two birds with one stone by illustrating this point while at the same time explaining a particular stock-flow empirical issue which has to do with investment.

By way of example, non financial firms carry out investment, and the value of this item appears both in the national accounts and in the balance sheets of this institutional

[16] The following applies to all series INT except INT_B^r.

sector. In the former, it is a fundamental part of the national income identity ($p_i^f I_F$). In contrast, concerning balance sheets, from one accounting period to the next the value of this item accrues to firms' (and, as a consequence, national) wealth; $p_k^f \Delta K_F$, with p_k^f being the price of non-financial assets, K_F being the volume, and Δ a time difference factor. One may be misled into thinking that because this is so, prices and volumes of investment in both accounts are the same[17].

Unfortunately, this is not the case, and the only identity that holds is $p_i^f I_F = p_k^f \Delta K_F$ (equation A.68), with prices and volumes of investment on both accounts being different series. This is so mainly because p_k^f contains the prices of land (as seen in Figure 1.3, this is a very volatile variable), whereas p_i^f does not[18]. For further references and technical details see the E. C. Eurostat 2010, the official manual and guidelines of accounting in the European Union.

Having mentioned the treatment of investment, let us now go back to how this variable is embedded in the corresponding stock of non-financial capital, and how this is affected by flows, revaluation effects and other changes in volume. As said before, the **flow of capital of firms** is expressed as

$$p_k^f \Delta K_F$$

and it accrues to $p_k^f K_F$, where K_F is the volume of the stock of non-financial assets held by firms. Revaluation effects are in turn expressed as $K_{F-1} \Delta p_k^f$. Other changes in volume (OCV) are equilibrating terms that are necessary for the accounts to be well consolidated. As a consequence, the latter term is necessary, although it does not have a proper theoretical interpretation, which is the reason why we did not include this term in the presentation explicitly[19].

The calculation of prices out of revaluations and stocks is straightforward, but for a thorough explanation of how we computed these see A.1.6 in the appendix. At this point, it is worth mentioning that the prices of financial and non-financial assets are not found explicitly in either *Banque de France* or *INSEE*, so that computation of these items was compulsory. Interestingly, this complication was rather an advantage, given that (1)

[17] Even if this treatment were correct, one must bear in mind that changes in inventories have to be deducted in the national accounts for this item to match its counterpart in the balance sheets.

[18] "The costs of ownership transfer on non-produced assets other than land are shown separately in the capital account, and treated as gross fixed capital formation, but in the balance sheets such costs are incorporated in the value of the asset to which they relate even though the asset is non-produced" E. C. Eurostat 2010, p. 175. For the purposes of national accounting, the price of land is not included, but it should be noted that this item is of major importance for balance sheets.

[19] In fact, these items and the adjustment terms were treated as shares of *GDP*, unless otherwise stated.

it allowed us to compute prices that are consistent with the accounts[20], and (2) it also allowed us to calculate implicit prices for items which normally have no explicit price; deposits and loans.

Categorization and further assumptions

We assume there are only four of the seven categories of financial instruments in the French economy. We lumped together monetary gold and special drawing rights (AF.1) along with currency and deposits (AF.2) under the heading D (where D stands for deposits). Securities (AF.3), given their complicated nature, were treated as they are under the heading B (stands for bonds). We also lumped together loans (AF.4) and other accounts receivable/payable (AF.7[21]) into L (stands for loans), as well as equity and investment fund shares or units (AF.5) and insurance, pension and standardized guarantee schemes (AF.6) into E (stands for equity).

As in the case of current transactions, the values of these financial instruments are separated into price and volume, with an important difference. Since these instruments can either be on the asset side or on the liability side, we added an extra lowercase subscript for prices indicating whether the price of the corresponding item is an asset (a) or a liability (l), and an uppercase superscript to volumes (either A or L). By way of example, the **value of deposits held by households** is expressed as

$$p^h_{d_a} D^A_H$$

whereas the **value of household debt liabilities** are

$$p^h_{l_l} L^L_H$$

A final note on financial instruments. Given that these are separated into domestic and foreign currency, we added yet another subscript to prices and volumes, indicating whether they are in domestic currency (e, i.e. euros) or foreign currency (f). It must be noted that prices for instruments denominated in domestic currency are the same than those for totals. This is a matter of convenience, given that further separating prices would imply the introduction of around 40 more equations and their corresponding treatment. We did not proceed in this way for three reasons: (1) it is beyond our purposes,

[20]Of particular importance is the fact that the price of equities issued by non-financial firms mimics strongly the *CAC 40* index.

[21]Note: we use the system previous to 2010, so that this item is AF.7, and not AF.8 as is currently the case.

(2) 'national' prices of financial instruments strongly follow the evolution of totals, and (3) by the time of writing time itself was not so much on our side. Let us now move on to the core of the model.

A quick note before beginning, since the household sector is the first for which the equations are described, and given the uniformity with which the rest of the sectors were treated, we will dedicate more space to this sector than to the others, in order to avoid making extra subsections explaining the methodology so that we can then focus on peculiarities for each sector.

4.2.2 Households

Households are made up of individual entrepreneurs and non-entrepreneurs (alternatively non-capitalist working class). The main obvious distinction is that the main revenue of non-entrepreneurs stems from wages (in some cases also out of benefits and transfers), whereas a large part of the revenue and wealth of individual entrepreneurs comes from financial assets[22]. *INSEE* provides data for both types of households for the production and operating accounts, though not for the other accounts. In our attempt to simplify the system, we treat the items of households and non-profit organizations at the service of households (*NPISH*) as a whole in this section under the heading of the former institutional sector. In other words, we lumped together all the items of households and *NPISH* together, and we treated them as if we were only dealing with households[23].

Households' uses-resources

Following Table 4.1 below, individual entrepreneurs (and *NPISH*) carry out production activities and buy intermediate goods (both of which are treated as exogenous), the difference between the two is the sector's value added ($p_{va}VA_H$). In this process they pay wages (W_{H_H}) to their workers and taxes on production and imports (T_{2_H}) to the government.

As shown in the table, the difference between value added, on the one hand, and taxes and wages paid, on the other, makes up individual entrepreneurs' profits (Π_H). The sum of these profits, wages received (W_H), interests (INT_H^r), dividends (DIV_H^r) and social security and insurance benefits received (SB_H), less interests (INT_H^p), contributions (SC_H)

[22] In the case of the upper brackets, equity.

[23] Needless to mention, this is yet another oversimplification. However, it must be noted that the weight of this sector is quite small and, however small it may be, if we ignore it, our model would not be complete and accounting consistency would not be guaranteed.

		Uses	**Resources**
	Value added		$p_{va}VA_H$
−	*Wages paid*	W_{H_H}	
−	*Taxes on production and imports*	T_{2_H}	
=	***Individual entrepreneurs' profits***		Π_H
+	*Wages received*		W_H
−/+	*Interests*	INT_H^p	INT_H^r
+	*Dividends*		DIV_H^r
+	*Social security benefits*		SB_H
−	*Social security contributions paid*	SC_H	
−	*Income tax*	T_{3_H}	
=	***Disposable income***		Y_d^{H*}
−	*Consumption*	p_cC	
=	***Saving***		S_H
−	*Gross investment*	$p_i^hI_H$	
=	***Households' financing capacity***		FC_H

Table 4.1 – Households' uses-resources. * When and if social transfers in kind are considered, these are added to disposable income, and the corresponding item is adjusted disposable income[a].

[a]We believe that this is a particularly important item for the French economy that is, in turn, close to being negligible in other economies. Indeed, in the absence or quasi-absence of social transfers (as is the case, for instance, in several countries in Latin America or Africa) aggregate demand and consumption habits will tend to be less dynamic than in the presence of such transfers.

and income taxes paid (T_{3_H}), makes up the sector's disposable income (Y_d^H). At this point of our work, unfortunately we are unable to draw distinctions among income brackets. In other words, we cannot distinguish between the poorest (say) 10% individuals in the French population and the richest 10, 1 o 0.1%. We did, however, rely on the Top Incomes database in chapters 1 and 2, but it must be noticed that neither that database is consistent with the national accounts (because its calculations stem from tax records), nor is our treatment of aggregates consistent with it. As a consequence, the Top 1% income share series and the Lorenz-Pareto coefficient are not included in our system. The integration of these data is indeed another issue that deserves further research.

Households' savings (S_H) is the difference between the sector's disposable income and its consumption expenditures (p_cC). Finally, the difference between these savings and their gross investment ($p_i^hI_H$) is their financing capacity[24] (FC_H).

[24]As French households' saving is more important than their investment, they normally have a positive financing capacity.

The terms just mentioned and shown in the table above are described in equations A.1 to A.18 in the appendix, but a few of these deserve explicit mention in this part, given that they are not derived from identities. Thus, households' value added are defined as a changing proportion α_h of total value added. Wages and taxes paid by this sector are in turn defined as a proportion of total value added (VA_H). Profits are defined as in the identity shown in Table 4.1.

Equation 4.2 shows that wages received by households (W_H) are the sum of wages paid by firms, households and the government (W_{paid}) and those paid by the rest of the world (W_R). Interests received by this institutional sector (eq. 4.3) are defined as the product of the corresponding interest rate (i_d^h) and the value of the stock of deposits ($p_{d_a}^h D_H^A$) held from the previous period. Interests paid (eq. 4.4) are calculated in a similar fashion, with the difference that the interest rate paid (r_l^h) is multiplied by the previous period's stock of debt ($p_{l_l}^h L_H^L$). Dividends (eq. 4.5) are in turn a proportion ψ_1 of the previous period's stock of equities held ($p_{e_a}^h E_H^A$).

$$W_H = W_{paid} + W_R \tag{4.2}$$

$$INT_H^r = i_d^h(p_{d_a-1}^h D_{H-1}^A) \tag{4.3}$$

$$INT_H^p = r_l^h(p_{l_l-1}^h L_{H-1}^L) \tag{4.4}$$

$$DIV_H^r = \psi_1(p_{e_a-1}^h E_{H-1}^A) \tag{4.5}$$

Social security benefits received by households (eq. 4.6) are the closing (row) line for the corresponding item. That is, SB_H is the sum of social security benefits paid by the government, firms[25], banks less those received by the rest of the world. Social security contributions (SC_H) are a proportion[26] ψ_2 of wages and salaries received by households. Income taxes paid (eq. 4.8) are a proportion of taxable income, which is defined as household disposable income before this type of taxes are deducted. Disposable income

[25]This is simply an accounting convention. In fact, neither firms nor banks pay these benefits *per se*. What happens instead is that, since workers (in the present work, an imperfect synonym for households) pay contributions during their active life, once these are paid back to those who are retired, the corresponding amount is discounted from firms' accounts. In fact, the bulk of these are paid through the account *social assistance benefits in cash*. We also lumped together this item and transfers, the bulk of which comes from the account *miscellaneous current transfers*. Therefore, both items together (grouped under the heading social benefits, SB) represent pensions and voluntary contributions.

[26]We remind the reader that parameters like the one described in this item, change over time.

was defined above.

$$SB_H = SB_F + SB_B + SB_G - SB_R \tag{4.6}$$

$$SC_H = \psi_2 W_H \tag{4.7}$$

$$T_{3_H} = t_{3_h}(\Pi_{H-4} + W_{H-4} + INT_{H-4} + DIV_{H-4} + SB_{H-4} - SC_{H-4}) \tag{4.8}$$

Personal consumption (eq. 4.9) is a behavioral equation that depends on disposable income and on wealth (see the discussion in subsection 2.1.3), which is in turn divided into housing ($p_k^h K_H$) and financial wealth ($p_{e_a}^h E_H^A$) properly deflated with the consumer price index. The former (eq. 4.10) and the price index of households' investment (eq. 4.11) are a function of the *GDP* deflator, which is the behavioral equation described in chapter 2 above and the details of which will be further given in the next chapter (part 5.2.1).

Finally, the identity shown in equation 4.12 says that the value of investment ($p_i^h I_H$), as given in the national accounts, must equal the value of the flow of non-financial assets held by households ($p_k^h \Delta K_H$), the composition of which is shown in the next part.

$$ln(C) = f\left[ln\left(\frac{Y_H^d}{p_c}\right), ln\left(\frac{p_k^h K_H}{p_c}\right), ln\left(\frac{p_{e_a}^h E_H^A}{p_c}\right)\right] \tag{4.9}$$

$$p_c = f(p_y) \tag{4.10}$$

$$p_i^h = f(p_y) \tag{4.11}$$

$$I_H p_i^h = p_k^h \Delta K_H \tag{4.12}$$

Households' wealth

Households' wealth comes mostly from the homes they own[27], whose outstanding value at a given period t comes mostly in the form of a stock of non-financial assets they hold ($p_k^h K_H$, also alternatively called physical capital). They also hold a stock of deposits ($p_{d_a}^h D_H^A$) and a stock of equity ($p_{e_a}^h E_H^A$). On their liability side, they contract debts ($p_{l_l}^h L_H^L$), which are mainly used to finance their demand for housing and their financial accumulation (i.e. equity). The difference between their assets and liabilities is their net wealth (NW_H). These items are represented in Table 4.2.

		Asset	**Liability**
	Non-financial assets	$p_k^h K_H$	
+	*Deposits*	$p_{d_a}^h D_H^A$	
+	*Equity*	$p_{e_a}^h E_H^A$	
−	*Credit*		$p_{l_l}^h L_H^L$
=	***Net wealth***		NW_H

Table 4.2 – Households' balance sheet.

The *balance sheet* matrix of households shown in Table 4.2 has three complementary matrices with which it must be consolidated; a *flow* (or capital account) matrix, a *revaluation* matrix and an *other changes in volume* matrix. We omit the description of the last two in order to save space and keep the description as simple as possible. We also describe the flow matrix only for this institutional sector and not for the remaining ones, given that a derivation of it would be straightforward once we follow a first example.

When the volume of the corresponding financial instrument is preceded by Δ it is considered a flow. It should be noted that, normally, we would have that the change in the value of a stock from one period to the next are due to changes in both volumes and prices, i.e. $\Delta(P_t Q_t) = P_t Q_t - P_t \Delta Q_t - Q_{t-1}\Delta P_t - P_{t-1} Q_{t-1}$. Nevertheless, as shown in Table 4.4 an important equilibrating element in the accounts are the variables "other changes in volume"[28]. This in turn implies that changes in volume are considered in two terms; "flows" and "other changes in volume". If we take into consideration this caveat, then

[27] Individual entrepreneurs may *also* hold equipment. However, our analysis focuses on the main activity of institutional sectors, leaving aside secondary roles, however important these may be. In fact, this applies mainly to households and firms, given that banks are intermediaries and the government (at least in theory) looks after society as a whole by redistributing resources. Thus, we leave the study of French households as producers slightly aside, at least for the current version.

[28] See also *Box I* in Couleaud, Mauro, and Delamarre 2012 and page 233 of the European Commission Eurostat 2013.

it would be evident that $P_t \Delta Q_t \neq P_t Q_t - P_t Q_{t-1}$. However, despite the inexactness and inconvenience of the inclusion of such necessary term, we stick to using Δ in the flow term only for ease of exposition[29].

		Asset	**Liability**
	Non-financial assets	$p^h_k \Delta K_H$	
+	*Deposits*	$p^h_{d_a} \Delta D^A_H$	
+	*Equity*	$p^h_{e_a} \Delta E^A_H$	
−	*Credit*		$p^h_{l_l} \Delta L^L_H$
=	***Balance***		Bal_H

Table 4.3 – Households' capital flows.

As seen in Table 4.3, flows are the changes in value due to changes in volume from one period to the next of the corresponding asset/liability, and the balance between the two is represented by Bal_H. This last item may alternatively be called the capital account of the sector in question, and equals the sum of S_H and Aj_H. In other words, this identity is the link between the real and the financial series for households. This, of course, is also the case for the other institutional sectors.

Given that flows, revaluation effects and "other changes in volume" make up stocks, a consolidation between these four items is in order. Table 4.4 shows that the stock of non-financial assets (*NFA*) held by households at period t ($p^h_k K_H$), equals the previous period's stock of non-financial assets ($p^h_{k-1} K_{H-1}$), plus their flow of physical capital between the two periods ($p^h_k \Delta K_H$), plus a revaluation effect[30] ($4K_{H-1} \Delta p^h_k$) and other changes in volume (OCV^H_K). The same reasoning applies for the other assets/liabilities, with the single difference that physical capital suffers wear and tear (fixed capital consumption; FCC_H) from $t-1$ to t. At this point, we do not show our treatment of the terms *other changes in volume* in the present chapter. These terms are, however, treated explicitly in the computer code in order to guarantee accounting consistency[31].

[29]Note, when the given stock term is preceded by the symbol Δ, the item is considered a flow, whereas if the stock term is in parentheses and the symbol Δ lies outside of it, this means that it is the stock term differenced. As we just saw, these are not the same and we do this in order to keep the notation of flows as standard as possible.

[30]The fact that the revaluation term is multiplied by four may seem counterintuitive. However, as mentioned above, we remind the reader that volumes of stocks were brought to quarters. Since this is the case, in order to compensate for this by the time of calculating price indexes (which we do in some equations when prompted) the calculations do not add up to a figure which is a fourth of the actual. For more details, see below.

[31]These terms were calculated as percentages of *GDP*, with some exceptions.

		Stock $t-1$	+ **Flow**	− **FCC**	+ **Revaluation**	+ **OCV**	= **Stock** t
	NFA	$p^h_{k-1}K_{H-1}$	$p^h_k\Delta K_H$	FCC_H	$4K_{H-1}\Delta p^h_k$	OCV^H_K	$p^h_k K_H$
+	*Deposits*	$p^h_{d_a-1}D^A_{H-1}$	$p^h_{d_a}\Delta D^A_H$		$4D^A_{H-1}\Delta p^h_{d_a}$	$OCV^H_{D_A}$	$p^h_{d_a}D^A_H$
+	*Equity*	$p^h_{e_a-1}E^A_{H-1}$	$p^h_{e_a}\Delta E^A_H$		$4E^A_{H-1}\Delta p^h_{e_a}$	$OCV^H_{E_A}$	$p^h_{e_a}E^A_H$
−	*Credit*	$p^h_{l_l-1}L^L_{H-1}$	$p^h_{l_l}\Delta L^L_H$		$4L^L_{H-1}\Delta p^h_{l_l}$	$OCV^H_{L_L}$	$p^h_{l_l}L^L_H$
=	***Balance***	NW_{H-1}	Bal_H	FCC_H	rev_H	OCV_H	NW_H

Table 4.4 – Households' stock-flow consolidation.

An important note is in order here which has to do with how financial accounts data were handled. The values of the items described in the table are all available quarterly (though annualized) from *Banque de France* except for stocks. As mentioned before, in order to solve this problem, we used the technique proposed by Denton 1971, which guarantees that the sum of the values in a given series brought to quarters equals the annual stock figures. This was a particularly important first step for the system to be consistent[32].

For instance, since we were interested in computing the profit rate of firms, we needed to have quarterly series in both numerator and denominator. Had we not brought the stock of firms' non-financial assets to quarters, then we would have had a profit rate which is four times as low from its adequate scale and value, given that profits (the numerator and a flow concept) is available quarterly from the national accounts, whereas in that hypothetical case we would have that non-financial assets (the denominator) is four times larger. In fact, this transformation of stocks from annual to quarters is the reason why we multiplied by 4 the corresponding revaluation terms, mentioned above (otherwise, following the example of the profit rate, this series would be 4 times larger).

We believe that the sixth column of Table 4.4 is not so straightforward to interpret, not even for those familiar with the stock-flow literature. So, a word about it is necessary. The second row of that column shows the revaluation effect of non-financial assets held by households, and this item is the product of four times the volume of the stock of the corresponding asset lagged one period, times the change in the price of the instrument. The third row of the sixth column from the corresponding Table shows the revaluation effect of the deposits held by households.

The last row of Table 4.4 shows the corresponding totals of each matrix. The balance

[32]Another great advantage of bringing annual series to quarters is that we were able to carry out econometric models using these data, which quadruples the number of observations in our sample under analysis while at the same time it makes it more reliable (following the law of large numbers).

of the column "Stock $t-1$" is households' net worth of the previous quarter (NW_{H-1}). The balance of the column "Flow" measures the change in value of the assets held by households from quarter $t-1$ to t due to a change in volume, which includes quantity and quality effects (see Piriou and Bournay 2012). It is represented by Bal_H, and is (as mentioned above) the link between the financial account and the transactions carried out by households. The balance of the column "Revaluation" are changes in the value of assets/liabilities due to changes in their corresponding price. As mentioned above, perhaps the balance of the column OCV has no particular meaning (from a theoretical point of view), since its purpose in the financial accounts is to equilibrate stocks, flows and revaluations, while at the same time ensuring that accounting equilibrium persists among and across sectors and periods.

Throughout the equations defining the behavior of households concerning their financial assets the reader will notice that, in order to guarantee accounting consistency, we assumed that the flow of equities held by households are determined as a balancing equation. That is, as the difference between their saving and debt liabilities and the other assets they hold[33]. We could have, in principle, determined as a balancing equation households' debt, but since we are more interested in the determination of their demand for credit (which is highly dependent on the evolution of interest rates, see chapter 1, part 1.1.2) we preferred to estimate an equation for this variable instead of their financial accumulation. As will be seen in our estimations and in our discussion, there is reason to believe that the evolution of credit demand has been a key determinant (though not the only one) of housing bubbles.

Households' non-financial assets

Equations A.19 to A.22 in the appendix show the specification for the terms that make up households' non-financial assets. Only two out of these four equations are reproduced here in order to make the reading simpler. This procedure of concentrating on key specifications is followed all along the presentation and, as we have insisted several times now, this is done for simplicity.

Equation 4.13 shows that the price of housing (p_k^h alternatively called the price of capital of households) is a function of the demand for dwellings per head (K_H/pop), of the real interest rate ($r_l^h - infl$), and the unemployment rate (u). The demand for housing units (eq. 4.14) is a function of real disposable income per head, the ratio of the price of

[33]Note: by introducing both equations (which we did in order to be able to apply a shock to the financial accumulation of households) the system's consistency is also respected.

capital to the consumer price index, and the unemployment rate. For further details see the discussion in part "Demand for dwellings" of chapter 2.

$$p_k^h = f\left[\left(\frac{K_H}{pop}\right), (r_l^h - infl), u\right] \tag{4.13}$$

$$ln\left(\frac{K_H}{pop}\right) = f\left[ln\left(\frac{Y_H^d/p_c}{pop}\right), ln\left(\frac{p_k^h}{p_c}\right), ln(u)\right] \tag{4.14}$$

Fixed capital consumption (or, alternatively, physical capital depreciation) at period t, is a proportion (δ_k^h) of the stock of capital at $t-1$. Finally, the flow of non-financial assets held by households is defined as the stock-flow identity, derived from Table 4.4. As we warned above, we omit the presentation of the term OCV_K^H, which is in this case defined as a proportion of $p_{va}VA_H$.

Households' deposits held

Equations A.23 to A.32 in the appendix describe the specifications of deposits held by households, and we reproduce these equations in their entirety only for this instrument, given that it is the first one of its kind being described. In contrast to non-financial assets, deposits can be held in either domestic currency (franc before 1999, the euro thereafter) or foreign currency (i.e. a basket of weighted currencies). This calls for a separation of each D element (except other changes in volume) in the consolidation table, which we avoided in order to keep the presentation as simple as possible.

First, it should be noted that both stocks and flows of deposits (eqs. 4.15 and 4.18, respectively) are separated into national and foreign currency, where the stock in foreign currency[34] is properly divided by the exchange rate[35] (x_r). The flow term in foreign currency (second term on the right-hand-side of 4.18) is not divided by the exchange rate because, as equation 4.19 shows, the stock term in foreign currency is already included in it (eq. 4.19), plus a revaluation term described below that is also affected by the exchange rate (see eq. 4.22). Equation 4.17 is the difference between the outstanding amount of the

[34]Note, financial prices or volumes denominated in foreign currency are followed by a(nother) subscript f. In contrast, volumes denominated in domestic currency are followed by a subscript e. We do not distinguish between prices in domestic currency and 'totals', mainly because graphical inspection suggests that their evolution is not so dissimilar. Of course, this leaves open another avenue of improving for the model.

[35]This is important because, if the expected exchange rate devalues (under the current notation, if x_{r*} falls), the value of the assets denominated in foreign currency will rise, compared to those in domestic currency.

stock of deposits (which is a given proportion ψ_4 of current consumption) less the stock of deposits denominated in domestic currency. On the other hand, equation 4.16 shows the total flow of deposits held by households as derived from Table 4.4, less the flow of deposits held in foreign currency.

$$D_H^A p_{d_a}^h = p_{d_a}^h D_{H_e}^A + \frac{p_{d_a f}^h D_{H_f}^A}{x_r} \tag{4.15}$$

$$D_{H_e}^A p_{d_a}^h = p_{d_a - 1}^h D_{H-1}^A + p_{d_a}^h \Delta D_H^A + rev_{d_a}^h - \theta_d^h p_{d_a}^h D_H^A \tag{4.16}$$

$$\frac{D_{H_f}^A p_{d_a f}^h}{x_r} = \psi_4 p_c C - p_{d_a}^h D_{H_e}^A \tag{4.17}$$

$$\Delta D_H^A \times p_{d_a}^h = p_{d_a}^h \Delta D_{H_e}^A + p_{d_a f}^h \Delta D_{H_f}^A \tag{4.18}$$

$$\Delta D_{H_f}^A \times p_{d_a f}^h = \Delta \left(\frac{p_{d_a f}^h D_{H_f}^A}{x_r} \right) + rev_{d_a f}^h \tag{4.19}$$

$$p_{d_a}^h = f(i_d^h) \tag{4.20}$$

$$rev_{d_a}^h = rev_{d_a e}^h + rev_{d_a f}^h \tag{4.21}$$

$$rev_{d_a f}^h = \left(\frac{p_{d_a f-1}^h D_{H_f -1}^A}{x_{r-1}} \right) \frac{\Delta ER}{ER_{-1}} \tag{4.22}$$

$$rev_{d_a e}^h = 4 D_{H-1}^A \Delta p_{d_a}^h - rev_{d_a f}^h \tag{4.23}$$

The implicit price of deposits (eq. 4.20) is an inverse function of the interest rate. As a consequence, whenever a rise in the interest rate occurs, the demand for money (and deposits in general) will fall. The implicit price is, in this case, the transmission channel through which the interest rate influences households' holding of deposits. The revaluation term of this instrument (equation 4.21) is four times the volume of the corresponding stock from the previous period, multiplied by the change in the price, which is the formula shown in the sixth column and third row of Table 4.4, whereas the revaluation term in foreign currency is the corresponding stock from the previous period, times the growth rate of the exchange rate[36]. In order to guarantee that the revaluation term of deposits is the sum of those held in foreign and domestic currency, equation 4.23 is the difference between the former and that in foreign currency.

As is evident from the current discussion, the separation of financial instruments between those denominated in domestic currency and those denominated in foreign currency obliged us to include two extra equations per category. That is, instead of having one equation for stocks, we now have three, and the same applies to flows and revaluation effects[37], which is equivalent to having 11 equations (3 for stocks + 3 for flows + 3 for revaluation effects + 1 for price + 1 for OCV) per financial instrument rather than only four (one of each) before the distinction was made.

This separation is necessary so that the exchange rate can be included in the system, and for this to allow us analyzing the impact of changes in this variable on (1) the current account and (2) the capital account. The effects of the exchange rate on both accounts is rarely studied simultaneously, and modelers usually focus their attention on either one at the time and/or on the determinants of the exchange rate alone.

Households' credit demand

Equation 4.24 shows that this stock is divided in both (national and foreign) currencies. However, it is equation 4.25 the one that is relevant, given that it provides a rationale for the demand for credit (as a ratio of non-financial assets) by this institutional sector that demands it given changes in the ratio of disposable income to the stock of capital, the interest rate, and the rate of financial return. It must be noted that the left-most and upper-most variable in this specification is the volume of the stock of credit in domestic currency, which in turn implies that it is this variable that is determined in the system, while at the same time we are able to guarantee the separation between price and volume, and we are also able to estimate this behavioral equation. The stock of loans contracted in foreign currency (eq. 4.26) is simply a proportion θ_l^h of the total.

$$L_H^L p_{l_l}^h = p_{l_l}^h L_{H_e}^L + \frac{p_{l_l f}^h L_{H_f}^L}{x_r} \tag{4.24}$$

[36]As seen below, the term ER is simply the inverse of x_r. Since this is so, we could have, in principle, omitted the denominators in the equation, given that the product of x_{r-1} and ER_{-1} is unity, but we preferred to keep the notation as straightforward as possible. See the Appendix for the corresponding derivation.

[37]Since the term OCV is simply there to equilibrate the accounts, it would be very difficult to carry out the same separation procedure on these and, as we mentioned several times now, this term has no particular theoretical interpretation.

$$\left(\frac{L^L_{H_e} p^h_{l_l e} + (p^h_{l_l f} L^L_{H_f}/x_r)}{p^h_k K_H}\right) = f\left[ln\left(\frac{Y^d_H}{p^h_k K_H}\right), r^h_l, r^a_{e_h}\right] \tag{4.25}$$

$$\frac{L^L_{H_f} p^h_{l_l f}}{x_r} = \theta^h_l p^h_{l_l} L^L_H \tag{4.26}$$

$$p^h_{l_l} = f(r^h_l, infl) \tag{4.27}$$

The flow of loans contracted by households is defined in the same way as the deposits they hold. That is, as the sum of the flows denominated in national and foreign currency. The latter is defined also in the same fashion: as the sum of the differenced stock of loans in foreign currency and the revaluation effect of loans contracted in foreign currency. The flow of credit issued by households is solved as from Table 4.4. The difference between the two (also as in the case of deposits) is the credit contracted nationally. Equation 4.27 shows that the implicit price of loans is a function of the interest and the inflation rates. Naturally, the results of these are presented in the next chapter. The remaining equations for the revaluation effects are also written following the same login as that of deposits.

Households' equities held and financial return

Equation 4.28 shows that the volume of the stock of equities, as a ratio of output, is determined by the rate of financial return ($r^a_{e_h}$, as defined by Lavoie and Godley 2001, see below), the value of debt as proportion of disposable income, and of the real interest rate. The part of financial wealth held by households in foreign currency are a proportion ($\theta^h_{e_a}$) of the total, and the difference between the two (eq. 4.30) is the part held in domestic currency only.

$$\frac{E^A_H}{Y} = f\left[r^a_{e_h}, \left(\frac{p^h_{l_l} L^L_H}{Y^h_d}\right), (r^l_h - infl)\right] \tag{4.28}$$

$$\frac{E^A_{H_f} p^h_{e_a f}}{x_r} = \theta^h_{e_a} p^h_{e_a} E^A_H \tag{4.29}$$

$$E^A_{H_e} p^h_{e_a} = p^h_{e_a} E^A_H - \frac{E^A_{H_f} p^h_{e_a f}}{x_r} \tag{4.30}$$

The flow of this instrument is again separated into national and foreign currency as in the case of deposits, and the part in foreign currency as the sum of the corresponding stock differenced and the revaluation effect. What is actually relevant in this case is that, as we mentioned previously, the closing (column) line for households is this financial instrument. Thus, equation 4.31 makes explicit the fact that the flow of equities held by this sector in domestic currency is the difference between the total and that held only in foreign currency, where the former is the difference between liabilities (debt only in this case) and assets (deposits and non-financial assets) plus saving and an adjustment term[38] (Aj_H).

$$\Delta E^A_{H_e} \times p^h_{e_a} = p^h_{l_l} \Delta L^L_H - p^h_{d_a} \Delta D^A_H - p^h_k \Delta K_H + S_H + Aj_H - p^h_{e_a f} \Delta E^A_{H_f} \tag{4.31}$$

The price of equities held by households (eq. 4.32) is a function of the leading price of equities (that is, of those issued by firms). Finally, to conclude the presentation of the equations concerning the financial holdings and debts of this sector, the reader will note that equation 4.33 describes the rate of financial return received by households ($r^a_{e_h}$), which is defined (following Lavoie and Godley, 2001) as the sum of the growth rate of the price of equities and the dividends received per stock of equities from the previous period.

$$p^h_{e_a} = f(p^f_{e_l}) \tag{4.32}$$

$$r^a_{e_h} = \frac{\Delta p^h_{e_a}}{p^h_{e_a-1}} + \frac{DIV^r_H}{p^h_{e_a-1} E^A_{H-1}} \tag{4.33}$$

4.2.3 Firms

Firms' uses-resources

We treat here private non-financial companies (*NFC*) only; non-profit organizations are treated along with households, and financial firms are a separate sector (banks). Table 4.5 shows that *NFC*'s production and intermediate consumption are not considered explicitly. The difference between the two is their value added ($p_{va} VA_F$). As in the case of individual entrepreneurs, firms also pay wages (W_F) and taxes (T_{2_F}), the difference of which is their *gross operating surplus* or gross profits (Π_F).

They pay interests to banks (INT^p_F) and dividends to themselves and other sectors

[38] Reminder, these adjustment terms were set as proportion of the sector's value added or, when the given sector does not produce (i.e. banks and the rest of the world) the term used in *GDP*.

(DIV_F^p). In turn, they also receive interests on their deposit holdings from banks (INT_F^r) and dividends (DIV_F^r) from the equities they hold. The difference between their gross profits and their net received interests and dividends makes up their profits after distribution (Π_F^a). These, less income taxes (T_{3_F}) plus contributions received[39] (SC_F) is their saving or self-financing (S_F). Finally, the difference between their saving and their gross investment ($p_i^f I_F$) is their financing need ($-FC_F$; that is, a negative financing capacity).

		Uses	**Resources**
	Value added		$p_{va}VA_F$
−	*Wages*	W_F	
−	*Taxes on production and imports*	T_{2_F}	
=	***Gross profits***		Π_F
−/+	*Interests*	INT_F^p	INT_F^r
−/+	*Dividends*	DIV_F^p	DIV_F^r
=	***Profits after distribution***		Π_F^a
−	*Income tax*	T_{3_F}	
+	*Social security contributions*		SC_F
−	*Social security benefits*	SB_F	
=	***Firms' saving (self-financing)***		S_F
−	*Gross investment*	$p_i^f I_F$	
=	***Firms' financing need***		$-FC_F$

Table 4.5 – Firms' uses-resources.

Wages paid by firms (eq. 4.34) are defined as total wages paid, less those paid by other households and the government. Taxes on production (T_{2_F} i.e. *VAT*) are a given proportion of value added. The difference between production. Interests paid by firms (eq. 4.36) are defined as the product of the corresponding interest rate (r_l^f) and the difference between the stock of loans and the stock of deposits lagged one period. The dividends paid by this sector (eq. 4.37) are the closing line for all dividends circulating in (or through) the French economy. Dividends received (eq. 4.38) are a proportion ϕ_1 of the equities held by firms.

[39]Piriou and Bournay 2012 (p. 63, our translation) mention that "employers pay social benefits (uses in the distribution account of employers) to employees (resources in the distribution account of households) through *fictitious social security contributions* paid by employees (resources in their distribution account); this is possible because employees received a fictitious 'additional compensation' (resources in the primary income account of households) by employers (uses in the operating account of employers). This convention has the advantage that it includes in the compensation of employees which ultimately make part of the cost of labor for employers and labor income for households" (our italics).

$$W_F = W_{paid} - W_{H_H} - W_G \tag{4.34}$$

$$T_{2_F} = t_{2_f} p_{va} VA_F \tag{4.35}$$

$$INT_F^p = r_l^f (p_{l_l-1}^f L_{F-1}^L - D_{F-1}^A) \tag{4.36}$$

$$DIV_F^p = DIV_F^r + DIV_B^r + DIV_G^r + DIV_H^r + DIV_R^r - DIV_B^p - DIV_R^p \tag{4.37}$$

$$DIV_F^r = \phi_1 (p_{e_a-1}^f E_{F-1}^A) \tag{4.38}$$

Equation 4.39 shows profits after distribution of interests and dividends, and corporate taxes (eq. 4.40) are a proportion t_{3_f} of these lagged one year. Social security contributions (not shown here) are simply defined as proportions of *GDP*.

$$\Pi_F^a = \Pi_F - INT_F^p - DIV_F^p + DIV_F^r \tag{4.39}$$

$$T_{3_F} = t_{3_f} \Pi_{F-4}^a \tag{4.40}$$

The price of investment from the national accounts is a function of the general price level, and this in turn enters the identity that guarantees the equilibrium between investment in the national accounts and the books of firms.

$$p_i^f = f(p_y) \tag{4.41}$$

$$I_F p_i^f = p_k^f \Delta K_F \tag{4.42}$$

Firms' non-financial wealth

Firms hold a stock of non-financial assets ($p_K^f K_F$), a stock of deposits (D_F^A) and a stock of equity ($p_{e_a}^f E_F^A$). They in turn finance their productive activity by contracting debt obligations ($p_{l_l}^f L_F^L$) and by issuing equity[40] ($p_{e_l}^f E_F^L$). These assets and liabilities are shown

[40]The number of financial assets and liabilities were reduced to a minimum so that they can be easily be treated and to simplify the system. For instance, the amount of securities on the liability side of the balance

in Table 4.6.

		Asset	Liability
	Non-financial assets	$p^f_k K_F$	
+	*Deposits*	D^A_F	
+/−	*Equity*	$p^f_{e_a} E^A_F$	$p^f_{e_l} E^L_F$
−	*Credit*		$p^f_{l_l} L^L_F$
=	***Firms' net wealth***		NW_F

Table 4.6 – Firms' balance sheet.

Like in the case for households' wealth, we present the consolidation of firms' *stocks*, *flows*, *revaluation effects* and *other changes in volume*, which are shown in Table 4.7. The term Bal_F equals the sum of S_F and Aj_F.

		Stock $t-1$	+ **Flow**	− **FCC**	+ **Revaluation**	+ **OCV**	= **Stock** t
	NFA	$p^f_{k-1} K_{F-1}$	$p^f_k \Delta K_F$	FCC_F	$4K_{F-1}\Delta p^f_k$	OCV^F_K	$p^f_k K_F$
+	*Deposits*	D^A_{F-1}	ΔD^A_F		$rev^F_{D_A}$	$OCV^F_{D_A}$	D^A_F
+	*Eq. held*	$p^f_{e_a-1} E^A_{F-1}$	$p^f_{e_a} \Delta E^A_F$		$4E^A_{F-1}\Delta p^f_{e_a}$	$OCV^F_{E_A}$	$p^f_{e_a} E^A_F$
−	*Eq. issued*	$p^f_{e_l-1} E^L_{F-1}$	$p^f_{e_l} \Delta E^L_F$		$4E^L_{F-1}\Delta p^f_{e_l}$	$OCV^F_{E_L}$	$p^f_{e_l} E^L_F$
−	*Credit*	$p^f_{l_l-1} L^L_{F-1}$	$p^f_{l_l} \Delta L^L_F$		$4L^L_{F-1}\Delta p^f_{l_l}$	$OCV^F_{L_L}$	$p^f_{l_l} L^L_F$
=	***Balance***	NW_{F-1}	Bal_F	FCC_F	rev_F	OCV_F	NW_F

Table 4.7 – Firms' stock-flow consolidation.

We now turn to describe the elements that make up the stocks, flows and revaluations shown in the table.

Firms' non-financial assets and potential output

Equation 4.43 indicates that the price of non-financial assets held by firms is a function of the housing price described in subsection 4.2.2, and of the interest rate paid by firms. The value of the stock of capital is in turn defined as in Table 4.7, and the corresponding depreciation term (FCC_F) is simply a proportion δ^f_k of the stock of non-financial assets of the previous period. The capital accumulation rate (eq. 4.44, in flow form net of deprecation) is a standard Kaleckian behavioral equation that depends positively on the

sheet of firms was assumed to be null, whereas we lumped this item together with . These simplifications are detailed in the appendix.

output gap (our proxy for capacity utilization), the profit rate ($S_F/p_k^f K_{F-1}$), and negatively on the rate of financial return on equities issued ($r_{e_f}^l$) and the real interest rate ($r_l^f - infl$). The volume of potential production (eq. 4.45) is in turn a proportion k of the volume of capital produced by the three sectors involved in the production process.

$$p_k^f = f(p_k^h, r_l^f) \tag{4.43}$$

$$car = f\left[gap, \left(\frac{S_F}{p_k^f K_{F-1}}\right), r_{e_f}^l, (r_l^f - infl)\right] \tag{4.44}$$

$$Y^p = k(K_H{-}1 + K_F{-}1 + K_G{-}1) \tag{4.45}$$

Firms' deposits held

The stock of deposits held by firms are divided into those denominated in foreign currency and those in domestic currency, where D_F^A is expressed in value given that no implicit price was computed for this series. The first part of this stock expressed in domestic currency (the sum of the first three items in eq. 4.46) is obtained from the consolidation table shown above, from which the part expressed in foreign currency ($\theta_d^f D_F^A$) is deducted. Equation 4.47 is in turn defined as the total (which is in turn a part ϕ_4 of nominal *GDP*), less the previous term.

$$D_{F_e}^A = D_{F-1}^A + \Delta D_F^A + rev_{d_a}^f - \theta_d^f D_F^A \tag{4.46}$$

$$\frac{D_{F_f}^A}{x_r} = \phi_4 p_y Y - D_{F_e}^A \tag{4.47}$$

The flow of deposits held by firms is also divided in the two reference currencies, and the division is made in the standard way shown for the same instrument held by households. The same applies for the revaluation terms, with the difference that, given that no price was calculated for this instrument total revaluation in the revaluation term in domestic currency is obtained as in the consolidation table.

Firms' credit issued

The demand for credit by firms (eq. 4.48) is defined as a function of the financial rate of return, the real interest rate and the share of profits out of national income[41]. Equation 4.49 is used to determine the stock of debt denominated in foreign currency, but we express it in terms of the corresponding amount in domestic currency and the total in order to satisfy the identity $p^f_{l_l} L^L_F = p^f_{l_l} L^L_{F_e} + (p^f_{l_l f} L^L_{F_f})/x_r$. Indeed, note that this second equation is a reformulation, which starts out with the term $L^L_{F_e}$ so that this is the variable determined in the model.

Having said that, this expression is determined by the evolution of the price of equities issued by firms. Our explanation is that firms contract loans in foreign currency given a rise in the cost of issuing equity. Equation 4.50 ensures that the difference between the consolidated stock of debt (total, i.e. $p^f_{l_l -1} L^L_{F-1} + p^f_{l_l} \Delta L^L_F + rev^f_{l_l}$) and that denominated in domestic currency equals $(p^f_{l_l f} L^L_{F_f})/x_r$.

$$\frac{L^L_F p^f_{l_l}}{p^f_k K_F} = f\left[r^f_{e_l}, (r^f_l - infl), \frac{S_F}{p_y Y} \right] \tag{4.48}$$

$$\frac{-L^L_{F_e} p^f_{l_l} + p^f_{l_l} L^L_F}{p^f_{l_l} L^L_F} = f(p^f_{e_l}) \tag{4.49}$$

$$\frac{L^L_{F_f} p^f_{l_l f}}{x_r} = p^f_{l_l -1} L^L_{F-1} + p^f_{l_l} \Delta L^L_F + rev^f_{l_l} - p^f_{l_l} L^L_{F_e} \tag{4.50}$$

The implicit price of credit contracted by firms (eq. 4.51) is a function of the corresponding interest rate and of the inflation rate. The revaluation effects that go with it are in turn defined as in the case of the deposits held by households. That is, the total revaluation term is the sum of the revaluations in foreign and domestic currency, with the former in turn defined as the product of the stock of loans contracted in foreign currency lagged one period and the growth rate of the exchange rate (under the price quotation system).

$$p^f_{l_l} = f(r^f_l, infl) \tag{4.51}$$

[41] We tried to include the profit rate at first, but this proved difficult from a statistical point of view.

Firms' equities held and rate of financial return

This instrument has become the main liability of French firms since the mid-eighties. As in the previous cases, the value of equity is separated in two, depending on whether they are held in domestic or foreign currency. The part (in stock form) that is held in foreign currency is defined in equation 4.52, where the reference term is the one held in local currency. As in the case of debt liabilities seen above, the latter appears with a negative sign and to this we add the total, so that the difference is the former. Equation 4.53 is satisfied through the consolidation table. The total flow of this instrument (eq. 4.54) and the part denominated in foreign currency are set as in previous cases whereas the part accumulated in domestic currency is the closing column for firms' capital account.

The price of equities held by firms (eq. 4.55) is a function of the reference (see next part). Revaluation terms are set as it was the case of deposits held by households and, in order to save space, we refer the reader to part A.2 of the appendix for the details (which are straightforward). Finally, the rate of financial return on equities held (eq. 4.56) are defined as in Lavoie and Godley 2001.

$$\frac{-E^A_{F_e} p^f_{e_a} + p^f_{e_a} E^A_F}{p^f_{e_a} E^A_F} = f\left[\left(\frac{\Delta p^f_{e_a}}{p^f_{e_a-1}}\right) - \left(\frac{\Delta p^{US}_e}{p^{US}_{e-1}}\right)\right] \tag{4.52}$$

$$\frac{E^A_{F_f} p^f_{e_a f}}{x_r} = p^f_{e_a-1} E^A_{F-1} + p^f_{e_a} \Delta E^A_F + rev^f_{e_a} - p^f_{e_a} E^A_{F_e} \tag{4.53}$$

$$\Delta E^A_{F_e} \times p^f_{e_a} = p^f_{l_l} \Delta L^L_F + p^f_{e_l} \Delta E^L_F - \Delta D^A_F + Aj_F + FC_F - p^f_{e_a f} \Delta E^A_{F_f} \tag{4.54}$$

$$p^f_{e_a} = f(p^f_{e_l}) \tag{4.55}$$

$$r^a_{e_f} = \frac{\Delta p^f_{e_a}}{p^f_{e_a-1}} + \frac{DIV^r_F}{p^f_{e_a-1} E^A_{F-1}} \tag{4.56}$$

Firms' equities issued and rate of financial return

All equities issued by French firms are denominated in domestic currency. Naturally, this does not exclude foreign actors from acquiring them. As a consequence of this, the presentation of the elements of this instrument is straightforward, and the revaluation term is here directly defined as in the fifth row/sixth column of Table 4.7.

Thus, for the stock term the estimated specification that was adequate to retain (from a statistical and theoretical point of view) was the ratio of this item and total assets of firms ($p_k^f K_F + D_F^A + p_{e_a}^f E_F^A$), and this is a function of the profit rate ($S_F/p_k^f K_{F-1}$), the real interest rate ($(r_l^f - infl)$) and the rate of financial return on equities issued defined in equation 4.60. The reader will notice that this is the same equation as 3.18 in chapter 3, except that in the model presented there we excluded deposits as a simplification. The flow of equities issued is in turn defined as in the consolidation table above.

$$\frac{E_F^L p_{e_l}^f}{p_k^f K_F + D_F^A + p_{e_a}^f E_F^A} = f\left(\frac{S_F}{p_k^f K_{F-1}}, (r_l^f - infl), r_{e_l}^f\right) \tag{4.57}$$

$$\Delta E_F^L \times p_{e_l}^f = p_{e_l}^f E_F^L - p_{e_l-1}^f E_{F-1}^L - 4E_{F-1}^L \Delta p_{e_l}^f \tag{4.58}$$

$$\frac{p_{e_l}^f}{p_k^f} = f(p_e^{US}, r_l^f) \tag{4.59}$$

$$r_{e_f}^l = \frac{\Delta p_{e_l}^f}{p_{e_l-1}^f} + \frac{DIV_F^p}{p_{e_l-1}^f E_{F-1}^L} \tag{4.60}$$

The leading price of equities (that is, the one on which all other equities depend) is defined as a ratio of the price of physical capital in equation 4.59, where it is shown that it depends on the price of equities in the U.S. (i.e. the *S&P 500* as a proxy for the world reference ’stock’ price) and the nominal interest rate paid by French firms.

Three comments about this specification are in order. The first is that this sort of Tobin’s q[42] specification is the same series shown in Figure 1.6 of chapter 1 and, as we saw in the corresponding discussion, the evolution of this series has followed closely the rate of capital accumulation of French non-financial firms. This is a reflection of the fact that, as firms were estranged from the command of monetary authorities (from the mid-eighties to 2007-08), the *CAC 40* gained strength as a leading indicator for the evolution of private investment. As a consequence, the two variables determining the price of equities issued by French firms depends on the world leading indicator of business confidence (*S&P 500*) and the interest rate.

The second comment is about our choice of this q expressed as a ratio of market replacement prices, instead of values. It should first be noted that the evolution of both series (the q ratio of prices and in values) is virtually the same except for a slight scale

[42] See also the part entitled "Prices of financial instruments" in chapter 2.

difference that has become even narrower after 2000. Secondly, as a technical issue, we were obliged *not* to include volumes in the corresponding formula because when we tried to do so the software would indicate the presence of an 'overflow', which is the term used when the determination of two variables are included on the left-hand side. This is no longer the case in equations 4.57 and 4.59, since the product of price and stock of equities issued appears only in the former.

4.2.4 General Equations

The current section provides a description of some general equations which are not specific to any particular sector.

Production, prices and wages

Since our model respects accounting identities, it is but natural to show that the sum of value added from the three producing sectors (households, firms and the government) be equal to aggregate production by the expenditure approach, the main identity upon which our work relies. This is seen in equation 4.61, which states that aggregate value added (in nominal terms) is equal to *GDP* in value, less taxes on production received by the government. The latter come from producing sectors and the rest of the world.

The price of this value added (eq. 4.62), common to the three producing sectors, is a function of the general price level described just below, and which is (yet) another key element in our model. Equation 4.63 says that the *GDP* deflator[43] is a function of unit cost, the output gap (our proxy for capacity utilization), and the price of imports[44].

The determination of wages has as a left-hand side the ratio of wages paid to salaried employment[45], and is in turn determined by consumer prices, output per worker (or labor productivity), and the unemployment rate. For further details, the reader is again referred to the discussion in the previous chapter.

$$VAp_{va} = p_y Y - T_{1_G} - T_{1_R} \tag{4.61}$$

[43] Note that, since price indexes are *chained*, they do no respect the *additivity* property as was the case when using the Laspeyres, Paasche or Fisher indexes. For further details on this issue see Piriou 1992.

[44] See the discussion in part "Prices in national accounts" of chapter 2 for further details.

[45] Note, it would have been preferable to have a function for salaried workers paid by firms only, in order to be able to identify the effect of wages paid by this sector only on the economy as a whole. However, this proved difficult, given that data on workers employed per institutional sector are more difficult to come by. Again, we shall restrict ourselves to working with the assumption that this estimated equation is proxy for wages paid by firms.

$$p_{va} = f(p_y) \tag{4.62}$$

$$ln(p_y) = f\left[ln\left(\frac{wN}{Y}\right), gap, ln(p_m)\right] \tag{4.63}$$

$$ln\left(\frac{W_{paid}}{N_{sal}}\right) = f\left[ln(p_c), ln\left(\frac{Y}{N}\right), ln(u)\right] \tag{4.64}$$

Employment

Total employment (eq. 4.65) is a function of the volume of output, whereas salaried employment (eq. 4.66) is a changing proportion n^S of the latter. The amount of French workers that are part of the active population (those seeking for employment) is determined by total employment and total active population, which includes inactive workers. For a discussion on this last specification see Jacquot 1997 and the part entitled "Employment" in the preceding chapter.

$$ln(N) = f(ln(Y)) \tag{4.65}$$

$$N^S = n^S N \tag{4.66}$$

$$ln(AP) = f(ln(N), ln(TAP)) \tag{4.67}$$

$$u = 1 - \frac{N}{AP} \tag{4.68}$$

Exchange rate

The inclusion of the exchange rate in the model *per se* was relatively simple. What was not so straightforward to deal with was the inclusion of all the elements denominated in foreign currency. Having said that, let us say a few words about the former. Equation 4.69 says that the nominal exchange rate[46] is a function of the interest rate differential and of

[46]This series was calculated as a weighted average of the exchange rates of France with respect to its main trading partners. Indeed, this is the same method used by international organizations to calculate the NEER (nominal effective exchange rate) and several other variants of the same. We decided to proceed in this way in order to (1) focus on the evolution of key (rather than all) partners, and (2) leave the possibility of working on a 'linked' model for several economies open. Our series follow very closely the evolution of

the ratio of the stock of assets held by France with respect to its stock of liabilities (see part "Exchange rate" in chapter 2). The series ER is simply the inverse of the exchange rate[47]. This was a necessary step in order to simplify the notation of the financial instruments denominated in foreign currency.

As mentioned in the preceding chapter, we also included the equations defining the behavior of the exchange rate expected by fundamentalists (eq. 4.71) and chartists (eq. 4.72). A weighted average of the two is done in equation 4.73, where we assigned 0.5 to each type of financial actors. This is done in this first version, and we could in principle change the value of these weights in order to investigate the effects of speculation (i.e. all chartists) in foreign markets in France, but since this is beyond our purposes at this point, we just leave that open as a possibility[48].

$$x_r = f\left[(r^r - i^r), \left(\frac{Assets}{Liabilities}\right)\right] \tag{4.69}$$

$$ER = \frac{1}{x_r} \tag{4.70}$$

$$\Delta x_r^f = f(x_{r-1}^f - x_{r-1}^{f*}) \tag{4.71}$$

$$\Delta x_r^c = f(\Delta x_{r-p}^c) \tag{4.72}$$

$$x_{r*} = 0.5 x_r^f + 0.5 x_r^c \tag{4.73}$$

This expected exchange rate (eq. 4.73) is present in the portfolio equations in stock form, that is, those which involve the decision of financial actors to hold or issue instruments denominated in foreign currency. In contrast, the exchange rate (eq. 4.69) is used in other non-decision equations, such as flow and revaluation terms that complement the former.

the NEER.

[47] Under the notation x_r a devaluation is a fall in this variable. Thus, x_r is expressed under the volume quotation system, and ER under the price quotation system. See chapter 2 of Gandolfo 2002 for a discussion.

[48] This step would require several other side-steps. For instance, given that the behavioral equations defining the demand for financial instruments in foreign currency depend on the interest rate differential corrected for changes in the expected exchange rate, these specifications in turn depend on the weights previously assigned. The natural consequence would be that the value of the estimated coefficients in these equations may change, and/or that the properties of the estimated equations is modified (i.e. that it is no longer a statistically satisfactory).

Let us now turn to the equations that describe the public accounts.

4.2.5 Public sector (general government)

Public sector's uses-resources

As seen in Table 4.8 government's non-market production ($p_{va}VA_G$) is registered in the same line as the other sector's value added. This sector pays wages to public servants (W_G) and receives taxes on production[49] (T_{2_G}), which it also pays but are directly deducted from those it receives in the present model. For the bonds it issues it pays interests (INT_G^p), and as payment of its entrepreneurial activities it receives dividends[50] (DIV_G^r).

Another way the public administration finances its expenditure is through taxes on income received from the other sectors and itself (T_{3_G}). It also receives and redistributes social security contributions (SC_H), and provides social security benefits to households (SB_G). The French government also pays social transfers in kind (in the form of housing aid and medical care, mainly) to households but, because of their nature[51], these are not considered as part of public spending for national accounting purposes. Finally, the government also spends in consumption goods ($p_g G$) and investment goods ($p_i^g I_G$).

Social security spending has increased significantly since 1996 and accounts for a large share of total French government spending. According to the *Ministère du Budget* (op cit, p. 37, our translation), "[t]he part of indebtedness supported by the social security administrations has neatly progressed since the creation of the CADES" (*Caisse d'Amortissement de la Dette Sociale*) in 1996.

As in the case of households, the government's non-market production in volume (VA_G) is defined as a given proportion (α_G) of total value added (eq. 4.74).

[49] All taxes are net, in the sense that we deduct subsidies from the corresponding account (production or revenue).

[50] It is clear that, since the wave of privatizations began in France and several other parts of the world, dividends received by the government have diminished in importance. As an important side effect, the receipts of the public sector have been even more limited than before the privatizations began (the other channel being the control of inflation and its consequent weight on the public debt-to-*GDP* ratios), thus reinforcing public sector constraints. This trends have persisted even in the presence of stock market bubbles.

[51] These expenditures stem mainly from the so-called *ASSO* (*Administrations de Sécurité Sociale*). According to the Budget des Comptes Publics et de la Réforme de l'État 2012 (p. 7, our translation) "the sinking fund for social debt (CADES) and the pension reserve fund (FRR) have left the sub-sector agencies of central government (ODAC) and joined that of social security (ASSO). Indeed, CADES seeks to cushion social debt constituted in the sub-sector ASSO and the financing structure of FRR has been modified after its creation, today dominated by *receipts on social security*" (our italics).

		Uses	Resources
	Value added		$p_{va}VA_G$
$-$	*Wages*	W_G	
$+$	*Taxes on production and imports*		T_{2_G}
$-$	*Interests*	INT_G^p	
$+$	*Dividends*		DIV_G^r
$+$	*Income taxes received*		T_{3_G}
$+$	*Social security contributions*		SC_G
$-$	*Social security benefits*	SB_G	
$-$	*Consumption expenditures*	$p_g G$	
$=$	***Government saving***		S_G
$-$	*Gross investment*	$p_i^g I_G$	
$=$	***Government financing capacity***		$-FC_G$

Table 4.8 – Government's uses-resources.

$$VA_G = \alpha_g VA \tag{4.74}$$

Net taxes on products (eq. 4.75), mainly *VAT* and excise duties, received by the government from firms, from households and from itself, are a share (t_1) of total value added[52] ($p_{va}(VA_F + VA_H + VA_G)$). Wages paid to public servants (eq. 4.76) are defined as the difference between non-market public value added and its depreciation or fixed capital consumption of the public sector, which is in turn defined as a fraction (δ_k^g) of the previous period's stock of capital.

Equation 4.77 shows the specification of interest payments on public debt (INT_G^p), which are defined as the *annual* interest rate paid on bonds issued by the French government ($r_{b_l}^g$) multiplied by the outstanding value of the stock of debt liabilities issued ($p_{b_l}^g B_{G-1}^L$) from the previous period. As of 2010, these were relatively low, mainly due to the historically low interest rates. See also Budget des Comptes Publics et de la Réforme de l'État 2012.

$$T_{1_G} = t_1 p_{va}(VA_F + VA_H + VA_G) \tag{4.75}$$

$$W_G = p_{va} VA_G - FCC_G \tag{4.76}$$

[52]For this item there is no counterpart in the SEC 95 methodology.

$$INT_G^p = r_{b_l}^g p_{b_l-1}^g B_{G-1}^L \tag{4.77}$$

Dividends received by the government (eq. 4.78) are a proportion (λ_2) of equities held by the public sector. These come from the public firms (by order of importance in terms of 2012 sales): GDF Suez, EDF, EADS, France Télécom, Renault, SNCF, Air France - KLM, Groupe La Poste, Thales, Safran, Areva, Réseau Ferré de France, RATP, France Télévisions, DCNS, Aéroports de Paris, La Française des Jeux, GIAT Industries, Radio France and FSI (Source: *INSEE*). Of course, these are the public firms still managed by the government, given that several are now private (such as TF1, Société Générale, BNP, Air France, Crédit Lyonnais, among many others).

$$DIV_G^r = \lambda_2 p_{e_a-1}^g E_{G-1}^A \tag{4.78}$$

Social security contributions received by the government (eq. 4.79), mainly from retirement funds[53], are the sum of contributions paid by households (SC_H), and deducted of those artificially received by firms (SC_F), banks (SC_B) and the rest of the world (SC_R). Thus, these consist of a part paid by employers (D6111), a part paid by employees (D6112) and a third part paid by the self-employed (*non salariés*, D113). See Appendix for nomenclature issues. Note that this is the closing line for contributions.

Social security benefits paid by the government to households and the rest of the world (eq. 4.80), mainly in the form of pensions, and benefits paid directly to public sector employees. These are defined as a proportion (λ_3) of *GDP*. As mentioned above, other benefits (social transfers in kind or intervention spending[54], not shown in the system), are the subject of an intense debate which the *socialist* president has advocated, among other forms of spending, to reduce (see *Ministère du Budget op. cit.*).

$$SC_G = SC_H - SC_F - SC_B - SC_R \tag{4.79}$$

$$SB_G = \lambda_3 p_y Y \tag{4.80}$$

Taxes on production received by the French government (T_{2_G}) are the sum of taxes on

[53]"The resources of (...) [retirement] plans consist primarily of contributions by individuals and by employers on behalf of their employees." (INSEE 2014, p. 78).

[54]"From an economic point of view, intervention costs are characterized by the lack of consideration of the expenditure, as opposed to spending in so-called productive apparatus (operation, personnel, investment). This is the action of the State on the economy and society at large." Budget des Comptes Publics et de la Réforme de l'État 2012, p. 71., our translation.

products (VAT and excise duties) defined in equation 4.75 above, those received from the rest of the world (T_{1_R}), and taxes on production received from individual entrepreneurs and firms[55] deducted of subsidies paid to the rest of the world. Income taxes collected from all sectors (including public enterprises) are defined in equation 4.82. Clearly, these two equations are the respective closing lines for these items.

$$T_{2_G} = T_{1_G} + T_{1_R} + T_{2_H} + T_{2_F} - T_{2_R} \tag{4.81}$$

$$T_{3_G} = T_{3_H} + T_{3_F} + T_{3_B} + T_{3_R} \tag{4.82}$$

Government current spending (eq. 4.83) is defined as a proportion of *GDP*[56]. This is useful for at least two reasons. The first is that it allows us to treat public spending independently of any formulation that depends on the goals (which change constantly) of the public sector. The second is that it allows us to carry out 'shocks' on the corresponding series that can be straightforwardly in percentage points of output in order to analyze multiplier effects. The price of this variable (eq. 4.84) is determined by the evolution of the general price level.

$$G = \lambda_1 Y \tag{4.83}$$

$$p_g = f(p_y) \tag{4.84}$$

Government saving[57] (eq. 4.85) is public non-market production less wages paid to public servants, plus taxes (on production, and on income) received, less interest payments to foreign and French banks, plus dividends received, plus contributions received, less benefits paid to households, less current expenditure. It is not uncommon for public disbursements to exceed receipts.

[55]Taxes on production paid by banks are also included in T_{2_F}, given that we lumped together the items from the production account from firms and banks in this account.

[56]Concerning the usefulness of keeping public expenditure as an exogenous variable, see the discussion in p. 16 of Brillet 2010. This is also the approach adopted in several *SFC* models, for instance, Le Heron 2009 and Godley and Lavoie 2007 in several chapters.

[57]Despite the current government's priority (in tandem with that of the European economic authorities) to bring down debt and deficit levels as a proportion of *GDP*, it is noteworthy to mention that from 2009 on fiscal consolidation hawks have been out in numbers and have successfully brought government dis-saving down (increasing government saving) in the face of outrageously high unemployment rates. This was mentioned in much more detail in part 1.2 of chapter 1. Note, the deficit in the sense of the Maastricht criteria is not the same as the one we use in this model.

Equations 4.86 and 4.87 describe the price and volume of public investment, where the former is a function of th *GDP* deflator, and the latter is the accounting identity that guarantees equilibrium of this item in the national accounts and in the balance sheet of this sector. Clearly, the difference between 4.85 and 4.87 is the financing capacity/need of the government, which is usually in 'red ink'[58].

$$S_G = p_{va} VA_G - W_G + T_2 - INT_G^p + DIV_G^r + T_3 + SC_G - SB_G - p_g G \tag{4.85}$$

$$p_i^g = f(p_y) \tag{4.86}$$

$$I_G p_i^g = p_k^g \Delta K_G \tag{4.87}$$

Public wealth

The government's balance sheet was overly simplified, given that our interest in studying this sector is how it finances its spending. Thus, we lumped all its debt obligations (bonds, deposit liabilities and credit contracted) into the category "bonds" ($PF3$). It must be noted that under this same heading (that is, in the same line of the financial accounts, but in the balance sheet of banks) are included the securities traded by financial institutions which are often of a completely different nature (i.e. derivatives). We will leave this important issue for further research.

The government holds a stock of non-financial assets ($p_k^g K_G$) and a stock of financial assets in the form of equities ($p_{e_a}^g E_G^A = p_{e_a}^g E_{G_e}^A + p_{e_a f}^g E_{G_f}^A$). As mentioned above, the public sector finances its spending by issuing bonds ($p_{b_l}^g B_G^L = p_{b_l}^g B_{G_e}^L + (p_{b_l f}^g B_{G_f}^L)/x_r$). The difference between its assets and liabilities is, as shown in Table 4.9, public net wealth (NW_G).

As in the previous cases, these *stocks* must be consolidated with their corresponding *flows*, *revaluation effects* and *other changes in volume*. This is shown in Table 4.10.

The equation upon which we close this sector's accounting is, almost as a natural choice, the flow of bonds issued by the government (i.e. the public deficit). That is, we let

[58] This sentence paraphrases an important reference work for the approach known as 'public choice'. The work in question is Buchanan, Rowley, and Tollison 1987, whose first chapter is entitled "Government by Red Ink". The first words of this chapter summarize the approach proposed by the authors (which we clearly do not share): "Perhaps the most important economic problem facing Western democracies over the remaining years of the twentieth century is the propensity of governments to operate in the red" (p. 3). Oftentimes 'austerians' refer to works by *public choicers* in the same spirit to defend their misguided and stubborn policy proposals (for instance, Alberto Alesina's *expansionary austerity hypothesis*).

		Asset	Liability
	Non-financial assets	$p_k^g K_G$	
+	*Equity*	$p_{e_a}^g E_G^A$	
−	*Bonds*		$p_{b_l}^g B_G^L$
=	***Public net wealth***		NW_G

Table 4.9 – Government's balance sheet.

		Stock $t-1$	+ **Flow**	− **FCC**	+ **Revaluation**	+ **OCV**	= **Stock** t
	NFA	$p_{k-1}^g K_{G-1}$	$p_k^g \Delta K_G$	FCC_G	$4K_{G-1}\Delta p_k^g$	OCV_K^G	$p_K^G K_G$
+	*Eq. held*	$p_{e_a-1}^g E_{G-1}^A$	$p_{e_a}^g \Delta E_G^A$		$4E_{G-1}^A \Delta p_{e_a}^g$	$OCV_{E_A}^G$	$p_{e_a}^g E_G^A$
−	*Bonds*	$p_{b_l-1}^g B_{G-1}^L$	$p_{b_l}^g \Delta B_G^L$		$4B_{G-1}^L \Delta p_{b_l}^g$	$OCV_{B_L}^G$	$p_{b_l}^g B_G^L$
=	***Balance***	NW_{G-1}	$Bal._G$	FCC_G	rev_G	OCV_G	NW_G

Table 4.10 – Government's stock-flow consolidation.

this variable be the balancing equation, determined as the difference between its financial assets and its financing capacity.

Public non-financial assets

The price of public capital (eq. 4.88) is a function of the price of households' dwellings, the price of public investment (from the national accounts) and the interest rate paid on bonds. The purpose of including p_i^g in this equation is to take into account any rise in the general price level on the value of public capital. Naturally, the price of land and the interest rate are also important factors that affect this series, for they determine the capacity of the sector to accumulate physical assets.

$$p_k^g = f(p_k^h, p_i^g, r_{b_l}^g) \tag{4.88}$$

The stock of public capital is determined as in Table 4.10, where fixed capital consumption (or depreciation) is defined as a proportion δ_k^g of the one period lagged value of government physical capital (eq. 4.89). The last item defining the sector's non-financial assets is the corresponding flow, which is defined as a proportion λ_4 of GDP.

$$FCC_G = \delta_k^g p_{k-1}^g K_{G-1} \tag{4.89}$$

$$\Delta K_G = \lambda_4 Y \tag{4.90}$$

Public sector's equities held

In standard fashion in this work, we divide the value of equities held by the government into national and foreign currency, where the latter (eq. 4.91) is defined as a proportion θ_e^g of the total. The part denominated in foreign currency equals $\lambda_5 p_y Y$, which in turn is equal to the total value of the stock of equities held by the sector, less the part denominated in foreign currency.

The corresponding flow and revaluation terms are also quite standard in the notation up to here. The total value of flows are the sum of those held in foreign currency ($\Delta(E^A_{G_f} p^g_{e_a f}/x_r) + rev^g_{e_a f}$) and in domestic currency, which is the difference between the total flow (determined from the consolidation table) and the previously defined flow.

The price of this instrument (eq. 4.93) is a function of the price of equities issued by firms, the leading indicator for the French stock market.

$$\frac{E^A_{G_f} p^g_{e_a f}}{x_r} = \theta_e^g p^g_{e_a} E^A_G \tag{4.91}$$

$$E^A_{G_e} p^g_{e_a} = \lambda_5 p_y Y - \frac{E^A_{G_f} p^g_{e_a f}}{x_r} \tag{4.92}$$

$$p^g_{e_a} = f(p^f_{e_l}) \tag{4.93}$$

Public sector's bonds issued

The value of the stock of bonds issued by the government ($p^g_{b_l} B^L_G$) is also separated into that denominated in foreign and domestic currency. The part of the value of this instrument issued in foreign currency (which is specified as the difference between the total and the part in domestic currency) is a function of the interest rate differential, corrected for changes in the expected exchange rate (eq. 4.94). The part denominated in foreign currency is obtained as the difference between the total, as in Table 4.10, and the previously defined term.

$$\frac{-B^L_{G_e} p^g_{b_l} + p^g_{b_l} B^L_G}{p^g_{b_l} B^L_G} = f[r^r - (i^r + \Delta x_{r*})] \tag{4.94}$$

$$\frac{B^L_{G_f} p^g_{b_l f}}{x_r} = p^g_{b_l-1} B^L_{G-1} + p^g_{b_l} \Delta B^L_G + rev^g_{b_l} - p^g_{b_l} B^L_{G_e} \tag{4.95}$$

Bonds newly issued by the government ($p^g_{b_l} \Delta B^L_G$) held by French banks and the rest of the world are, as we mentioned above, the closing variable for the government, but this closing is shown in equation 4.96, where the part of the flow value denominated in domestic currency is defined. The difference between the total and the latter are defined in standard fashion (see for example the stock of equities held by households).

$$\Delta B^L_{G_e} \times p^g_{b_l} = p^g_k \Delta K_G + p^g_{e_a} \Delta E^A_G - S_G - Aj_G - p^g_{b_l f} \Delta B^L_{G_f} \tag{4.96}$$

As we mentioned previously, the price of bonds paid by the public sector are not defined as behavioral equations, given the complexity of the task. Clearly, it would have been desirable to estimate an equation for these important price of security items, but we leave this item as defined in equation 4.97 (as we calculated it from the financial accounts) because (1) we believe there would be little room for consensus in such case, and (2) a specification for this price would imply a link of this price to its 'pairs' (i.e. the price of derivatives), but we see no link in the evolution of these. By way of example, the price of securities issued by banks (2005 = 1) ranges from nearly 8000 in the mid 1980s to 0.03 in 2010q1, whereas the price of bonds issued by the public sector range from 0.8 to 0.9 in the same reference periods. Therefore, the lack of homogeneity between the series do not allow for a link between these[59].

Finally, the revaluation terms are defined in the standard way described up to here, with the exception of the term corresponding to the value denominated in domestic currency, which is the difference between the total (obtained from the consolidation table) and the part denominated in foreign currency.

$$\Delta p^g_{b_l} = \frac{rev^g_{b_l}}{4B^L_{G-1}} \tag{4.97}$$

[59]Perhaps this calls for either (1) a reclassification of the existing financial accounting system (not very likely), or (2) a much deeper study of the so-called shadow banking system (not an easy task).

4.2.6 Banks

Banks' uses-resources

Banks[60] also carry out transactions. These consist of insurance benefits (SB_B) to households, interest payments on deposits to households, firms and the rest of the world (INT_B^p), distributed dividends to all sectors (DIV_B^p) and taxes to the government (T_{3_B}). They also receive interest payments from loans and securities (INT_B^r) and dividends from the equities they hold (DIV_B^r).

		Uses	Resources
$-/+$	*Interests*	INT_B^p	INT_B^r
$-/+$	*Dividends*	DIV_B^p	DIV_B^r
$-$	*Income tax*	T_{3_B}	
$+$	*Social security contributions*		SC_B
$-$	*Insurance benefits*	SB_B	
$=$	***Banks' saving***		S_B

Table 4.11 – Banks' uses-resources.

Interests paid by banks (eq. 4.98) are the result of multiplying the annualized interest rate banks pay (r^b) by the stock of interest-bearing instruments (deposits and securities; $p_{d_l}^b D_{B-1}^L$ and $p_{b_l}^b B_B^L$, respectively) lagged one period.

$$INT_B^p = r^b(p_{d_l-1}^b D_{B-1}^L + p_{b_l-1}^b B_{B-1}^L) \tag{4.98}$$

Interests received by banks are the closing line identity, where the terms INT_H and INT_R (interests paid by households an the rest of the world) are net.

$$INT_B^r = INT_B^p + INT_F^p + INT_G^p - INT_H - INT_R \tag{4.99}$$

Dividends paid by banks equal a proportion γ_1 of the stock of equities they issued one period before.

$$DIV_B^p = \gamma_1 p_{e_l-1}^b E_{B-1}^L \tag{4.100}$$

Dividends received by banks is a share (γ_2) of equities held lagged one quarter.

$$DIV_B^r = \gamma_2 p_{e_a-1}^b E_{B-1}^A \tag{4.101}$$

[60] We remind the reader that this sector is made up of private banks and the central bank.

Income tax paid by banks equals t_{3_B} (the hypothetical tax rate) times current revenues of financial institutions of the previous year, which come mainly in the form of interests and dividends received.

$$T_{3_B} = t_{3_b}(INT^r_{B-4} + DIV^r_{B-4}) \tag{4.102}$$

Insurance benefits paid to households are a proportion γ_3 of *GDP*.

$$SB_B = \gamma_3 p_y Y \tag{4.103}$$

Social security contributions paid by banks are a predetermined percentage γ_4 of *GDP*. See footnote 39 and the description of equation 4.2 above for further details.

$$SC_B = \gamma_4 p_y Y \tag{4.104}$$

Financing capacity of banks equals their after tax net profits (that is, after payment of interests and dividends). Given that, according to our assumption, they do not carry out production activities, banks' financing capacity equals their saving and their current income. INT_B and DIV_B are net received interests and dividends, respectively.

$$FC_B = INT_B + DIV_B + SC_B - SB_B - T_{3_B} \tag{4.105}$$

Banks' wealth

A basic assumption in this section is that banks satisfy the demand for credit, print money and issue securities *passively*[61]. Thus banks play only a marginal role in making important behavioral decisions in the model. It must also be noted that the balancing equation of banks is the flow of equities they issue. That is, the difference between their holdings and their other liabilities (both in the form of flows), once we have deducted the sector's financing capacity.

[61] This is counterintuitive to our arguments set forth in chapter 1, given that in that part we insisted on the fact that banks lowered interest rates for households as soon as they perceived the lack of demand from firms. This lack of consistency is due to two main reasons. On the one hand, to our knowledge, this type of bank behavior (setting interest rates according to inter-sectoral demand for credit) has received little to no attention in the existing literature and, what predominates instead is the credit rationing literature (at least on the Keynesian front). On the other hand, our arguments set forth in the first chapter came after the analysis of the data observed, and the design of the model was made a bit aside from that. We will clearly address this issue in the future, but it should be noted that some shocks carried out in the modeling exercise lend support to our hypothesis about the role of the capital structure of firms (which is clearly linked to the behavior of banks).

As seen in Table 4.12, banks lend money to other institutional sectors ($p^b_{l_a} L^A_B = p^b_{l_a} L^A_{B_e} + (p^b_{l_a f} L^A_{B_f})/x_r$) and to themselves. However, in order to simplify our model, we subtracted the latter from the outstanding amount of stocks of debt they hold. Banks also hold securities ($p^b_{b_a} B^A_B = p^b_{b_a} B^A_{B_e} + (p^b_{b_a f} B^A_{B_f})/x_r$) and issue them as well ($p^b_{b_l} B^L_B = p^b_{b_l} B^L_{B_e} + (p^b_{b_l f} B^L_{B_f})/x_r$). Nevertheless, it must be noted that the former exceed the latter, given banks' role as financial intermediaries. Needless to mention, securities (notably derivatives) have become increasingly important over the last thirty years. They also hold and issue equities ($p^b_{e_a} E^A_B = p^b_{e_a} E^A_{B_e} + (p^b_{e_a f} E^A_{B_f})/x_r$ and $p^b_{e_l} E^L_B$, respectively). As this sector includes the central bank, it must be noted that money and deposits ($p^b_{d_l} D^L_B = p^b_{d_l} D^L_{B_e} + (p^b_{d_l f} D^L_{B_f})/x_r$) appear on their liability side[62].

		Asset	**Liability**
	Credit	$p^b_{l_a} L^A_B$	
+/−	*Securities*	$p^b_{b_a} B^A_B$	$p^b_{b_l} B^L_B$
+/−	*Equity*	$p^b_{e_a} E^A_B$	$p^b_{e_l} E^L_B$
−	*Deposits*		$p^b_{d_l} D^L_B$
=	***Banks' net wealth***		NW_B

Table 4.12 – Banks' balance sheet.

As in the previous cases, we also present the consolidation matrix for banks in Table 4.13.

		Stock $t-1$	+ **Flow**	+ **Revaluation**	+ **OCV**	= **Stock** t
	Credit	$p^b_{l_a-1} L^A_{B-1}$	$p^b_{l_a} \Delta L^A_B$	$4L^A_{B-1} \Delta p^b_{l_a}$	$OCV^B_{L_A}$	$p^b_{l_a} L^A_B$
+	*Sec. held*	$p^b_{b_a-1} B^A_{B-1}$	$p^b_{b_a} \Delta B^A_B$	$4B^A_{B-1} \Delta p^b_{b_a}$	$OCV^B_{B_A}$	$p^b_{b_a} B^A_B$
+	*Eq. held*	$p^b_{e_a-1} E^A_{B-1}$	$p^b_{e_a} \Delta E^A_B$	$4E^A_{B-1} \Delta p^b_{e_a}$	$OCV^B_{E_A}$	$p^b_{e_a} E^A_B$
−	*Sec. issued*	$p^b_{b_l-1} B^L_{B-1}$	$p^b_{b_l} \Delta B^L_B$	$4B^L_{B-1} \Delta p^b_{b_l}$	$OCV^B_{B_L}$	$p^b_{b_l} B^L_B$
−	*Eq. issued*	$p^b_{e_l-1} E^L_{B-1}$	$p^b_{e_l} \Delta E^L_B$	$4E^L_{B-1} \Delta p^b_{e_l}$	$OCV^B_{E_L}$	$p^b_{e_l} E^L_B$
−	*Deposits*	$p^b_{d_l-1} D^L_{B-1}$	$p^b_{d_l} \Delta D^L_B$	$4D^L_{B-1} \Delta p^b_{d_l}$	$OCV^B_{D_L}$	$p^b_{d_l} D^L_B$
=	***Balance***	NW_{B-1}	$Bal._B$	rev_B	OCV_B	NW_B

Table 4.13 – Banks' stock-flow consolidation.

[62] We lumped banks' non-financial assets, value added, taxes and wages with those of firms, thus assuming that banks do not produce value and, correspondingly, carry out the supply of financing passively.

Banks' deposit liabilities

The total value of the stock of deposit liabilities of banks (not shown here) is determined in a standard fashion into a part denominated in local currency and another part denominated in foreign currency, with the former (eq. 4.106) determined as the closing stock deposits circulating in the French economy less the part expressed foreign currency. In other words, deposits issued by banks equal the sum of deposit holdings of firms, households and the rest of the world less the liability part of the latter. Naturally, the difference between the total and the part expressed in French money is the part in foreign currency.

$$D^L_{B_e} p^b_{d_l} = D^A_F + p^h_{d_a} D^A_H + p^r_{d_a} D^A_R - p^r_{d_l} D^L_R - \theta^b_{d_l} p^b_{d_l} D^L_B \tag{4.106}$$

The value of the flow of deposit liabilities of banks (total and foreign currency) are determined in the standard way shown for other assets above, and the part denominated in domestic currency is partly obtained from the consolidation table shown previously. The same standard procedure was also applied to revaluation effects. Finally, the implicit price of deposits (eq. 3.25) is a function of the interest rate and the inflation rate.

$$\Delta D^L_{B_e} \times p^b_{d_l} = p^b_{d_l} D^L_B - p^b_{d_l-1} D^L_{B-1} - rev^b_{d_l} - p^b_{d_l f} \Delta D^L_{B_f} \tag{4.107}$$

$$p^b_{d_l} = f(r^b_b, infl) \tag{4.108}$$

Banks' securities held

Banks' securities are defined in the simplest possible way. In the case of those held by French banks, we can observe again the separation of the value of holdings into national and foreign currency (not shown). As it was the case for other financial instruments described above, the part held in domestic currency is used to determine its counterpart, by subtracting this from the total. This is shown in equation 4.109, where it can be seen that the ratio of this item with respect to the total is a function of the interest rate differential, corrected for changes in the expected exchange rate. The part expressed in foreign currency is in turn determined as the difference between the total (a proportion γ_5 of GDP) and the term just described.

$$\frac{-B^A_{B_e} p^b_{b_a} + p^b_{b_a} B^A_B}{p^b_{b_a} B^A_B} = f[r^r - (i^r + \Delta x_{r*})] \tag{4.109}$$

$$\frac{B^A_{B_f} p^b_{b_a f}}{x_r} = \gamma_5 p_y Y - p^b_{b_a} B^A_{B_e} \tag{4.110}$$

The flow terms are defined in a standard way, with the 'consolidated flow' included in the part held in domestic currency (eq. 4.111). The price of this item and its corresponding revaluation terms are treated in the same way as those of bonds issued by the government.

$$\Delta B^A_{B_e} \times p^b_{b_a} = p^b_{b_a} B^A_B - p^b_{b_a -1} B^A_{B-1} - rev^b_{b_a} - p^b_{b_a f} \Delta B^A_{B_f} \tag{4.111}$$

$$\Delta p^b_{b_a} = \frac{rev^b_{b_a}}{4B^A_{B-1}} \tag{4.112}$$

Banks' securities issued

The value of securities issued by French banks are also divided into national and foreign currency, where the former (eq. 4.113) contains the closing line for all securities circulating through the French economy. That is, the stock of securities issued by banks equal the stock held by themselves, those held by the rest of the world, and to these we must subtract the bonds issued by the French and foreign governments and banks. The corresponding equation is the difference between these items and the part of the value of the stock issued by banks in foreign currency. The latter are defined as a part $\theta^b_{b_l}$ of the total in that specification.

$$B^L_{B_e} p^b_{b_l} = p^b_{b_a} B^A_B + p^r_{b_a} B^A_R - p^g_{b_l} B^L_G - p^r_{b_l} B^L_R - \theta^b_{b_l} p^b_{b_l} B^L_B \tag{4.113}$$

Equation 4.114 deals explicitly with the part denominated in foreign currency, where the total stock of this instrument is obtained from the consolidation table, and to this we subtract the part in domestic currency obtained in the previous equation.

$$\frac{B^L_{B_f} p^b_{b_l f}}{x_r} = p^b_{b_l -1} B^L_{B-1} + p^b_{b_l} \Delta B^L_B + rev^b_{b_l} - p^b_{b_l} B^L_{B_e} \tag{4.114}$$

The remaining equations for this instrument are treated in an *ad hoc* way, following the procedure applied to other instruments shown above. This is so given that no particular interest is given to any of these items.

Banks' credit granted

The total value of the stock of credit holdings of French banks is also divided in two currencies. The part held in foreign currency out of the total is a function of the interest rate differential, corrected for changes in the expected exchange rate. Again, the procedure is such that this is expressed as the difference between the total and that in domestic currency. Equation 4.116 shows the explicit expression for the credit holdings of banks in foreign currency, which contains the closing line of the instrument. Loans granted by banks are the debt liabilities of households, firms and the rest of the world, but from this total we have to deduct the part held by the foreign sector. The difference between this closing item and credit holdings in domestic currency are credit holdings in foreign currency.

$$\frac{-L^A_{B_e} p^b_{l_a} + p^b_{l_a} L^A_B}{p^b_{l_a} L^A_B} = f[r^r - (i^r + \Delta x_{r*})] \tag{4.115}$$

Closing line for credit (stock form)

$$\frac{L^A_{B_f} p^b_{l_a f}}{x_r} = p^h_{l_l} L^L_H + p^f_{l_l} L^L_F + p^r_{l_l} L^L_R - p^r_{l_a} L^A_R - p^b_{l_a} L^A_{B_e} \tag{4.116}$$

The flow terms of this instrument are also treated in a simple standard way as the other instruments. But before leaving the description of this bank asset, let us briefly say a word about its price, which (as equation 4.117 shows) depends on the price q ratio mentioned above. Our motivation for making loan prices depend on q is both empirical and theoretical.

$$p^b_{l_a} = f\left(\frac{p^f_{e_l}}{p^f_k}\right) \tag{4.117}$$

On the empirical side, the evolution of both series are closely related to the physical capital accumulation rate of firms or, to put it in other words, the price of loans granted by French banks follow the business cycle. Theory-wise, this empirical fact supports our hypothesis that, when the price of credit rises, this makes equity issuing more attractive for firms. This in turn makes the price of the latter rise above that of capital, creating an unsustainable process that ends up in a bubble build-up. In plain terms, when credit becomes more expensive (i.e. $p^b_{l_a}$ rises), other sources of financing are sought to fund investment. This is closely related to the discussion surrounding th capital structure of firms in the part "Capital structure of French firms and inflation" of chapter 1. Further research is underway as we write[63].

Banks' equities held

The value of the stock of equities held by banks is defined in the same way as previously described instruments. The sum of equities held denominated in domestic currency are expressed as the left-and-upper-most in equation 4.118, specification that is in turn used to determine the difference between the total and that instrument (i.e. the part of this asset in foreign currency). This ratio is a function of the interest rate differential used in several expressions above. Equation 4.119 explicitly determines the value of the stock of this instrument held in foreign currency. This item is the difference between the total (a proportion γ_6 of GDP) and the part held in domestic currency.

$$\frac{-E^A_{B_e} p^b_{e_a} + p^b_{e_a} E^A_B}{p^b_{e_a} E^A_B} = f\left[r^r - (i^r + \Delta x_{r*})\right] \tag{4.118}$$

$$\frac{E^A_{B_f} p^b_{e_a f}}{x_r} = \gamma_6 p_y Y - p^b_{e_a} E^A_{B_e} \tag{4.119}$$

Flows and revaluation terms are not given a particular treatment, and are in turn written in a standard way that resembles what we have already seen up to this point. Finally, the price of equities held by banks is a function of the leading price of equities in the model (the one belonging to those issued by non-financial firms).

$$p^b_{e_a} = f(p^f_{e_l}) \tag{4.120}$$

Banks' equities issued

Equities issued by banks are exclusively printed in domestic currency. So, as in the case of firms, the presentation of this instrument boils down to three equations. The stock of equities issued by banks is obtained as in Table 4.13, whereas the corresponding flow is the closing line for this sector. This term correspondingly links the capital and the current accounts of banks. Lastly, the price of these equities are a function of the leading price for this instrument.

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[63] Also, see the graphs and estimation results in the following chapter.

$$\Delta E_B^L \times p_{e_l}^b = p_{b_a}^b \Delta B_B^A + p_{l_a}^b \Delta L_B^A + p_{e_a}^b \Delta E_B^A - p_{d_l}^b \Delta D_B^L - p_{b_l}^b \Delta B_B^L - FC_B - Aj_B \tag{4.121}$$

$$p_{e_l}^b = f(p_{e_l}^f) \tag{4.122}$$

4.2.7 Rest of the world

Transactions with the rest of the world

The exports from France to the rest of the world ($p_x X$) are shown as the first item in Table 4.14 as a *use* for the latter and, symmetrically, France's imports ($p_m M$) are shown in the *resources* of the rest of the world. Taxes flow from one side to the other, but overall the rest of the world pays more to France in the form of taxes on production (T_{1_R}) and on income (T_{3_R}). Both economic entities lend to each other and invest in one another. The corresponding payments of these are, for the rest of the world, interests and dividends (INT_R^p and DIV_R^p), and their receipts come naturally in the same form (INT_R^r and DIV_R^r). Since a larger amount of contributions and benefits (SC_R and SB_R, respectively) flow from France to the outside these are registered as a resource for the latter.

		Uses	**Resources**
	Exports	$p_x X$	
−	*Imports*		$p_m M$
=	***Trade balance***		TB
−	*Taxes on products*	T_{1_R}	
−	*Wages*	W_R	
−/+	*Interests*	INT_R^p	INT_R^r
−/+	*Dividends*	DIV_R^p	DIV_R^r
−	*Income tax*	T_{3_R}	
+	*Social security contributions*		SC_R
+	*Social security benefits*		SB_R
=	***Current account balance***		CA

Table 4.14 – Rest of the world's uses-resources.

A full description of the transactions and capital movements of France with other countries would be difficult if these were not registered in euros under a single heading called rest of the world. Without ignoring that we are not exactly dealing with all other economies in the globe, we will focus on what concerns the French economy and treat its foreign sector under a broad perspective and, in the case of the trade balance, on the France's main trade partners. Of course, this is done in this first step, and we leave the study of the foreign sector in more detail for further research.

Foreign trade equations

French exports (or the rest of the world's imports from France) are determined as in standard *IS-LM-BP* models, that is, as depending on foreign income (the *GDP* Y^f of the main partners[64] as a proxy) and the terms of trade. The latter are expressed as the ratio of French export prices (p_x) and those from trading partners[65] (p_{x*}/x_r). Of particular importance is the explicit inclusion of the exchange rate in the formula, meaning that an appreciation (or a rise in the price of exports) would imply a rise in the cost of buying French goods and, as a consequence, a deterioration of the trade balance is expected.

$$ln(X) = f\left[ln(Y^f), ln\left(\frac{p_x}{p_{x*}/x_r}\right)\right] \tag{4.123}$$

Export prices are in turn defined as a function of the *GDP* deflator and of the price of competitors. In the long term specification, the sum of the values of the coefficients is very close to unity, which is in line with what we mentioned in the part "Foreign trade" in chapter 2.

$$ln(p_x) = f\left[ln(p_y), ln\left(\frac{p_{x*}}{x_r}\right)\right] \tag{4.124}$$

Equations 4.125 and 3.25 mirror the treatment for exports. Imports depend on French demand (*GDP* as a proxy) and on the ratio of national prices to import prices (expressed in euros). The latter are a function of the general price level and of the price of competitors, properly divided by the exchange rate. As in the export price equation, the sum of the estimated long term coefficients is close to unity.

[64]As mentioned in the previous chapter, these are: Austria, Belgium, Canada, China, Denmark, Finland, Germany, Greece, Italy, Japan, Mexico, Netherlands, Portugal, Spain, Sweden, Switzerland, Turkey, UK and US.

[65]Again, taking the discussion in the previous chapter as a reference, we remind the reader that these partners include Belgium, Germany, Italy, Japan, Netherlands, Spain, UK and the US. It would have been desirable to include the same list of countries in Y^f and p_{x*}, however, for practical reasons (and in some cases lack of adequate data) we preferred to keep this heterogeneous sample of partners at this stage, by also pointing out that the indexes would not differ by much. It must be noted that we compared our constructed data with official sources and the evolution of both series (observed and calculated) follow each other very closely.

$$ln(M) = f\left[ln(Y), ln\left(\frac{p_y}{p_m}\right)\right] \tag{4.125}$$

$$ln(p_m) = f\left[ln(p_y), ln\left(\frac{p_{m*}}{x_r}\right)\right] \tag{4.126}$$

Transactions with the rest of the world

As in the case of banks, the treatment of the foreign sector is also highly simplified, given that (1) we are interested in analyzing the French economy in a broad context but focusing particularly on the role of macroeconomic policy, and (2) some of the items that make up the current account taken separately are relatively small. As a consequence, several of the items shown in Table 4.14 are defined as ratios of French *GDP* and these are not displayed here. This is the case of taxes on production, wages, income taxes and social security benefits.

Interests and dividends from and of the foreign sector are given the same treatment as the other four sectors. That is, the interests paid (eq. 4.127) are the product of the apparent interest rate they pay to France and the value of the stock of interest-bearing liabilities lagged one period. The interests received by the rest of the world paid by France (eq. 4.128) follow the same principle, with the important difference that the interest rate paid by France is corrected for changes in the exchange rate[66].

$$INT_R^p = r^r(p^r_{d_l-1}D^L_{R-1} + p^r_{b_l-1}B^L_{R-1} + p^l_{l_r-1}L^L_{R-1}) \tag{4.127}$$

$$INT_R^r = (i^r + \Delta x_r)(p^r_{d_a-1}D^A_{R-1} + p^r_{b_a-1}B^A_{R-1} + p^r_{l_a-1}L^A_{R-1}) \tag{4.128}$$

Dividends paid by the rest of the world to French residents are a proportion ϵ_1 of the value of equities from firms abroad from held the previous period. A similar reasoning applies to the dividends received by the rest of the world from firms installed in France. Equation 4.131 shows that the contributions received by the foreign sector are a proportion ϵ_3 of wages.

[66] We tried to keep this specification as displayed in the equation. However, when we did this, a relatively slight depreciation made this interest rate turn to negative territory (given its low current level) which, in the context of a nominal interest rate, this does not make sense. As a consequence of this, the effect of a depreciation has a strong impact on the current account. In the face of this difficulty, we treated the term $i^r + \Delta x_r$ as independent of the changes in the exchange rate, noting in passing that this is not a restrictive assumption, given that the other items contained on the right-hand side of the equation are also affected by the exchange rate.

$$DIV_R^p = \epsilon_1 p^r_{e_l-1} E^L_{R-1} \tag{4.129}$$

$$DIV_R^r = \epsilon_2 p^r_{e_a-1} E^A_{R-1} \tag{4.130}$$

$$SC_R = \epsilon_3 W_R \tag{4.131}$$

Balance of indebtedness

In this part we describe the balance of indebtedness, rather than the "wealth of the rest of the world", term which we believe would not be appropriate. That is, we focus here on the balance between the holdings of French assets of the rest of the world, and their liabilities with respect to France. Thus, the rest of the world holds and buys deposits from France denominated in domestic and foreign currency ($p^r_{d_a} D^A_R = p^r_{d_a} D^A_{R_e} + (p^r_{d_a f} D^A_{R_f})/x_r$ and $p^r_{d_l} D^L_R = p^r_{d_l} D^L_{R_e} + (p^r_{d_l f} D^L_{R_f})/x_r$, respectively), holds and issues securities ($p^r_{b_a} B^A_R = p^r_{b_a} B^A_{R_e} + (p^r_{b_a f} B^A_{R_f})/x_r$ and $p^r_{b_l} B^L_R = p^r_{b_l} B^L_{R_e} + (p^r_{b_l f} B^L_{R_f})/x_r$), credit obligations ($p^r_{l_a} L^A_R = p^r_{l_a} L^A_{R_e} + (p^r_{l_a f} L^A_{R_f})/x_r$ and $p^r_{l_l} L^L_R = p^r_{l_l} L^L_{R_e} + (p^r_{l_l f} L^L_{R_f})/x_r$), as well as equities[67] ($p^r_{e_a} E^A_R$ and $p^r_{e_l} E^L_R$). All this is seen in Table 4.15.

		Asset	**Liability**
+/−	*Deposits*	$p^r_{d_a} D^A_R$	$p^r_{d_l} D^L_R$
+/−	*Securities*	$p^r_{b_a} B^A_R$	$p^r_{b_l} B^L_R$
+/−	*Credit*	$p^r_{l_a} L^A_R$	$p^r_{l_l} L^L_R$
+/−	*Equity*	$p^r_{e_a} E^A_R$	$p^r_{e_l} E^L_R$
=	*Foreign net wealth*		NW_R

Table 4.15 – Rest of the world's balance sheet with respect to France.

These stocks, as we saw before for the other sectors, must be consolidated (Table 4.16). A special closure is made with the rest of the world. On the one hand, we close the sector's accounting with the flow of French equities it holds (the difference between their liabilities and assets, minus financing capacity, in this case the French current account).

[67] As can be seen in the notation in parentheses, equities held and issued by the rest of the world are not separated into foreign and domestic currency. This is so because we assume equities held are denominated in euros exclusively, whereas equities issued are expressed in foreign currency only. This is unrealistic since the introduction of the euro because, since then, other foreign countries issue equities denominated in euros as well. For more details on this see below.

As for the stock of equities the rest of the world issues, we assumed (with no special theoretical foundation *other than the need to make the accounting of the model consistent*) that this variable is the difference between the stock of equities issued by the other sectors, less the stock of equities they all hold (included the rest of the world).

		Stock $t-1$	+ **Flow**	+ **Revaluation**	+ **OCV**	= **Stock** t
	Deposits	$p^r_{d_a-1}D^A_{R-1}$	$p^r_{d_a}\Delta D^A_R$	$4D^A_{R-1}\Delta p^r_{d_a}$	$OCV^R_{D_A}$	$p^r_{d_a}D^A_R$
+	*Sec. held*	$p^r_{b_a-1}B^A_{R-1}$	$p^r_{b_a}\Delta B^A_R$	$4B^A_{R-1}\Delta p^r_{b_a}$	$OCV^R_{B_A}$	$p^r_{b_a}B^A_R$
+	*Credit*	$p^r_{l_a-1}L^A_{R-1}$	$p^r_{l_a}\Delta L^A_R$	$4L^A_{R-1}\Delta p^r_{l_a}$	$OCV^R_{L_A}$	$p^r_{l_a}L^A_R$
+	*Eq. held*	$p^r_{e_a-1}E^A_{R-1}$	$p^r_{e_a}\Delta E^A_R$	$4E^A_{R-1}\Delta p^r_{e_a}$	$OCV^R_{E_A}$	$p^r_{e_a}E^A_R$
−	*Deposits*	$p^r_{d_l-1}D^L_{R-1}$	$p^r_{d_l}\Delta D^L_R$	$4D^L_{R-1}\Delta p^r_{d_l}$	$OCV^R_{D_L}$	$p^r_{d_l}D^L_R$
−	*Sec. issued*	$p^r_{b_l-1}B^L_{R-1}$	$p^r_{b_l}\Delta B^L_R$	$4B^L_{R-1}\Delta p^r_{b_l}$	$OCV^R_{B_L}$	$p^r_b B^L_R$
−	*Credit*	$p^r_{l_l-1}L^L_{R-1}$	$p^r_{l_l}\Delta L^L_R$	$4L^L_{R-1}\Delta p^r_{l_l}$	$OCV^R_{L_L}$	$p^r_{l_l}L^L_R$
−	*Eq. issued*	$p^r_{e_l-1}E^L_{R-1}$	$p^r_{e_l}\Delta E^L_R$	$4E^L_{R-1}\Delta p^r_{e_l}$	$OCV^R_{E_L}$	$p^r_{e_l}E^L_R$
=	*Balance*	NW_{R-1}	$Bal._R$	rev_R	OCV_R	NW_R

Table 4.16 – Rest of the world's stock-flow consolidation.

Deposits held by the rest of the world, issued by French banks (i.e. reserves and SDRs)

The total value of the stock of deposits held by the foreign sector are, as customary, divided into domestic and foreign currency (not shown here). Naturally, the financial instruments denominated in the latter currency with respect to this sector have a higher share of totals than it was the case for other sectors. Therefore, the estimated equations defining the evolution of such shares have a higher weight for this sector.

As it was standard procedure above, the difference between the total stock of deposits and the part held in domestic currency (eq. 4.132) is a function of the interest rate differential corrected for changes in the exchange rate. The stock of deposits held in foreign currency (eq. 4.133) is in turn defined as the difference between the total (a proportion ϵ_5 of GDP) and the part held in domestic currency.

Flows and revaluations of this instrument for this sector are given the same standard treatment as other instruments described above, so we do not find it necessary to replicate them here, but leave the interested reader refer to the appendix. Equation 4.134 shows that the implicit price of deposit holdings are a function of the interest rate (corrected for changes in the exchange rate) and of inflation. The rationale for proceeding in this way is that, following (say) a rise in the interest rate, or a fall in French inflation, deposits will become more expensive, thus their demand will decrease.

$$\frac{-D^A_{R_e} p^r_{d_a} + p^r_{d_a} D^A_R}{p^r_{d_a} D^A_R} = f[r^r - (i^r + \Delta x_{r*})] \tag{4.132}$$

$$\frac{p^r_{d_a f} D^A_{R_f}}{x_r} = \epsilon_5 p_y Y - p^r_{d_a} D^A_{R_e} \tag{4.133}$$

$$p^r_{d_a} = f[(i^r + \Delta x_r), infl] \tag{4.134}$$

Deposits issued by the rest of the world, held by French banks

As it was mentioned above, deposits issued by the rest of the world contain international reserves, given that we added these on the liability side, instead of leaving them with a negative sign on the asset side as is commonly done by central banks holding SDRs. Due to this simplification, we were unable to estimate an equation determining this term. Instead, this term is defined in two forms in order to guarantee that the sum of both elements (in foreign and domestic currency) adds up to the total. The first is shown as the right-most term in equation 4.135, which says that the part of deposit liabilities of the rest of the world are a part $\theta^r_{d_l}$ of the total. The rest of the equation is the consolidated item shown in Table 4.16. The difference between the two is the part of the value of the stock denominated in domestic currency.

As was evident from previous equations for other instruments and sectors, stock, flow and revaluation terms are separated in foreign and domestic currency, and these equations are not shown for ease of exposition. Again, it should be pointed out that the treatment of these series is standard. The flow of deposit liabilities held abroad is treated again as the sum of the differenced corresponding stock and revaluation, where the latter is calculated as the product of the stock series lagged one period and the growth rate of the exchange rate (under the price quotation system). The corresponding price (eq. 4.137) is a function of the interest rate paid by France to the rest of the world.

$$D^L_{R_e} p^r_{d_l} = p^r_{d_l -1} D^L_{R-1} + p^r_{d_l} \Delta D^L_R + rev^r_{d_l} - \theta^r_{d_l} p^r_{d_l} D^L_R \tag{4.135}$$

$$\frac{D^L_{R_f} p^r_{d_l f}}{x_r} = \epsilon_6 p_y Y - p^r_{d_l} D^L_{R_e} \tag{4.136}$$

$$p^r_{d_l} = f(r^r) \tag{4.137}$$

Securities held by the rest of the world, issued by French banks

Stock, flow and revaluation terms for the value of securities held by the rest of the world are given the customary standard treatment that we described above for deposit liabilities and for other instruments in the balance sheet of other sectors. The part of the stock expressed in foreign currency is estimated as the difference between the total and the part denominate din domestic currency, and is in turn a function of the interest rate differential corrected for changes in the expected exchange rate. This term (eq. 4.139) is in turn the difference between the total, obtained from the consolidation table, and the part in domestic currency.

$$\frac{-B^A_{R_e} p^r_{b_a} + p^r_{b_a} B^A_R}{p^r_{b_a} B^A_R} = f[r^r - (i^r + \Delta x_{r*})] \tag{4.138}$$

$$\frac{B^A_{R_f} p^r_{b_a f}}{x_r} = p^r_{b_a -1} B^A_{R-1} + p^r_{b_a} \Delta B^A_R + rev^r_{b_a} - p^r_{b_a} B^A_{R_e} \tag{4.139}$$

The flow of this instrument expressed in foreign currency was obtained in a standard way, as the sum of the differenced stock and its corresponding revaluation term, with the latter also obtained as it is customary up to here. As in previous cases for securities, the corresponding price is not estimated, and is instead introduced in the model as the ratio of the revaluation term and four times the volume of the instrument lagged one period. Nonetheless, the part expressed in domestic currency is the difference between the total (a proportion ϵ_a of *GDP*) and the latter.

$$\Delta B^A_{R_e} \times p^r_{b_a} = \epsilon_a p_y Y - p^r_{b_a f} \Delta B^A_{R_f} \tag{4.140}$$

Securities issued by the rest of the world, held by French banks

Securities issued by the rest of the world, in turn held by French residents, are also separated depending on the currency of issuance. This applies to stocks, flows and revaluations, and he treatment of these is in line with previous cases. As a consequence, these are not shown either.

The part of the stock issued in foreign currency is expressed as the difference between the total (obtained as in Table 4.16) and the part in domestic currency. The latter (eq.

4.142) is also the difference between the total an the part issued in foreign currency, but these are expressed differently. The former is a proportion $\epsilon_8 p_y Y$ of GDP, and the latter is a part $\theta^r_{b_l}$ of the total. The remaining equations are given the usual treatment.

$$\frac{B^L_{R_f} p^r_{b_l f}}{x_r} = p^r_{b_l -1} B^L_{R-1} + p^r_{b_l} \Delta B^L_R + rev^r_{b_l} - p^r_{b_l} B^L_{R_e} \tag{4.141}$$

$$B^L_{R_e} p^r_{b_l} = \epsilon_8 p_y Y - \theta^r_{b_l} p^r_{b_l} B^L_R \tag{4.142}$$

Credit held by the rest of the world, issued by French residents

The part of the stock of loans granted by foreign banks (eq. 4.143) in domestic currency are determined as the difference of the total, from the corresponding row of consolidation table, and the part in foreign currency. The latter is defined as a proportion $\theta^r_{l_a}$ of the total, and the sum of both terms is the total.

$$L^A_{R_e} p^r_{l_a} = p^r_{l_a -1} L^A_{R-1} + p^r_{l_a} \Delta L^A_R + rev^r_{l_a} - \frac{p^r_{l_a f} L^A_{R_f}}{x_r} \tag{4.143}$$

$$\frac{L^A_{R_f} p^r_{l_a f}}{x_r} = \theta^r_{l_a} p^r_{l_a} L^A_R \tag{4.144}$$

The price of these loans are in turn a function of the interest rate foreign banks receive from French residents and of the inflation rate. The remaining equations are given the same treatment as the others.

$$p^r_{l_a} = f[(i + \Delta x_{r*}), infl] \tag{4.145}$$

Credit issued by the rest of the world, held by French banks

Credit granted by French banks to the rest of the world in stock and flow form are given the same treatment as in the case of loans made by foreign banks, so we do not replicate them here. As in the previous case, the price of these loans are also a function of the corresponding interest and inflation rates[68]

[68]A special treatment is given to the revaluation term of loans contracted by the rest of the world. Indeed, this is the equation that guarantees equilibrium at the revaluation level. The logic behind this closure is that $rev_H + rev_F + rev_B + rev_G + rev_R = 0$, where each rev^S (for each S sector) is the sum of the revaluation terms on the asset side of its hypothetical revaluation matrix less the corresponding terms on the liability side (not shown). The graphs showing that the equilibrium is respected are shown in chapter 6 as ratios of

$$p^r_{l_l} = f(r^r, infl) \tag{4.146}$$

Equities held by the rest of the world, issued by French companies

Since, a we mentioned at the beginning of this subsection, equities held by the rest of the world are denominated only in domestic currency, the number of equations for this instrument for the foreign sector boils down to three equations. The first is the stock (eq. 4.147), which is obtained from the consolidation table. The second (eq. 4.148) is the flow term, which serves as a closing line for the sector. That is, this equation serves as the link between the current and the capital accounts. Lastly, because there are potentially several factors that determine the price of equities held by the rest of the world, and most of these do not depend on the French economy (i.e. France is a 'small' economy as in Mundell-Flemming type models), this term is defined as it was obtained from the accounts.

$$E^A_R p^r_{e_a} = p^r_{e_a-1} E^A_{R-1} + p^r_{e_a} \Delta E^A_R + rev^r_{e_a} \tag{4.147}$$

$$\Delta E^A_R \times p^r_{e_a} = p^r_{d_l} \Delta D^L_R + p^r_{b_l} \Delta B^L_R + p^r_{l_l} \Delta L^L_R + p^r_{e_l} \Delta E^L_R - p^r_{d_a} \Delta D^A_R - p^r_{b_a} \Delta B^A_R - p^r_{l_a} \Delta L^A_R + FC_R + Aj_R \tag{4.148}$$

$$\Delta p^r_{e_a} = \frac{rev^r_{e_a}}{4E^A_{R-1}} \tag{4.149}$$

Equities issued by companies abroad, held by French residents

The equation for the value of the stock of equities issued outside of France (eq. 4.150), held by French residents, guarantees that all equities circulating through the French economy are created somewhere and find a destination. In other words, this stock value equals the sum of equities held by firms, banks, the government, households and the rest of the world, less the equities that are issued by French firms and banks. The flow term (eq. 4.151) is obtained from the consolidation term, and the price is exogenously determined by the revaluation term as a ratio of the stock of equities issued the previous period.

the left-hand side with respect to the right-hand side of the given equilibrating terms.

$$E_R^L p_{e_l}^r = p_{e_a}^f E_F^A + p_{e_a}^b E_B^A + p_{e_a}^g E_G^A + p_{e_a}^h E_H^A + p_{e_l}^r E_R^A - p_{e_l}^f E_F^L - p_{e_l}^b E_B^L \tag{4.150}$$

$$\Delta E_R^L \times p_{e_l}^r = p_{e_l}^r E_R^L - p_{e_l-1}^r E_{R-1}^L - rev_{e_l}^r \tag{4.151}$$

$$\Delta p_{e_l}^r = \frac{rev_{e_l}^r}{4E_{R-1}^L} \tag{4.152}$$

System's closing variable and unwritten equation

To conclude the presentation of this system, two more equations have to be mentioned. The first (eq. 4.153) is explicitly written in the software, and represents the financing capacity of the rest of the world, which equals the current account of France. In contrast, 4.154 is the unwritten equation that guarantees the equilibrium of the system in flow form. Clearly, for the system to be stock-flow consistent, these two must be equal at all times. This is the case, with sa few outliers that are, in our opinion, not consequential. For a discussion of the model properties, see the first part of chapter 6.

$$FC_R = p_m M + INT_R^r + DIV_R^r + SC_R + SB_R - p_x X - W_R - T_{2_R} - INT_R^p - DIV_R^p - T_{3_R} \tag{4.153}$$

$$FC_R = -(FC_H + FC_F + FC_G + FC_B) \tag{4.154}$$

4.2.8 Warning

The present model is, just like any other model for whatever other purposes, certainly not perfect. Some errors may remain that could potentially have important effects when (and if) these are solved. Since the model is relatively large and it relies on econometric and simulation techniques, several technical and fundamental issues have to be dealt with and, at least at this point, not all have been addressed properly or satisfactorily for the eyes of specialists (who, clearly, know more than ourselves) in either macroeconomics, modeling, econometrics or all. Before getting to treat these issues briefly, it should be mentioned that, if errors remain in our modeling exercise, this lies well beyond our will and sometimes reach, and we contempt ourselves with presenting an **imperfect first experiment** that could (and will) be improved in the future.

One of these issues concerns the structure of the model itself, issue that is in turn linked to the resolution algorithm used. For example, the adjusting terms called *other changes in volume*[69] were set explicitly in the code as shares of production, except for two balance sheet items for firms: capital and equities held. Instead of treating these two terms as the others, we specified them as in the consolidation tables. This implies that two items from the corresponding instruments were written using the same identity. From a logical point of view this does not make sense, for one equation suffices for the corresponding column equilibrium to be respected.

However, this fundamental issue does not impede the model to be solved. This is so because the solving method used in the software (Gauss-Seidel) uses an *iterative updating rule*[70]. That is, the computation of the system is done the number of times equivalent to the number of observations in the simulation sample, replacing the values of the series. In other words, the solving of the system using this technique depends on the ordering of the equations. Consequently, the simultaneousness of equations does not impede the model to run. Of course, this does not mean that our procedure is the correct one. The advantage, nevertheless, is that this *ad hoc* treatment serves as a patch that can be treated in future and improved versions of the model.

As stated over and over, this is a first skeleton of a model that combines good old Cowles type modeling and the stock-flow literature, both of which have immense bodies of works separately. We believe this first attempt provides the basis for better and more credible models.

[69]To our knowledge, these terms have received little or no explicit mention in the existing empirical literature. As a consequence, we were unable to find a reference (from the modeling point of view) of how to deal with these variables. This is certainly another area that deserves further research in the empirical stock-flow literature.

[70]See the following link: http://www.eviews.com/online_help/helpintro.html#page/EViews%209%20Help/optimize.064.4.html.

Chapter 5

Estimates for behavioral equations included in the model

The behavioral assumptions underlying a particular mode of aggregation are just as important as the behavioral relationships assumed to hold between the variables defined.
Leijonhufvud 1968, p. 39.

5.1 Introduction

This chapter presents our estimates of the parameters used in the behavioral equations of the model built for the previous chapter. Most of these are based on Vector Error Correction Models (*VECM*s, or restricted *VAR*s), which lead to the corresponding Error Correction Mechanisms (*ECM*s) for each specification. The specifications that are not estimated in two steps are plain *OLS* equations of the corresponding series in differences[1]. *VECM* estimates are given a long-run interpretation, whereas *ECM* estimates are given a short run interpretation. Both types of specifications were selected (among several experiments) on the basis of two main features; (1) statistical validity, and (2) theoretical meaningfulness.

[1]Of course, it would have been desirable to maintain a certain degree of homogeneity among equations. However, given several issues, we were unable to do so. The reasons are several: (1) the large number of equations included in the model, (2) the large number of equations estimated (i.e. in *MÉSANGE* there little more than 40, whereas we estimated more than 50), (3) the large number of possible and feasible specifications, and (perhaps more importantly) (4) the fact that not all specifications allow convergence of th model. Clearly, due to the last issue, we were forced to contempt ourselves with some leaving "imperfect" specifications.

5.1.1 Statistical methodology

Statistical validity ensures that the basic assumptions upon which our specifications are based (mainly, stationarity of the corresponding equations[2]) are fulfilled. While we recognize that there could be some problems of omitted variables (i.e. an effect which is out of the reach of existing data and/or exogenous variables), we aim at providing the most solidly estimated coefficients with the existing macroeconomic fundamentals at our disposal, leaving unexpected events be unexpectedly determined (i.e. a sudden change in *animal spirits*).

Theoretical meaningfulness implies that we may be able to give our estimates an interpretation which is based on economic theory. That is, while we theorize about the signs[3], we leave the question of magnitude of the corresponding impact to estimates. The main body of research upon which our study lies is, broadly speaking, Keynesian. It incorporates ideas stemming from Keynes' *General Theory*, from Kalecki's *Principle of Increasing Risk* (Kalecki 1937b) and *Income Distribution Theory* (Kalecki 1938), as well as Minsky's *Financial Instability Hypothesis* (Minsky 1986).

Our choice of the statistical methodology rests upon the fact that *VECM*s consist of unrestricted systems of simultaneous equations that allow for simultaneous determination. In the same vein *ECM*s, which are in turn obtained from the former, allow for a short-term interpretation and further allow to infer causality in the sense of Granger. The latter also make a clear link between the short- and the long-run, via speeds of adjustments (the coefficients of the corresponding cointegration vectors lagged one period).

We tried to keep the choice of the variables of each specification as standard as possible within the above-mentioned theoretical framework, though we may have "innovated" due to either lack of homogeneity with the existing literature[4] (for instance, the own funds equation) or peculiarities of the French economy which may not have been yet studied (for instance, the structural breaks present in several equations, which are dependent on the timing of business cycles in France).

[2]That is, normality, homoskedasticity and lack of autocorrelation.

[3]Note: the equations at the beginning of each subsection show a plus sign by default. However, the expected signs are shown in the corresponding *VECM* Tables.

[4]We also recognize that it is virtually impossible to know *all* the existing literature, so we exclude the literature we have not come across.

Outliers and cointegration

Another peculiarity of our estimates is that we follow the approach developed in Hendry and Mizon 2011, Castle, Doornik, and Hendry 2012 as well as in Doornik, Hendry, and Nielsen 1998. In the first paper, entitled "Econometric Modelling of Time Series with Outlying Observations", the authors focus their attention on an issue that is often misinterpreted in theoretical discussions: the role of so-called *dummy variables*. Despite the fact that some non-practitioners[5] believe (though often without a clear understanding) these type of deterministic variables are like aces under the sleeve, thus comparing econometricians to illusionists.

So, concerning outliers, an important lesson Hendry and Mizon 2011 teach us is that outliers "arise both from sudden behavioural shifts (...) and from data measurement errors" (p. 4). Moreover, "[t]he inclusion of deterministic time trends, seasonal dummy variables, and event-specific dummy variables is a well established practice in empirical econometric modelling". The authors then propose a method called impulse-indicator saturation (IIS) as an attractive approach to deal with these event-specific anomalies. In a few words, the technique consists in removing extreme observations as well as location shifts and innovation outliers by including as many *dummies* as it is necessary for the estimated equation (i.e. the fitted values) to approach the observed series. Not only is this helpful, but even a necessary step for the corresponding statistical model to be correctly specified.

The authors also propose a software program that takes care of this: *Autometrics* (available as part of OxMetrics). Nevertheless, as we mentioned before, the software we use is EViews, so that their preferred algorithm was not used in the estimations. Instead, we developed our own "manual" way of programming an impulse-indicator saturation, which we integrate in each long-term and/or short-term equation. The inclusion of this IIS-type code was quite useful in our estimations and so, without them, convergence of simulations may not have been possible, thus the model would even be able to run.

A follow-up of that article is Castle, Doornik, and Hendry 2012, where the authors focus on "Model Selection when there are Multiple Breaks". Of course, the discussion here is dedicated to structural change dummies, which we also use in our estimations (there are indicated with shaded areas in the corresponding figures).

Finally, Doornik, Hendry, and Nielsen 1998 provide an example of what an "ideal"

[5]By some non-practitioners we mean researchers or economic/financial analysts who are not familiar with econometrics or statistics. It is not uncommon to hear informal comments (not very well informed) about what econometrics is or is not. A common misinterpretation is that dummy variables are used in a way to *take out* anomalous observations from the sample under study.

cointegrated system looks (or *should* approximately look) like. With some caveats in our own models, we tried to follow as closely as possible their procedure, although it must be noted that the number of equations estimated in this work is so large that it is difficult to estimate our equations as meticulously as the authors do, and dedicate as much space and detail to very equation as they also do.

5.1.2 Leads, lags, logs and other technical details

Most equations (other than prices) were estimated in logarithmic form, when possible, in order to (1) avoid heteroskedasticity problems and (2) to allow for an interpretation in the sense of elasticities. Whenever the values of the series specified as logs lie between 0 and 1, we multiplied the corresponding numerator by 100 in order to avoid modeling a series with negative values[6].

It must also be noted that we applied moving averages to several estimated series with a lead of 4 (since there are 4 quarters in a year). This step is done in order to "smooth" the corresponding series, thus avoiding having to deal with seasonality issues.

The number of lags in each specification depend on a standard lag exclusion test performed using EViews 8 (the software we used in all steps in the statistical modeling). Indeed, this is one step (out of several) in our misspecification testing. Joint tests were also checked for (presented in the last section of the current chapter).

The data used here stem from official sources. National accounts (*Comptes d'Agents Détaillés*) on a quarterly basis were obtained from *INSEE*, which span from 1949 to 2013 on a quarterly basis. These are all shown in the transactions part (lines 1 to 17) of the matrix of the sheet Simplified_URT_2010 from the document Transactions_Flows_2010.xls. Lines 20 to 23 of the same matrix were obtained from *Banque de France*'s financial accounts (*Comptes Nationaux Financiers*) of the corresponding aggregate financial instruments. These flows, as well as the revaluation terms (that is, the changes in value due to a change in price) of the corresponding asset/liability were obtained for each quarter annualized. All series were brought to quarters, particularly the stocks (of financial and non financial assets), using the technique proposed by Denton 1971 using annual or annualized data[7]. The terms *other changes in volume* (not used in the estimations) were obtained residually as shown in the consolidation tables at the beginning of each

[6]Clearly if, for instance, variable A is a part of variable B, the ratio A/B will lie between 0 and 1. So, if we take logs of this ratio, it will be negative. In order to avoid this, we calculated instead $ln(A \times 100/B)$.

[7]Note, this technique necessitates two series. The first is the annual series (N years) that is to be brought to quarters. The second is a quarterly series for the period ($4 \times N$ quarters) that serves as a guide for the quarter by quarter evolution of the previous series.

subsection (for each institutional sector) in chapter 4.

As mentioned above, the parameters from these models (except the employment equation) come from *VECM*s (the long-term equations), so we present these first, together with the equation and a graph of the determinants of the corresponding equation. The gray-shaded areas indicate the presence of structural change dummies for the corresponding period.

We present the equations sector by sector. This is the same order in which they appear in the previous chapter. We begin with the description of the equations that concern households in the next section. Then we move on to describe the estimates for firms in section 5.3. In section 5.4 we show the parameters found for the specifications of the general equations. Finally, the estimates that concern the government, banks and the rest of the world are shown in sections 5.5, 5.6 and 5.7, respectively.

All parameter estimates and their t-statistics are shown in section A.4 of the appendix. These are immediately followed by misspecification tests. As it has been the case so far, we omit time subscripts in order to simplify the notation, but of course, keeping in mind that we are dealing with time series all along.

5.2 Estimates for households

Households are one of the key sectors in which we focus. This is so because, as was mentioned in the first chapter, there have been important changes in the French economy which have been unfavorable for most workers and individual entrepreneurs since the beginning of the eighties. This issue has been at the core of the discussions in Post-Keynesian circles, and lies at the heart of the present thesis and is closely linked to the functional distribution of income and economic policy.

In other words, the setting of a low-employment regime, in turn the result of central bankers' obsession to tame the inflation rate (mainly through high interest rates), created a gradual reduction in the demand for credit by non-financial firms, thus forcing private banks to lend to other sectors. As far as France alone is concerned, two key sectors were households and the government. With the strong fall in interest rates (here calculated as *apparent*; i.e. the ratio of interest payments to the stock of debt lagged one period) paid by households, this sector's demand for credit increased drastically, thus creating two strong surges in the demand for dwellings. The first of these took place in the second half of the eighties, and the second from the end of the nineties to 2008. The rise in household indebtedness coupled with the high unemployment rates seen in France since the beginning of the eighties may in turn reflect the fact that households have used part of their debt-income for consumption purposes, as analyzed for the United States by Barba and Pivetti 2009.

5.2.1 Consumption

Following the discussion in section 2.1.3, we estimated a consumption function which has as its determinants disposable income and wealth, where the latter is separated into housing (or non-financial wealth) and equity (or financial wealth). The corresponding series are shown (in billions) in Figure 5.1, which shows a clear close link between income and consumption demand (top panels) throughout the whole period, a particularly close relationship since the second half of the nineties between stock market (or financial) wealth and consumption (left panels), as well as a clear connection between consumption and housing demand cycles around 1990 and 2008, respectively (top-left and bottom-right panels).

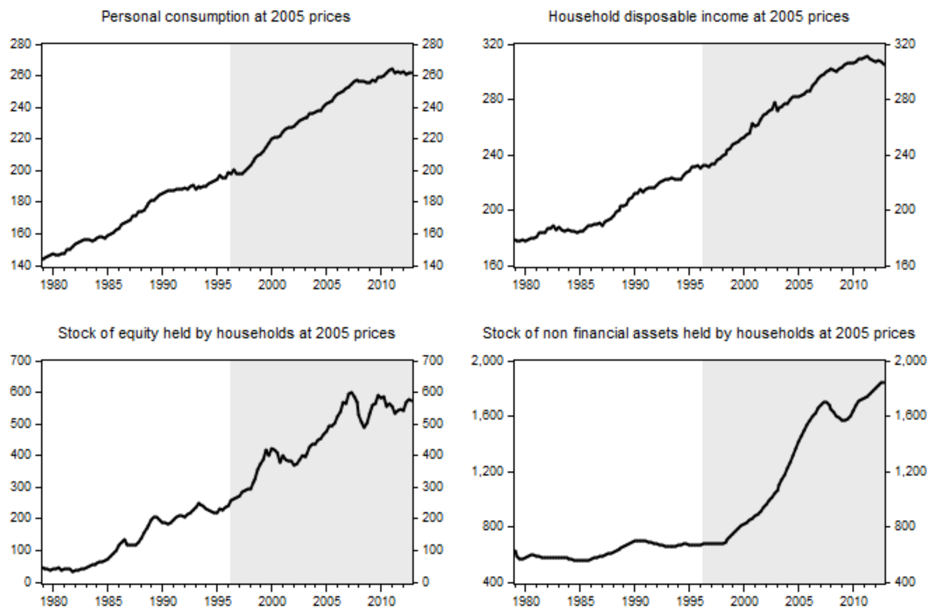

Figure 5.1 – Consumption function's components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

The shaded area in all four panels indicates that a structural change occurred throughout the corresponding period. In this specification, the shift took place from the second quarter of 1996 to the end of the sample period[8]. The corresponding dummy, which takes the value of 1 along this period, is included in the *VECM* and is significant for the housing (or non-financial) wealth vector. This is evident from the strong rise in the value of the stock of physical capital over the price index of consumption which began at around that period and did not end, mainly as a consequence of the sharp increase in the price of non-financial assets of households (in turn a consequence of the rise in the price of land, see the discussion in section 1.1.2). In comparison to, for instance the U.S., housing prices in France did not fall "enough" (i.e. to pre-bubble levels) so as to more or less offset the negative effect its rise created in the demand for dwellings or in the profit rate of firms (more on this below).

$$ln(C) = 0.06 + 0.83ln\left(\frac{Y_H^d}{p_c}\right) + 0.07ln\left(\frac{p_k^h K_H}{p_c}\right) + 0.12ln\left(\frac{p_{e_a}^h E_H^A}{p_c}\right) \tag{5.1}$$

The long-term consumption function we estimated (eq. 5.1) implies that the marginal propensity to consume is 0.83, whereas the demand elasticity of consumption with respect to housing wealth is 0.07, and that with respect to financial wealth 0.12. The first result means that as households' disposable income increases by 1%, this tends to make aggregate personal consumption rise by 0.83%. The effects of higher levels of wealth have a similar interpretation and, as is clear from the equation, financial wealth has a slightly stronger effect on consumption demand than does housing wealth. We interpret this as a strong artificial increase in housing wealth, mainly due to the corresponding price bubble.

Of course, financial wealth has also risen spectacularly due to its price. However, when we plot the ratio of these prices ($p_{k_t}^h/p_{e_a t}^h$, not shown here) the resulting curve evolves at around 0.6 from the beginning of the eighties until the end of the nineties, but grows drastically thereafter, until it reaches 1.25 in 2011. This indicates that housing prices have risen much faster than households' equity prices and, as a consequence, that housing wealth (for this sector) has risen more artificially than financial wealth.

$$\Delta ln(C) = 0.01 + 0.17\Delta ln(C_{-2}) - 0.16\Delta ln(C_{-4}) + 0.19\Delta ln\left(\frac{Y_{H-1}^d}{p_{c-1}}\right) - 0.08\Delta ln\left(\frac{Y_{H-4}^d}{p_{c-4}}\right)$$

[8] Note, whenever structural change dummies were set until the end of the estimation period (2012q4), we assumed that the structural change lasted until the *horizon* period (i.e. 2019). For a discussion on the extension of structural break dummies for forecasting purposes, see the part "Conditional forecasting" in Hendry and Mizon 2011.

$$+0.11\Delta ln\left(\frac{p_k^h K_H}{p_c}\right) - 0.01\Delta ln\left(\frac{p^h_{e_a-2}E^A_{H-2}}{p_{c-2}}\right) + 0.02\Delta ln\left(\frac{p^h_{e_a-3}E^A_{H-3}}{p_{c-3}}\right) - 0.008vc^C_{-1} \qquad (5.2)$$

The short term specification described above has as a complementary specification equation 5.2. In it, it can be seen that the growth rate of consumption ($\Delta ln(C)$) has a positive lagged effect on itself. That is, given a 1% increase in this growth rate, there is a 0.17% rise of itself two periods later, and part of this initial positive effect is counterbalanced two quarters later. Following a 1% increase in the growth rate of disposable income, the percentage change of consumption demand increases by 0.19% one quarter later, but this is partly offset two quarters prior to the first effect. Overall, however, it must be noted that the short-term effect of disposable income (and of consumption itself) on consumption is positive.

In the same vein, with a 1% rise in the growth rate of housing, there is a corresponding higher growth rate of consumption of 0.11%. Also, after a positive change in financial wealth takes place, there is a corresponding positive effect (though not as important as the previous one) on the percentage change in consumption. Note that the sum of the coefficients of $\Delta ln(p^h_{e_a-2}E^A_{H\_2}/p_{c\_2})$ and $\Delta ln(p^h_{e_a-3}E^A_{H-3}/p_{c-3})$ is 0.01, which means that the overall effect of a rise in the growth rate of the stock of financial wealth of households on the growth rate of consumption is positive.

The constant term in the short-run equation (0.01) is interpreted as the starting growth rate of the series or, what amounts to the same, as the growth rate of consumption when all variables are equal to zero. Finally, the adjustment from the short- to the long-run (the coefficient of the cointegration vector) takes place at a 0.8% quarterly or, what amounts to the same thing, a 3.2% yearly.

Naturally, the term vc^C_{-1} is the cointegration vector for the consumption function (the superscript C stands for that), and is in turn equal to

$$vc^C_{-1} = ln(C_{-1}) - 0.06 - 0.83ln\left(\frac{Y^d_{H-1}}{p_{c-1}}\right) - 0.07ln\left(\frac{p^h_{k-1}K_{H-1}}{p_{c-1}}\right) - 0.12ln\left(\frac{p^h_{e_a-1}E^A_{H-1}}{p_{c-1}}\right)$$

that is, the long-term consumption cointegration vector as it was obtained from the EViews window "Vector Error Correction Estimates". Of course, the same procedure is followed for the remaining specifications in the chapter. The "Johansen cointegration test" indicates that there are up to two cointegration vectors. However, for ease of interpretation in a theoretical sense, we decided to treat this long term specification as if there were only one vector for the log of consumption. Furthermore, misspecification tests (see part A.4 in the appendix) indicate that the specifications satisfy the assumptions of normality, homoskedasticity and non-autocorrelation.

5.2.2 Consumer prices

In this part we clarify issues concerning several price indexes, but we focus particularly on consumer prices. Of course, this is done in order to save space and for simplification purposes. We assume that the leading price equation (the *GDP* deflator) explains all other national accounts prices, and that this index determines consumer prices. As a consequence of this, the same applies to prices of value added, investment and public expenditure. Figures 5.2 and 5.3 display the evolution of these price indexes, with 2005 as a reference year.

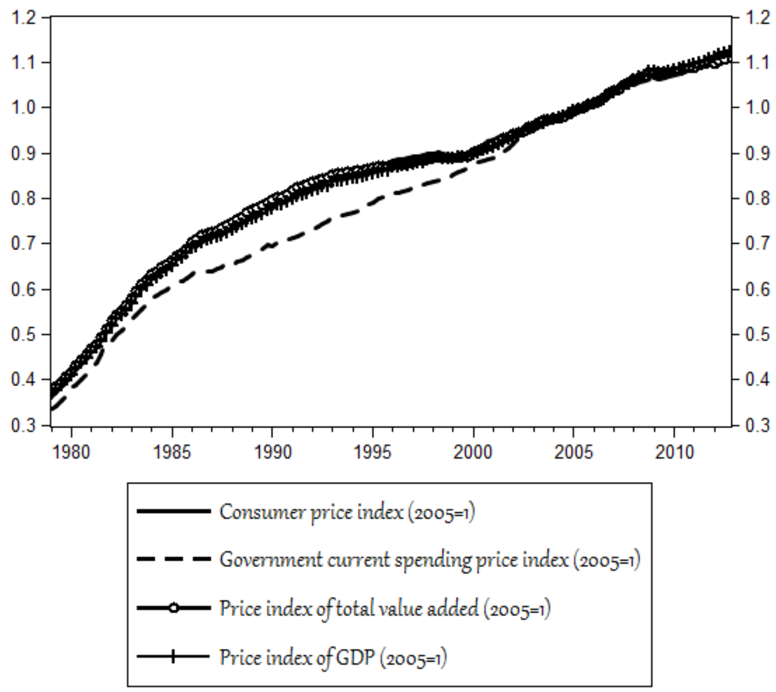

Figure 5.2 – *GDP* components' price indexes (1); 1979-2012. Source: *INSEE*.

As can be seen from the figures, the long-term evolution of the price indexes of the components of aggregate output closely follow that of the reference general price level. But the degree of 'closeness' clearly differs.

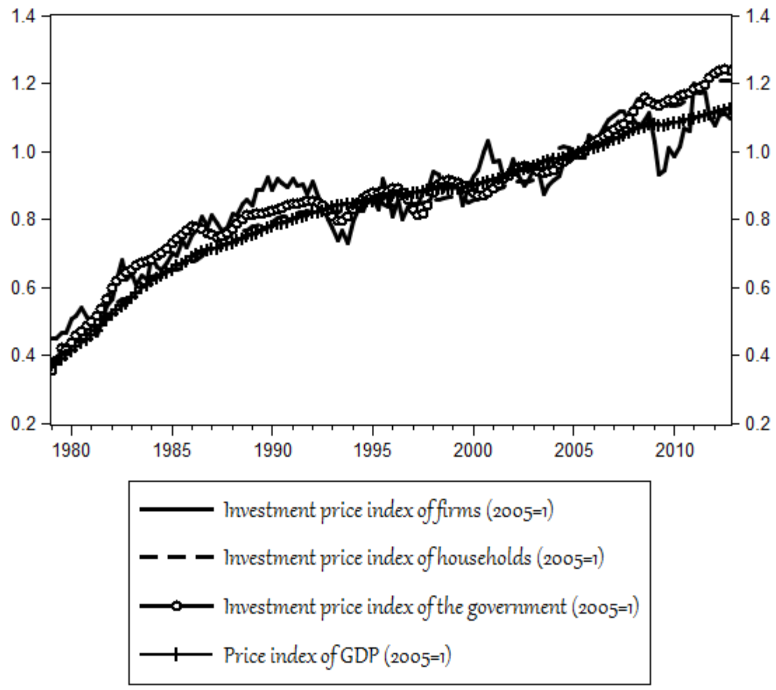

Figure 5.3 – *GDP* components' price indexes (2); 1979-2012. Source: *INSEE*.

The series for the prices of consumers, value added, public consumption expenditure and the general price level (Figure 5.2) show a steady progress from the end of the seventies up to the beginning of the "great moderation" (around 1985). Up to that point, the quarterly "inflation rates" were, broadly speaking, above 2% (close to 4% in 1981). Since 1985, however, these have hardly exceeded 1%. This is all consistent with what we have observed in chapter 1.

Nevertheless, as can be seen from Figure 5.3, the gap between *GDP* deflator and the price indexes of investment is wider. The former have fluctuated enormously. To take the most extreme example, the mean growth rate of the price index of firms' investment (for the period under study) is 0.8%, whereas its standard deviation is 4.6%. We add this issue to the long list of interest topics to be treated in the future. Let us now focus on the estimated long- and short-term equations for the consumer price index.

The long term specification is very simple, and is shown in the following equation

$$p_c = 0.07 + 0.94 p_y \tag{5.3}$$

The short term equation is likewise simple

$$\Delta p_c = 0.81\Delta p_{c-1} + 0.11\Delta p_y - 0.03vc^{p_c}_{-1} \tag{5.4}$$

These two equations simply indicate that the consumer price index grows almost one on one with the general price level (eq. 5.3), whereas the difference of the former (eq. 5.4) depends on the past evolution itself more than on the latter series differenced. The adjustment from the short to the long-run is relatively fast; 3% every quarter as speed of adjustment, which in turn implies that the short run reaches the long run at a speed of 12% annually.

Now, the fact that we did not estimate these price equations in logs (rather than in levels, as we do) does not imply a major 'interpretation' problem[9], given that the main specification (the general price level) was set in that way (see below). We proceeded in this way for these price estimations (not in logs) for no particular reason other than ease of data handling when computing.

5.2.3 Households' demand for dwellings

As mentioned in part 2.1.3, this specification is inspired in the works of Egebo, Richarson, and Lienert 1989 and Zezza 2008. We make the stock of per capita dwellings (K_H/pop) a function of per capita disposable income (Y^d_H/pop), the ratio between the price of dwellings and consumer price (p^h_k/p_c), the real interest rate paid by households[10] (r^h_l), and the unemployment rate (u). Unlike Egebo, et al., we included the last variable in our long-term specification, but not in the short-run one. They do the opposite.

Figure 5.4 shows the variables included in this model, with the corresponding shaded area that indicates a structural change dummy, which in this case takes the value of 1 from 2008q4 to the end of the sample period. The latter is significant for two vectors: demand for dwellings and the relative price series. The stock of non-financial assets held by households increased significantly after the 2008 crisis, mainly due to the rebound effect described by Couleaud, Mauro, and Delamarre 2012, which is due to the strong rise in the price of land. The ratio p^h_k/p_c, as we saw in the previous section, rose spectacularly from the end of the nineties until 2008, when it settled at around 10% higher level than in 2005 (the reference year). Thus, the structural change dummy accounts for these two

[9]Of course, if we had estimated $ln(p_c)$ and $\Delta ln(p_c)$ instead of p_c and Δp_c as we do here, we would have carried out our interpretation of the differenced series as growth rates.

[10]Note, the inflation rate was calculated here as the growth rate of the consumer price index. This is natural since this is the price indicator that affects households' budget and decisions. For the remaining sectors the price index used, when dealing with inflation, is the general price level.

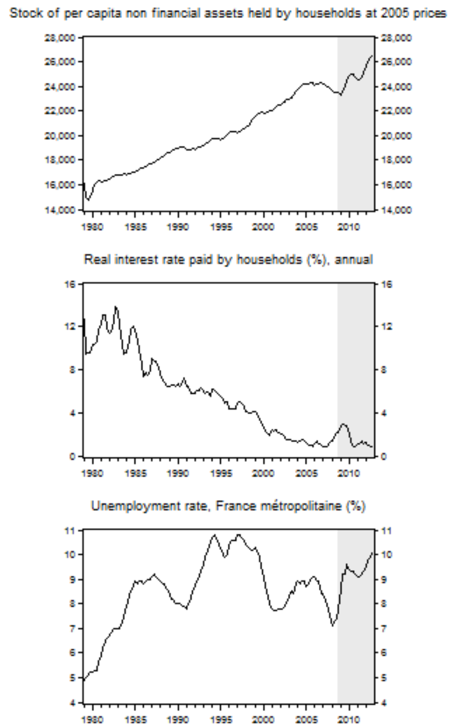

Figure 5.4 – Households' stock of non financial assets, function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

events.

$$ln\left(\frac{K_H}{pop}\right) = 4.95 - 0.22ln\left(\frac{p_k^h}{p_c}\right) - 7.88(r_h^l - infl) - 0.31ln(u) \quad (5.5)$$

Equation 5.5 shows the estimated long-term coefficients (except that of disposable income) on the long-term demand for dwellings, given that we assumed there are two cointegrating vectors in the *VECM*[11]. This is so because EViews reports the results from the first step Johansen procedure and, given that we did not impose any *a priori* restrictions, "the default normalization expresses the first r variables [number of cointegrating relations] in the *VEC* as functions of the remaining $k-r$ variables", where k is the number of endogenous variables[12]. However, through its error correction parameter estimated by the program, and through an impulse response function, we were able to observe

[11]Naturally, the first two variables included in the system are the two vectors of cointegration assumed in this specification: housing demand and disposable income. This would imply that per capita disposable income is negatively driven by the interest rate, the price ratio and the unemployment rate. Such relationship, however intuitive, is not based on any particular theory and we do not show it here.

[12]Quotation obtained from EViews User's Guide II, p. 573.

that the estimated effect of disposable income on housing demand is negative, which is counterintuitive[13]. However, it must be noted that, despite this deficiency (which is corrected in the second step of the estimation process), the *ECM* shows a positive effect between disposable income and demand for dwellings. Given that our simulations include the *OLS* short-term estimates along with the corresponding long-term equation (in which this counterintuitive result appears), we were able to observe an positive effect of disposable income on housing demand.

The remaining three explanatory variables have the expected negative signs. Thus, following an increase of 1% in the quarterly interest rate[14] ($r_h^l - infl$) there is a corresponding fall of 0.1% in the demand for dwellings[15]. With respect to the price ratio (p_k^h/p_c), a 1% rise in the price of capital above that of consumer goods leads to a 0.2% fall in the demand for dwellings. Also, a 1% increase in the unemployment rate (our proxy for consumer confidence[16]) implies a fall of the demand for homes by 0.3%.

$$\Delta ln\left(\frac{K_H}{pop}\right) = 2.07\Delta ln\left(\frac{K_{H-1}}{pop_{-1}}\right) - 1.73\Delta ln\left(\frac{K_{H-2}}{pop_{-2}}\right) + 0.62\Delta ln\left(\frac{K_{H-3}}{pop_{-3}}\right)$$

$$+ 0.05\Delta ln\left(\frac{Y_H^d/p_c}{pop}\right) - 0.02\Delta ln\left(\frac{p_k^h}{p_c}\right) - 0.0003vc_{-1}^{KH} \tag{5.6}$$

On the other hand, the quarterly growth rate of the per capita demand for dwellings (eq. 5.6) is affected by itself in the past three quarters, given that the coefficients of its first three lags were significant, and the sum of whose yields less than unity. This is obviously a prerequisite for the equation to be stable in the long run. Another important determinant of the growth rate of housing demand is the growth rate of disposable income per capita which, for every 1% it increases, it makes the former increase by 0.05%. A rise in the growth rate of the price ratio (p_k^h/p_c) of 1% provokes a fall in the demand for dwellings by 0.02%. Finally, the speed of adjustment is quite low (0.0003), which implies that the adjustment from the short- to the long-term takes, redundantly speaking, long.

[13]In fact, what would be desirable and more intuitive would be a parameter close to 1, according to Egebo, Richarson, and Lienert 1989.

[14]To avoid confusion, if the quarterly real interest rate is, say, 4%, a 1% increase of it would yield a new interest rate of 4.04% rather than 5%.

[15]This elasticity is calculated as -7.88 (the estimated coefficient) multiplied by the average quarterly real interest rate (0.01332).

[16]Note that confidence is an important component in *SFC* models. See for instance, Le Heron 2009.

5.2.4 Housing price

Following Jacobsen and Naug 2004, we posit that the house price is a function of income, the interest rate, the unemployment rate. Their specification (shown in p. 8 of their article) is such that, for Norway, they found that in the long term equation these three elements enter the specification, whereas the unemployment rate does not appear in the short term equation. We additionally introduced the housing stock per inhabitant, which proved being a good fit. This variable enters the short-run specification, but not the long-run one. This is so because the estimated equation was found to have three cointegration vectors, and the first three variables included in the long-run equation were disposable income (not shown in the equations below), per capita demand for dwellings and the variable of interest.

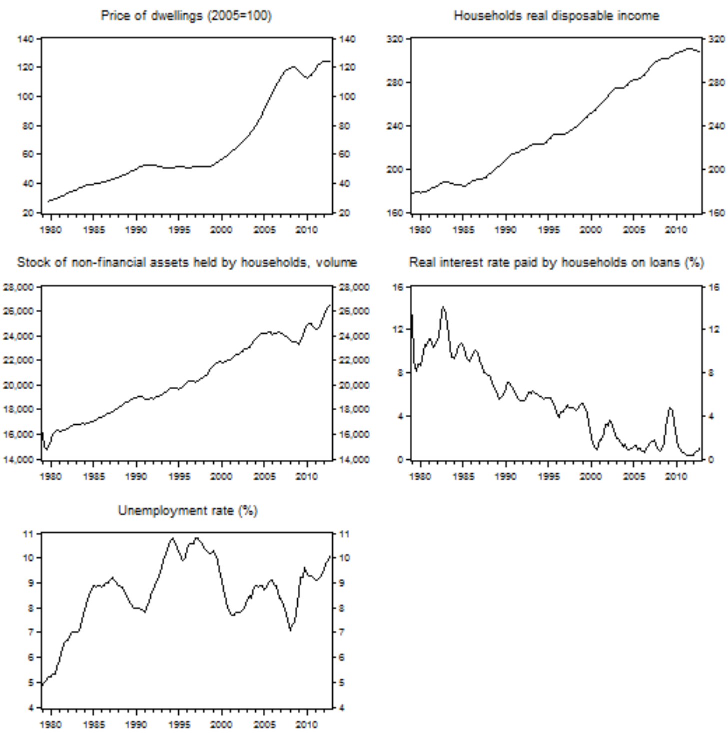

Figure 5.5 – Housing price function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

Impulse response graphical inspection (not shown here but available upon request) suggests, however, that these two cointegrating vectors (disposable income and per capita demand for dwellings) have a positive effect on the housing price. Figure 5.5 shows the latter and its above-mentioned determinants.

As mentioned in chapter 1 and as can be seen in the top left panel of the figure, there were two major housing bubbles since the new regime settled in France. The first goes from 1985 to 1989 and the second from 1997 to 2005. In contrast to, for instance, the case of the U.S. real estate market, housing prices in France did not fall to pre-bubble levels after the crisis. This has had important consequences for households and firms.

$$p_k^h = 1.17 - 24.32(r_l^h - infl) - 1.58u \tag{5.7}$$

Perhaps the most important determinant of this price is the real interest rate which, as equation 5.7 and the middle right panel show, has had an important negative effect on it. Unfortunately, given the properties of the function, we are unable to give an "elasticity" interpretation to this result, but we can attempt to do so indirectly by using the parameter and the data available. Thus, if the slope of the p_k^h function with respect to the real interest rate is -24.32, and the ratio of both is 676.9, we can then say that the corresponding elasticity is

$$\left(\frac{\Delta p_k^h}{\Delta(r_l^h - infl)}\right) \times \frac{(r_l^h - infl)}{p_k^h} = -24.32 \times 676.9 = 0.036$$

Thus, for every 1% that the real interest rate falls, there is a corresponding rise of 3.6% in the price of dwellings. Following the same procedure, we found that for every 1% increase in the unemployment rate there is a corresponding fall of p_k^h of 3.1%. Clearly, the evolution of the interest rates has been a more important factor in determining the evolution of the French housing market, both because the estimated elasticity of the price with respect to the real interest rate is higher than that of the unemployment rate, and because this dependent variable has increased ore than it has fallen.

$$\Delta p_k^h = 2.32\Delta p_{k-1}^h - 1.56\Delta p_{k-2}^h + 0.23\Delta p_{k-4}^h + 0.68\Delta\left(\frac{K_H}{pop}\right) - 0.005\Delta u - 0.0004vc_{-1}^{pkh} \tag{5.8}$$

In the short-term (eq. 5.8) it can be seen that the sum of the coefficients of the lagged dependent variable is less than unity, which ensures stability of the corresponding equation. The coefficient of $\Delta(K_H/pop)$ indicates that, following a unit increase of this variable, there is a corresponding rise of Δp_k^h by 0.68. The unemployment rate also has a negative impact on the corresponding series in the short-term, and the speed of adjustment seems relatively low[17].

[17] This might be merely an illusion, given that the dependent variable is not a growth rate (because

Before getting to the next specification, we remind the reader that the price of households' investment (and for that purpose, also for firms and the government, the other two producing sectors) is qualitatively and thus quantitatively different from the price of non-financial assets. For a discussion on this, see "Price of housing an capital" of in part 2.1.3 of the corresponding chapter.

5.2.5 Households' investment price

This specification is quite simple due to two main reasons. The first is theoretical, and has to do with the fact that we assumed that all prices included in the *GDP* identity (expenditure side) depend on the leader price level: the *GDP* deflator[18]. The latter is defined in a somewhat standard Kaleckian fashion (see below). The second reason is empirical, and has to do with the fact that the estimated long-term equation linking p_i^f and p_y appeared with a positive sign in the short run one, which would in turn imply a contradiction. This was the procedure followed for other equations whenever this sign problem occurred.

$$\Delta p_i^h = 0.86\Delta p_{i-1}^h + 0.09\Delta p_y \tag{5.9}$$

Thus, equation 5.9 says that a change in the price of households' investment is provoked by itself one period after an initial rise in it, and by the general price level. Clearly, the past evolution of Δp_i^h is more important than that of the *GDP* price index in determining the short-term evolution of the former.

5.2.6 Price of deposits held by households

Figure 5.6 shows that the price of deposits held by households has followed a hump-shaped pattern, rising strongly in the mid-eighties and slowly falling for the rest of the decade. From 1992 to 1993 this price fell strongly, recovered likewise the next year, and fell again in 1995. The pattern since then has had a clearer long-term trend, going up during the stock market boom (1995-2000) and consistently falling since then.

The interest rate on deposits has, broadly speaking, followed the opposite pattern, going up in times of harshness (i.e. early eighties, post 2007) and falling during times of

there are no logs in the function). Therefore, we are unable to evaluate the relative size of the speed of convergence.

[18]For graphical inspection see Figure 5.3 above.

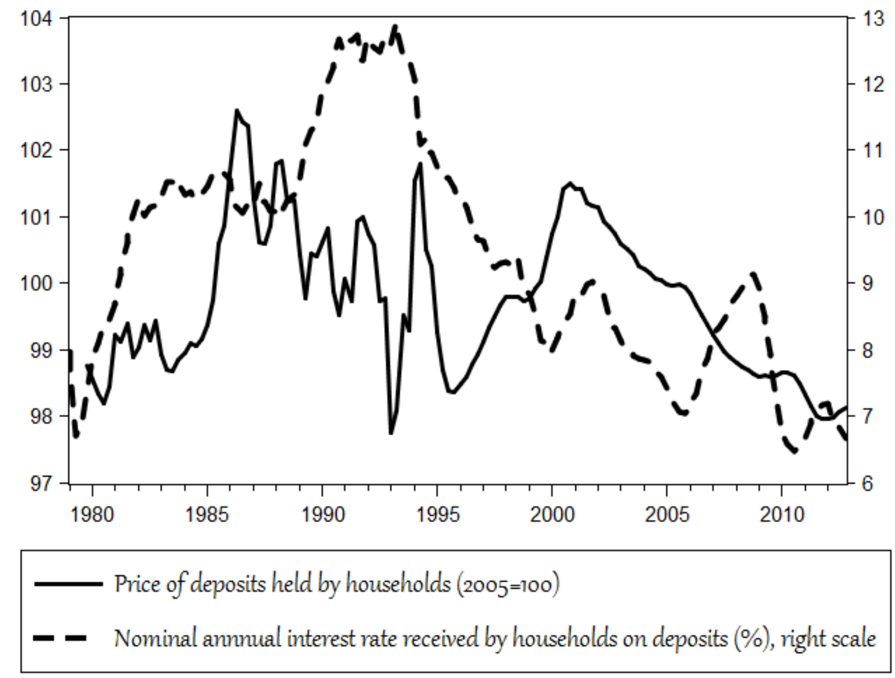

Figure 5.6 – Implicit price of deposits held by households and interest rate received on these; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

prosperity (i.e. the stock market boom). This counterclockwise pattern is reflected in the short term equation estimated:

$$\Delta p^h_{d_a} = 0.43\Delta p^h_{d_a-1} + 0.46\Delta p^h_{d_a-2} - 1.09\Delta i^h_d + 0.99\Delta i^h_{d-1} \tag{5.10}$$

Naturally, the evolution of $\Delta p^h_{d_a}$ depends strongly on its lagged values. It also depends negatively on the differenced interest rate. Note that the sum of the coefficients of Δi^h_d and Δi^h_{d-1} are negative.

5.2.7 Households' demand for credit

The log of the leverage ratio, here measured as the proportion of the stock of debt liabilities ($p^h_{l_l} L^L_H$ which equals $p^h_{l_l e} L^L_{H_e} + (p^h_{l_l f} L^L_{H_f}/x_r)$) out of the stock of non-financial assets $p^h_k K_H$, is a function of the ratio of disposable income with respect to the stock of non-financial assets ($Y^d_H/[p^h_k K_H]$), the real interest rate ($r^h_l - infl$) and financial rate of return ($r^h_{e_a}$). The last two variables are included in the specification in quarterly form, despite their being displayed on an annual basis in Figure 5.7.

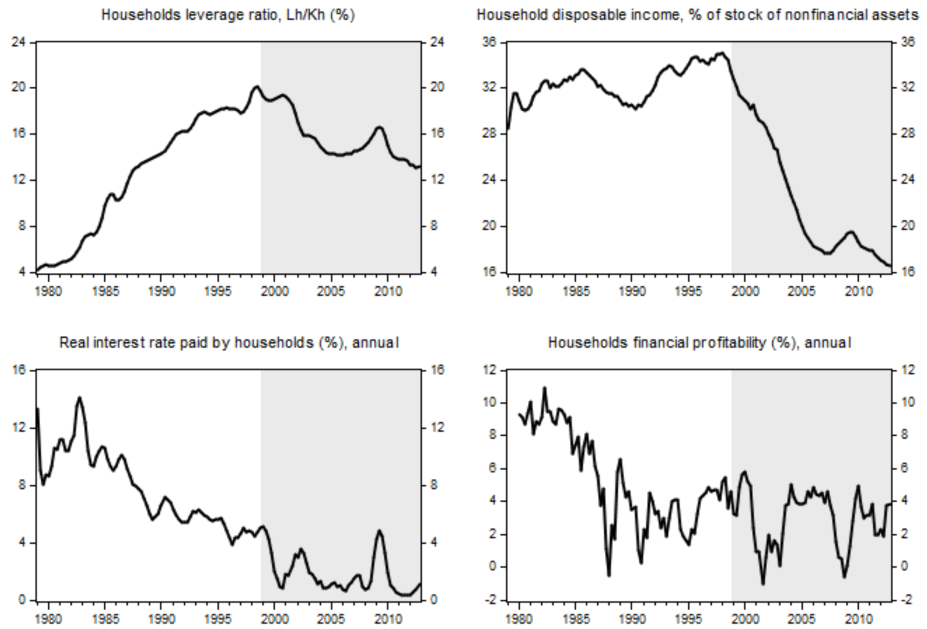

Figure 5.7 – Households' indebtedness function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

It can be observed that, in tandem with our explanation of the deterioration of households' wealth and income, the stock of this sector's debt obligations went from little more than 4% as proportion of their stock of non-financial assets in 1979 to 20% in 1998. It must be noted that the first housing boom of our period under analysis, which made the price of capital increase significantly, took place in the second half of the eighties, but no corresponding fall in the leverage ratio followed. However, as seen above, the second housing boom began around 1998, and this made the direction of the debt-ratio change its up-to-then upward trend. Of course, this is just one indicator (out of several) of the negative effects of the Volcker shock[19].

[19] As we mentioned in previous chapters, following the sharp increase in interest rates in the United States at the end of the seventies, several countries followed lead in order to avoid capital flight (among them, clearly, France). This had as a consequence the desired effect of taming inflation, despite the fact that it strongly discouraged credit demand by firms. This in turn forced banks to lower interest rates for households (which were quite high in the early eighties, see the lower left panel of Figure 5.7). In turn, their demand for credit increased significantly and this pushed up the price of dwellings. Another direct consequence of the fall in the demand for credit by firms is the strong increase in their reliance on equity

A second and even more striking indicator of the deterioration of households' well-being is the disposable income-to-capital ratio, which fell more drastically than debt issuance with respect to the same denominator. This ratio went from 35% in 1998 to roughly half (17.6%) of that level in 2007. This suggests at least two things. The first is that the strong rise in the price of capital was the main cause of the fall of the corresponding indicator, which indicates that this in turn had an important role in such deterioration. The second is that, given the steeper fall of the income-physical wealth ratio than that of the debt-ratio, we can observe that households' disposable grew at a slower pace than did credit demand.

The lower panel of Figure 5.7 shows two financial indicators which concern households; the interest rate and the financial rate of return. The former has been described previously throughout the present work. The latter was calculated as in Lavoie and Godley 2001, also described in the previous chapter. Unsurprisingly, this variable has fallen significantly, going from an annual average of around 9% in the first half of the eighties to 3.2% after the 1987 "Black Monday".

Visual inspection from Figure 5.7 suggests that there is a negative long-term association between the interest rate and debt demand. This is further confirmed in equation 5.11, where it a negative coefficient linking these two variables is present. This implies that, in the absence of any other change in the economy, a 1% fall in the quarterly interest rate makes household credit demand (as proportion of the stock of physical capital) increase by 15.7%[20]. On the other hand, a 1% increase in financial rate of return (of equities held by households) represents an increase in debt by 2.6%. Naturally, with a rise in the income-to-physical capital ratio of 1%, there is a corresponding increase of the household debt ratio.

$$\frac{L^L_{H_e} p^h_{l_l e} + (p^h_{l_l f} L^L_{H_f}/x_r)}{p^h_k K_H} = 0.27 + 0.09 ln\left(\frac{Y^d_H}{p^h_k K_H}\right) - 15.69(r^h_l - infl) + 2.63 r^h_{e_a} - 0.002t \quad (5.11)$$

In order to simplify the notation of the short-term specification, in what follows we define

issuing in order to fund investment (more on this below).

[20]Note that the interpretation is carried out straightforwardly in terms of units, given that there are no logs and that these are the units of measurement of the variables dealt with.

$$lev_H = \frac{L^L_{H_e} p^h_{l_l e} + (p^h_{l_l f} L^L_{H_f} / x_r)}{p^h_k K_H}$$

$$\Delta lev_H = 0.0006 + 2.04 \Delta lev_{H-1} - 1.66 \Delta lev_{H-2} + 0.51 \Delta lev_{H-3} + 0.025 \Delta ln \left(\frac{Y^d_{H-1}}{p^h_{k-1} K_{H-1}} \right)$$

$$-0.027 \Delta ln \left(\frac{Y^d_{H-2}}{p^h_{k-2} K_{H-2}} \right) + 0.007 \Delta ln \left(\frac{Y^d_{H-3}}{p^h_{k-3} K_{H-3}} \right) - 0.006 \Delta (r^h_l - infl) - 0.03 \Delta r^h_{e_a} - 0.002 \Delta r^h_{e_a - 3} \tag{5.12}$$

The corresponding short-term specification (eq. 5.12) says that an increase in the debt ratio brings about another increase in itself in the three subsequent quarters. Since the sum of the coefficients of these three lags is less than unity, this does not imply a major stability problem. Following the same logic, it can be seen also that a rise in the growth rate of the income-to-physical capital ratio also makes the household leverage ratio rise, whereas a rise in the financial indicators (interest rate and rate of financial return) diminishes the debt ratio.

5.2.8 Price of loans contracted by households

As was mentioned in the part "Financial and non-financial instruments" in chapter 4, we were able to calculate implicit prices of loans and deposits, despite the fact that neither are given any attention (to our knowledge). Nonetheless, we believe these price are interesting to analyze from an empirical point of view. On the one hand, they allow the researcher to distinguish between price and volume effects. That is, whenever the value of a given financial instrument changes, this can be due to changes in either the number of titles issued (volume) or due to its relative appreciation. On the other hand, this separation allows us to link these prices (embedded in the flow-of-funds) to the interest rates corresponding to these. Of course, instead of proceeding in this way, we could have attempted to construct a weighted average of the value of the corresponding instrument depending on maturity, type and other characteristics. However, this would be overly time-consuming and difficult to do.

Figure 5.8 shows the corresponding price and interest rate. As it can be seen, the former has fluctuated widely, but within very narrow limits (from 99.87 in 1983q4 to 103.56 in 2009q4). This evolution, from very low to very high is in stark contrast to the

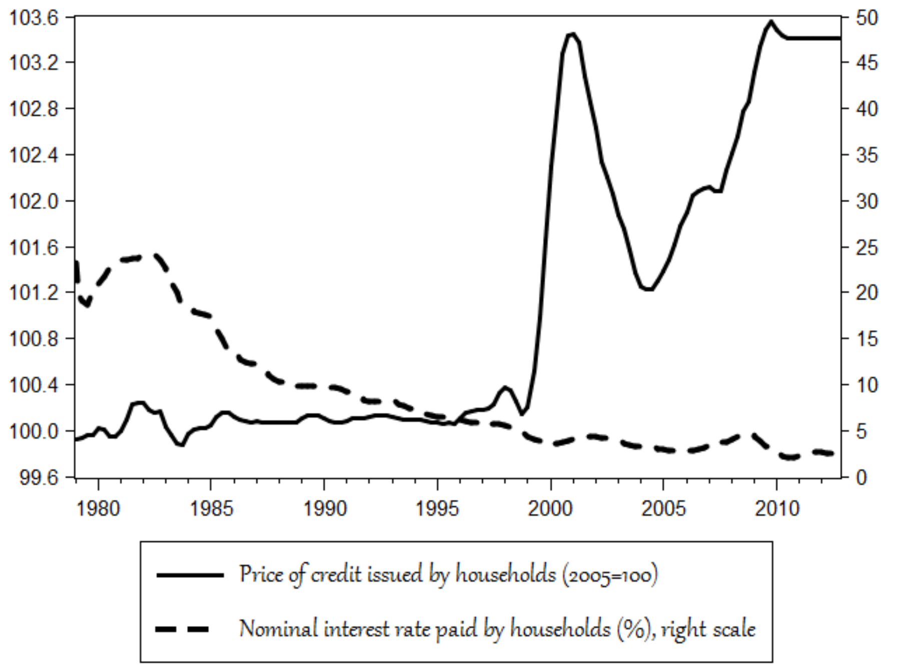

Figure 5.8 – Price of households' debt and nominal interest rate paid by this sector; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

evolution of the nominal interest rate paid by households, which has gone from 23.9% in 1982 to as low as 2.4% in 2010. This inverse relationship can be better understood in equation 5.13, where the estimated coefficient that links both variables is seen to be -3.2.

$$p_{l_l}^h = 1.02 - 3.2 r_l^h + 5.37 infl \tag{5.13}$$

Another component that enters this equation (and others with similar specifications) is the inflation rate. As we saw in the first chapter, the latter has followed roughly the same evolution as the interest rate (though with different timing), going from as high as 3.34% in 1981 quarterly (or more or less four times that figure annually) to close to zero figures throughout the nineties and 2000s. As a consequence, we decided to include this series instead of the *GDP* deflator in level, because the link between the two looks more straightforward. Another advantage of proceeding in this way is that the separate inclusion of the components of real interest rates can be differentiated. The effect of inflation on $p_{l_l}^h$ is clearly positive.

$$\Delta p_{l_l}^h = 0.98\Delta p_{l_l-1}^h - 0.23\Delta p_{l_l-3}^h - 0.04\Delta r_l^h + 0.17\Delta infl - 0.14\Delta infl_{-1} + 0.03\Delta infl_{-2} - 0.0009vc_{-1}^{plh} \tag{5.14}$$

In the short-term, the same relationship holds, as can be seen in the negative sign of the change of the interest rate as determinant of the change in the price of loans contracted by this sector, as well as in the overall positive impact of the change in the inflation rate on the same series (i.e. the sum of the coefficients of $\Delta infl_{-p}$ is positive). The speed of adjustment is, as expected, negative and significant.

5.2.9 Households' financial accumulation

French households are quite active in the stock market. In fact, the volume of the equities they hold as a proportion of the volume of *GDP* (top panel in Figure 5.9) has neatly progressed, going from 12% at the end of the seventies, to 142% in 2010. This is consistent with the fact that equity has become the predominant instrument that has been issued by firms ever since debt became more expensive (via high, then falling, interest rates and persistently low inflation rates). This is not contradictory with the fact that debt as proportion of disposable income (bottom left panel in the figure) has also increased sharply. This was largely explained in chapter 1.

Two more important determinants of households' financial accumulation are the real interest rate (bottom-right panel) and the financial rate of return (top-right panel). Both have seen important changes in their evolution, going from record high levels in the eighties (14 and 7.7% in 1982, respectively) to record lows around 2000 (0.9 and -1.5%, respectively). This is also consistent with the fact that, as real interest rates paid by households fell they increased their indebtedness, whereas at the same time with more demand for equities (from households, firms, banks, and the rest of the world) the "profit rate" of holding these instruments which is somehow an indicator of the demand for equities.

$$ln\left(\frac{E_H^A}{Y}\right) = -0.46 - 8.11r_{e_a}^h + 1.23\left(\frac{p_{l_l}^h L_H^L}{Y_H^d}\right) - 6.94(r_l^h - infl) \tag{5.15}$$

Equation 5.15 shows that these trends are confirmed. The demand for equities is determined by these three variables, negatively by the price/rates indicators, and positively by the debt indicator.

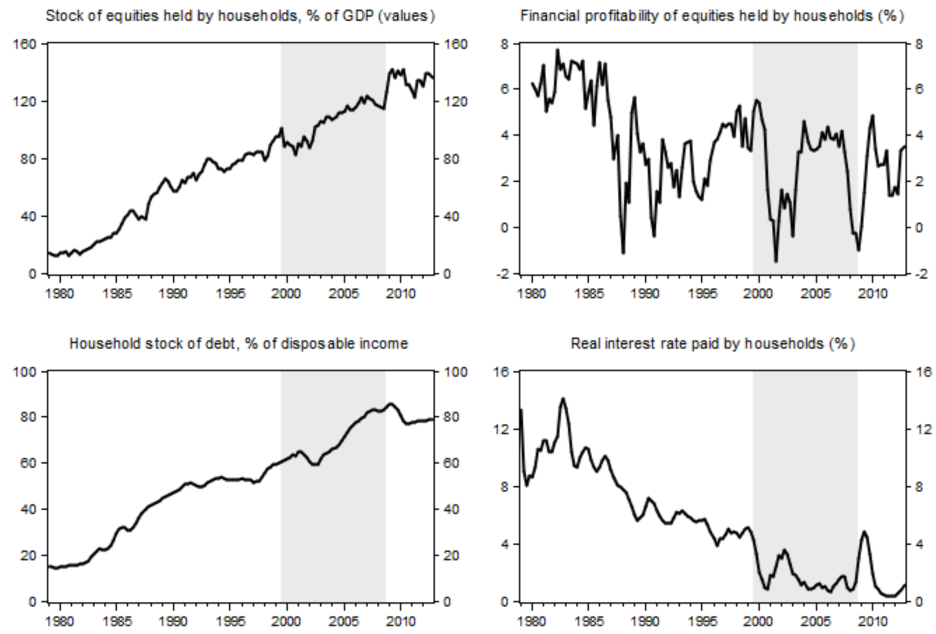

Figure 5.9 – Households' financial accumulation function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

$$\Delta ln\left(\frac{E_H^A}{Y}\right) = 0.88\Delta ln\left(\frac{E_{H-1}^A}{Y_{-1}}\right) - 0.06\Delta ln\left(\frac{E_{H-3}^A}{Y_{-3}}\right) + 0.26\Delta r_{e_a}^h + 0.14\Delta\left(\frac{p_{l_l}^h L_H^L}{Y_H^d}\right)$$

$$- 0.84\Delta(r_{l-3}^h - infl_{-3}) - 0.02vc_{-1}^{EAH} \quad (5.16)$$

The short-term re-parameterization of the long-term specification (eq. 5.16) confirms the previous findings, except for the rate of financial return, which in this equation is positive. This can be explained by the fact that, in the short-run households seek gains in financial markets, and so higher profit rates in these markets attract them. However, in the longer term, the cost effect weights more and discourages households from investing in them.

5.2.10 Price of equities held by households

As it was seen in the previous chapters, the evolution of the stock market has been crucial for the determination of the balance sheets of economic actors. Naturally, these wild fluctuations in equity prices have been beneficial to a minority, and harmful to the rest. Therefore, income and wealth inequalities have been the result of these evolutions (the object of the first chapter).

The long-term evolution of equity prices for all sectors (at least as they were calculated from the flow-of-funds accounts) have followed the same trend: more or less stable from the end of the seventies to 1982, growing steadfastly from then on to 1987, falling sharply right after, stabilizing again until 1995 when the dot-com bubble hit (1995-2000), the double bubble (the other one taking place in the real estate sector) from 2003 to 2008, and stabilizing/falling thereafter. Figures 5.10 and 5.11 show the evolution of all these prices.

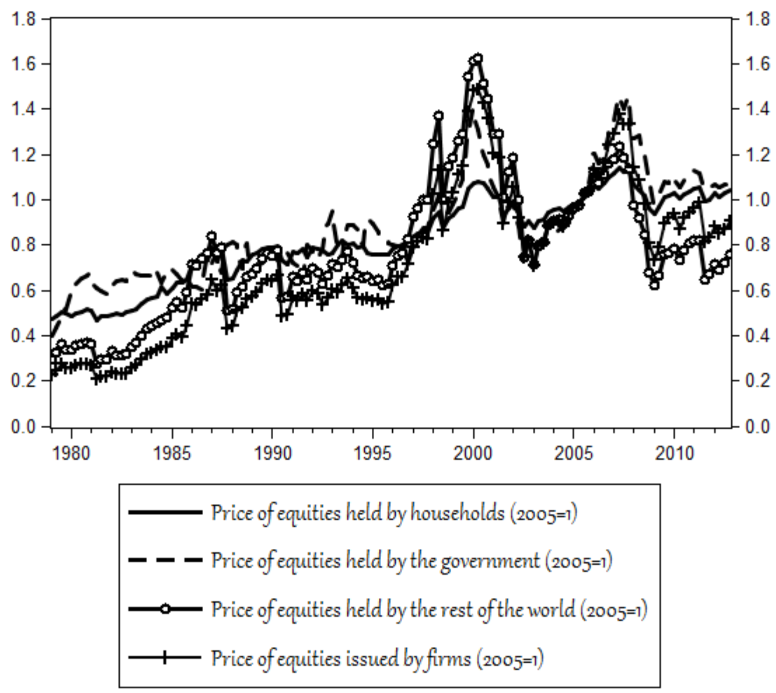

Figure 5.10 – Prices of equity (1); 1979-2012. Source: author's calculations based on data by *Banque de France*.

Given that all equity price series follow the same pattern (depending on intensity and closeness), we followed the same approach as in the case of national account prices. That is, we took a leader equity price (in this case, that of equities issued by firms) and we made all the other prices, except those concerning the foreign sector, depend on it.

The long term equation for the price of equities held by households is given by a constant term (0.34) and 0.7 times the price of equities issued by firms.

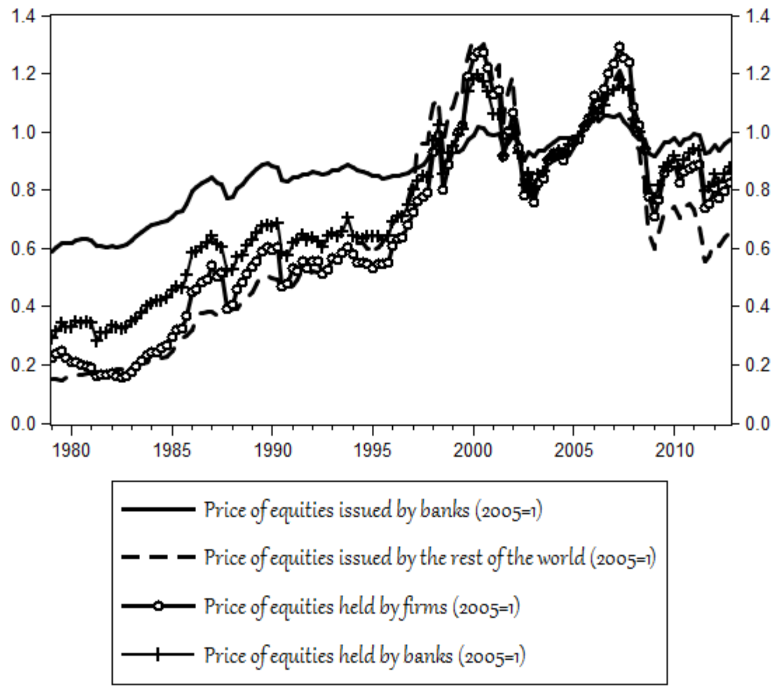

Figure 5.11 – Prices of equity (2); 1979-2012. Source: author's calculations based on data by *Banque de France*.

$$p^h_{e_a} = 0.34 + 0.69 p^f_{e_l} \tag{5.17}$$

The reparameterized version of this equation confirms these trends for the short term:

$$\Delta p^h_{e_a} = 0.88 \Delta p^h_{e_a -1} + 0.35 \Delta p^f_{e_l} - 0.31 \Delta p^f_{e_l -1} - 0.005 vc^{peh}_{-1} \tag{5.18}$$

5.3 Estimates for firms

We now turn to estimations concerning French non-financial firms. These are carried out for their rate of physical capital accumulation (or investment), their financial wealth (or equities held), their own funds (or equities issued), and othe related terms. We focus on the evolution of these variables, given our interest in the link between financial markets and investment. As mentioned above, the sharp rise in interest rates at the beginning of the eighties made firms less willing to issue debt obligations. As a natural counterpart, they favored the issuance of equities.

This shift took place gradually, though it must be noted that the *full* change from a debt-based to an equity-based mode of financing (say, when more than half of the firms' stock of liabilities turned out to be equities issued, rather than debt obligations, as was previously the case) occurred throughout the first half of the eighties. From then on and until 2007, physical capital accumulation (net of depreciation) closely followed the evolution of financial accumulation, measured as the growth rate of the volume of equities issued by non-financial firms[21]. Part of the explanation of the evolution of investment and own funds lies in movements in interest rates (notably that paid by households and firms).

5.3.1 Firms' physical capital accumulation rate

The net physical capital accumulation rate (*car*) is here calculated as the ratio of the net flow of physical capital (or non-financial assets) with respect to the stock from the previous quarter, evaluated at the current period's corresponding price. This series is a function of (1) the profit rate in standard Kaleckian form, (2) capacity utilization as in Bhaduri and Marglin 1990, (3) the real interest rate as in standard Keynesian models, and (4) financial rate of return on equities issued as in Reyes and Mazier 2014. Since all items in this specification are decimals, we preferred not to take logs and give it a "unit change" interpretation, instead of in the form of elasticities. As explained in the chapter "System of equations", $\Delta K_F p_k^f$ is the flow of non-financial assets held by firms, FCC_F is their *fixed capital consumption* (or depreciation in value), and $p_k^f K_F$ is the stock of the corresponding series. See the discussion in chapter 2 for further details.

Figure 5.12 shows the variables included in this specification. Physical capital accumulation (top-left panel) exhibits important declines that take place in a relatively short time span in the first half of the eighties, nineties and 2000s, and the corresponding recoveries after the troughs (which take longer). The general trend of the series is downwards. From 2003 to 2007, another recovery was in progress, but was abruptly interrupted by the 2007-2008 crisis, which make the accumulation rate fall close to zero.

The output gap (our proxy for capacity utilization, top-right panel) has followed the evolution of capital accumulation closer than the profit rate (middle-left panel). In fact, business cycles in the output gap mimic those of the accumulation rate. The positive association between these two series can be observed in the first coefficient displayed on

[21] This series was obtained from *Banque de France*'s flow of funds. The methodology is explained in chapter 1.

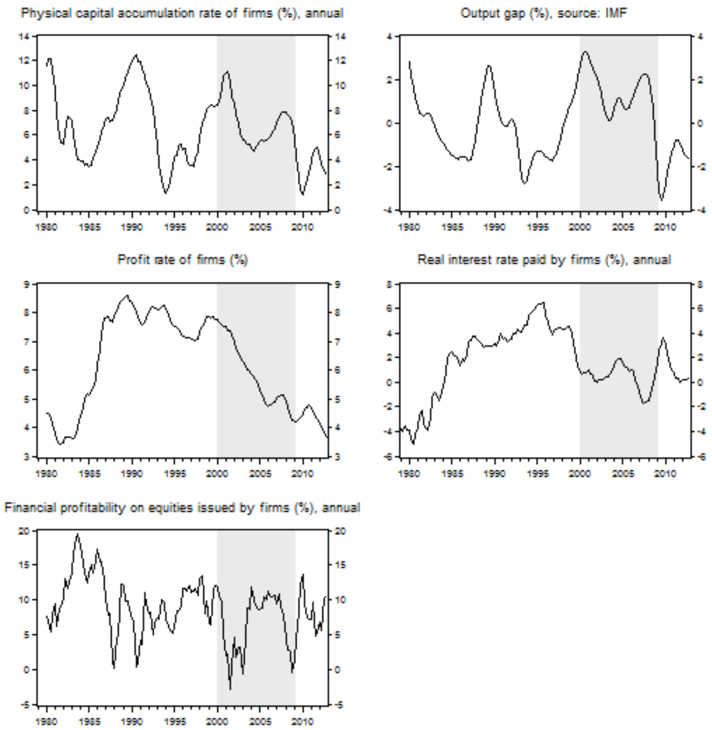

Figure 5.12 – Firms' non financial assets accumulation function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

the right-hand side of equation 5.19.

$$car = \frac{\Delta K_F p_k^f - FCC_F}{p_k^f K_{F-1}}$$

$$car = 0.16gap + 0.39\left(\frac{S_F}{p_k^f K_{F-1}}\right) - 0.11 r_{e_l}^f - 0.98(r_l^f - infl) \tag{5.19}$$

By the beginning of the eighties, the profit rate of firms (defined as the ratio of self-financing with respect to the stock of physical capital) fell from 4.6% to 3.2% in 1981. However, from that period on, and until 1986 it recovered significantly, reaching 8.2%. From that point, it did not fall below 6.8% until 2001, period in which it began a steep downward fall, which brought it back to its 1981 level. This drastic decline is likely to have been caused by the strong rise in the price of physical capital assets (a byproduct of the housing boom that took place before the crisis). The direct link between profits and accumulation is seen in the value of the second parameter on the right-hand side of the equation, which in turn means that following an increase from say, 4 to 5% of the profit rate there is a 0.4% in the accumulation rate.

The rate of financial return of firms (bottom panel) has moved counter-cyclically with respect to the physical capital accumulation rate during most of the quarters of the periods under analysis. There are, nonetheless, several exceptions. In 1981, prior to the 1987 financial crash[22], during the first part of the 1995 stock-market boom, and notably around the 2007-2008 crisis. Thus, as our results indicate, a one unit *quarterly* increase in the financial rate of return takes place, this provokes a 0.11% increase in the accumulation rate.

The annual real interest rate paid by firms started its upward path at the beginning of the eighties, going from negative territory until it reached 3% in 1985 (the same period at which firms' equity issuing exceeded their debt obligations). In 1986 interest payments fell as a proportion of the stock of interest-bearing instruments, but from then on and until 1995, the interest rate climbed up to 7%. During this 9-year period own funds (or equity issuing) met a sharp increase that was only reinforced by the internet bubble, which bid the price of equities at higher and higher levels, thus encouraging the sales of this financial instrument. By the time the dot-com bubble was gaining strength, the interest rate began falling, but this had barely any effect on the capital composition of firms. Perhaps by that time firms had already fallen into a *liquidity trap*[23]. After the steep fall in the price of equities that took place in 2008, however, several firms may have leaned towards debt-issuing. Therefore, according to our estimates, the negative impact of a rise from, say, 0.05 to 1.5% of the *quarterly* interest rate would imply a 0.98% fall in the *quarterly* accumulation rate.

$$\Delta car = 0.63\Delta car_{-1} + 0.09\Delta gap + 0.12\Delta\left(\frac{S_F}{p_k^f K_{F-1}}\right) - 0.05\Delta r_{e_l}^f$$
$$- 0.12\Delta(r_l^f - infl) - 0.06vc_{-1}^{car} \tag{5.20}$$

A detailed interpretation of our short-term estimates of equation 5.20 would be rather tedious, therefore all we can mention is that the long-term trends described above hold for the change in the accumulation rate, with the particular result that the term vc_{-1}^{car} is 0.06, meaning that the adjustment from the short- to the long-term takes place at a rate relatively fast (or at least faster than other specifications shown up to this point).

[22]Remember that in the discussion in the part "Public investment" in subsection 1.2.2 we mentioned that during this period, it was the government that took over investment, thus avoiding the recession after the stock-market crash.

[23]It is perhaps timely to remind the reader of the discussion of this issue in subsection 1.1.4.

5.3.2 Price of firms' non-financial assets

We saw above that the evolution of the prices of non-financial assets held by households (i.e. the housing price), firms and the government follow the same evolution. As we said back in subsection 5.2.4, we make this price depend on that of households. Additionally, we added the price of investment (see next subsection) and the real interest rate paid by firms in a short-term specification.

$$\Delta p_k^f = 2.39\Delta p_{k-1}^f - 1.92\Delta p_{k-2}^f + 0.52\Delta p_{k-3}^f + 0.62\Delta p_k^h - 1.48\Delta p_{k-1}^h + 1.16\Delta p_{k-2}^h - 0.31\Delta p_{k-3}^h$$

$$+ 0.0007\Delta p_i^f - 0.024\Delta(r_l^f - infl) + 0.021\Delta(r_{l-1}^f - infl_{-1}) - 0.007\Delta(r_{l-3}^f - infl_{-3}) \quad (5.21)$$

Equation 5.21 confirms that the change in the price of firms' non-financial assets is positively determined by itself in the past and the change in the price of housing, and a negative effect of the interest rate on it.

5.3.3 Price of firms' investment

Since the relationship between the price indexes in the national accounts was already shown above, this subsection is much briefer than the past ones. It only confirms what we had already said about the close link between the price of firms' investment and the general price level (see Figure 5.3).

$$p_i^f = 0.98 p_y \quad (5.22)$$

Both the long term specification (eq. 5.22) and the short-term one (eq. 5.23) confirm that this positive link persists over time. This is further reinforced with the negative coefficient of the speed of adjustment term vc_{-1}^{pif}.

$$\Delta p_i^f = 0.67\Delta p_i^f + 0.39\Delta p_y - 0.016 vc_{-1}^{pif} \quad (5.23)$$

5.3.4 Firms' own funds

We present (the log of) own funds (or equity issued $p_e^f E_F^L$) in this section as ratio of the outstanding stock of financial and non-financial assets held by firms ($p_k^f K_F + D_F^A + p_e^f E_F^A$, see the previous chapter for further details). This ratio is a function of the profit rate, the quarterly real interest rate and the quarterly financial rate of return. These four series are shown in Figure 5.13. Furthermore, this specification was also used in our simulated model (see part 3.4.3).

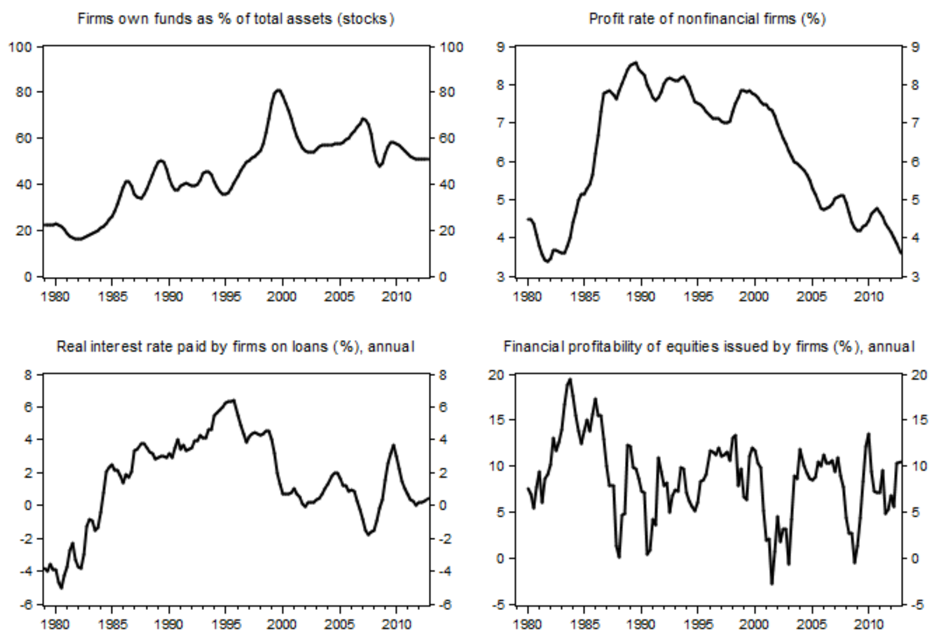

Figure 5.13 – Firms' own funds components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

In the early eighties, equities issued by firms represented only 22% of their total assets. By the end of the same decade, this figure was 50%. Despite a relatively moderate fall the year after, which left the corresponding series at around 40% until 1996, it kept on rising until it reached 81% by the end of the nineties. By 2002 own funds went down to 54% of total assets, and slowly began recovering, until the crisis hit. Once this happened, the variable more or less settled at around 50%. As we mentioned above, this was likely to have been caused by the evolution of the interest rate paid by firms. The upward long-term trend of both series until the end of the nineties (and their corresponding decline afterwards) is clear from Figure 5.13.

$$own = \frac{E_F^L p_{e_l}^f}{p_k^f K_F + D_F^A + p_{e_a}^f E_F^A}$$

$$ln(own) = 277.7(r^f_{l-1} - infl_{-1}) + 53.1 r^f_{e_l} \tag{5.24}$$

$$\Delta ln(own) = 2.6\Delta ln(own_{-1}) - 2.3\Delta ln(own_{-2}) + 0.73\Delta ln(own_{-3}) + 0.005\Delta\left(\frac{S_{F-3}}{p^f_{k-3}K_{F-4}}\right)$$

$$+ 0.38\Delta(r^f_{l-1} - infl_{-1}) - 0.08\Delta r^f_{e_l} - 0.00002vc^{own}_{-1} \tag{5.25}$$

Equation 5.24 indicates that, in the long-run, own funds are determined positively by the real interest rate and the rate of financial return of equities issued. It must be noticed that the latter is in contrast to the short term effect, which is negative. We believe this is so because, under a long-term perspective, a firm's (supply) decision to issue equity may be positively affected by the instruments' yield, which is in turn influenced by its demand. In contrast, in the short term financial actors (again on the demand side) seek the cheapest option, thus they buy equity only if it is affordable. Indeed, this apparent contradiction is also observed in the real estate market, where households buy houses on the basis of it affordability, but once they become owners they would prefer that the price of their property rises, making them wealthier.

The positive effect of the profit rate on own funds can only be observed in the short term specification (eq. 5.25) given that the Johansen cointegration test indicates the presence of two cointegrating vectors. Thus, as it was mentioned above, the coefficient of the second variable in the first cointegration vector (which we believe could be the profit rate) appears as null in the software. Nonetheless, in the short term it can be confirmed that a 1% rise in the profit rate makes firms' own funds (as proportion of their assets) increase by 0.005%.

The speed of adjustment seems to be small, given that the short-run adjusts to the long-run by 0.002% on a quarterly basis.

5.3.5 Price of equities issued by firms

As it was mentioned previously, this is the leader equity price in the French economy. Following the discussion in the part "Prices of financial instruments" in chapter 2 and in the part "Firms' equities issued and financial rate of return" of the previous chapter, we follow Tobin 1969 and Tobin and W. Brainard 1977 in that we set the so-called q (which is equal to the ratio of the price of equity with respect to the price of non-financial assets of non-financial firms) as our dependent variable[24].

Tobin 1969, in a theoretical model, makes q depend on a series of macroeconomic fundamentals that are closely related to monetary policy (money stock, the interest rate, the expected inflation rate), conjunctural components (income, savings and the profit rate) and other indicators. Tobin and W. Brainard 1977 add a different list of determinants but aiming in spirit at the same idea; to make q depend on policy and conjunctural instruments. Their reasons for not dealing with the same set of variables is both theoretical and empirical. The latter is mainly due to data issues, a problem we also had to deal with all along.

Figure 5.14 shows the q ratio and the proposed components we found relevant for the period under study. Let us deal with one at the time. First, the top-left panel shows the main variable of interest in the section which, as it was seen in Figure 1.6 in the first chapter, this series follow closely the evolution of the net physical accumulation rate of firms (except for the period that goes from 1987 to the beginning of the 1990s).

The top-right panel in the figure shows the profit rate of firms, where it can be observed that, from the beginning of the sample period to 1995 both series seem to evolve in the same way. They seem to be, however, disconnected from then on. This might be a reflection of the fact that the stock-market boom starting that year (which contributed to the large increase in the own funds ratio) and the subsequent housing bubble (which negatively affected the profit rate) contributed to this disconnection.

The middle-left panel shows the evolution of the nominal interest rate paid by firms, and it can be clearly seen that this series evolves inversely with respect to q. This can be explained by the fact that, as the former rises, this creates an incentive for firms to substitute debt issuing for equity issuing, which in turn raises the price of the latter.

The middle-right panel shows the unemployment rate. This variable may indicate two things. On the one hand it is a measure of price control, following the Phillips curve. On the other hand, it is a measure of business confidence on demand factors. Thus, no matter how advantageous the control of inflation (or a high unemployment rate) has been successful at boosting equity prices and firms' own funds, in the end it turns out that confidence in demand-side factors do matter, and they matter greatly. Finally, the bottom panel of the figure shows the growth rate of the volume of output, and this indicator helps us see that q is in fact procyclical.

[24]As it was mentioned before, the actual q calculated as the ratio of market value (stock of equities) and replacement value (stock of non-financial assets) follows virtually the same evolution than this price q ratio. Also as a reminder, we chose the "price ratio" over the "value ratio" for technical reasons.

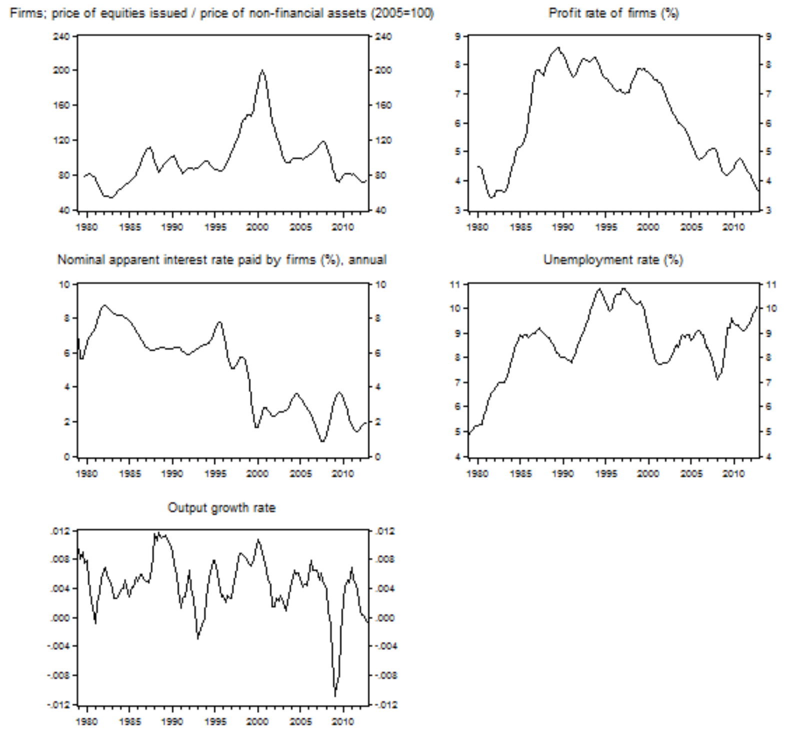

Figure 5.14 – Tobin's q and its determinants; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

$$\Delta q = 0.002 + 0.68\Delta q_{-1} + 3.16\Delta\left(\frac{S_F}{p_k^f K_{F-1}}\right) - 5.2\Delta r_{l-2}^f - 0.36\Delta u_{-2} + 0.36\Delta growth_{-1} \quad (5.26)$$

These determinants enter the short term specification described in equation 5.26, and confirm that the change in q is positively determined by changes in itself, the profit rate and the growth rate. In contrast, it is negatively affected by the nominal interest rate and the unemployment rate.

Unfortunately, we were unable to find a satisfactory long-term equation that was in turn integrated in a short-run specification[25]. Nevertheless, it must be noted that what matters most (not solely, though) is that the corresponding relationships hold in the expected way (i.e. that the signs are "correct"). We also estimated another short-term equation in which q is determined only by the interest rate and the *S&P 500*, with the

[25]We tried several options, but none of them other than the one shown here made the convergence criterion be satisfied. By convergence criterion we mean either that the model did not even run, and/or that the coefficient of the corresponding speed of adjustment was positive.

latter being a measure of the leading stock market indicator. Interestingly, however, the results including that specification or the one shown here do not modify substantially the results[26].

5.3.6 Firms' indebtedness

Figure 5.15 shows the evolution of the series that, according to us, determine the debt ratio. The latter is here defined as the stock of debt issued by firms divided by the stock of non-financial assets held by this sector. As we saw above, thanks to the two major housing booms (1986-1989 and 1998-2005), the price of physical capital increased drastically. As a consequence, the denominator of this leverage ratio increased likewise, thus making the top-left panel fall after the beginning of the second boom.

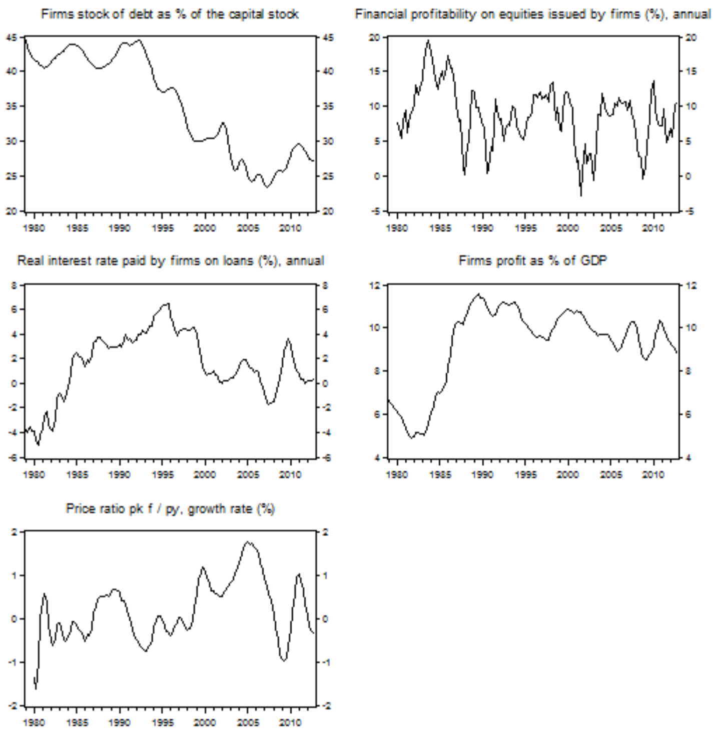

Figure 5.15 – Firms' debt ratio function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

The real interest rate and the rate of financial return are the competing prices of debt and equities issued. As a consequence, when the former rises the debt ratio falls. The

[26]By this we mean that the behavior of the baseline and the after-shock series in the simulation presented in the next chapter did not change their trend, but only their scale.

opposite happens with the latter, given that a rise in it would encourage more debt above equity issuing. Firms' profits enter this specification as proportion of *GDP*. It can be seen that this series has consistently gone up (just as the share of wages in national income has diminished). Now, despite the fact that the long-term evolution of the profit rate is such that it has increased whereas at the same time the leverage ratio has fallen (and despite the change in the capital structure of firms), we have reasons to believe that firms increase their demand for credit whenever profits increase. These results are confirmed in the following equation:

$$L_F = -5.8 - 0.002t + 96.4r^f_{e_l} - 115.8(r^f_l - infl) + 54.5\left(\frac{S_F}{p_y Y}\right) - 37\left(\frac{\Delta(pk_{ratio})}{pk_{ratio-1}}\right) \tag{5.27}$$

where

$$pk_{ratio} = \frac{p^f_k}{p_y}$$

$$L_F = \frac{L^L_F p^f_{l_l}}{p^f_k K_F}$$

The presence of the growth rate of pk_{ratio} in this long-term specification is justified by the fact that, as can be seen from the bottom panel of the figure, this series follow the inverse path of the leverage ratio. This is evident, given that the numerator of the given ratio is the price of non-financial assets (which appears also in the denominator of the debt-ratio). In turn, the denominator of pk_{ratio} is the general price level. All this implies that, whenever home prices rise above the general price level, this will tend to worsen the leverage ratio of firms, given that the "purchasing power" that firms' debt can command becomes less important.

$$\Delta L_F = 1.86\Delta L_{F-1} - 0.88\Delta L_{F-2} + 0.005\Delta r^f_{e_l-3} - 0.012\Delta(r^f_{l-1} - infl_{-1}) + 0.03\Delta\left(\frac{S_{F-3}}{p_{y-3}Y_{-3}}\right) - 0.0001vc^{LF}_{-1} \tag{5.28}$$

The specification for the short-term evolution of firms' indebtedness is shown in equation 5.28, where it can be seen that the overall effect of a change in financial rate of return is positive on the change in the debt ratio. We can also see that the overall short term effect of the change in the interest rate on indebtedness is negative. The change in the profit share on the change of the leverage ratio is also positive, and the speed of adjustment is relatively low (0.0001).

5.3.7 Price of firms' debt

Figure 5.16 shows that the hypothetical price of loans contracted by firms has virtually followed the opposite evolution of the inflation rate. This confirms what we mentioned in part "French firms and leverage" in the first chapter, where we mentioned that before the control of inflation was finally achieved (around 1982), French firms shifted their capital structure in favor of own funds, and they seemed to have turned debt-averse and more risk-friendly than before the mid-eighties.

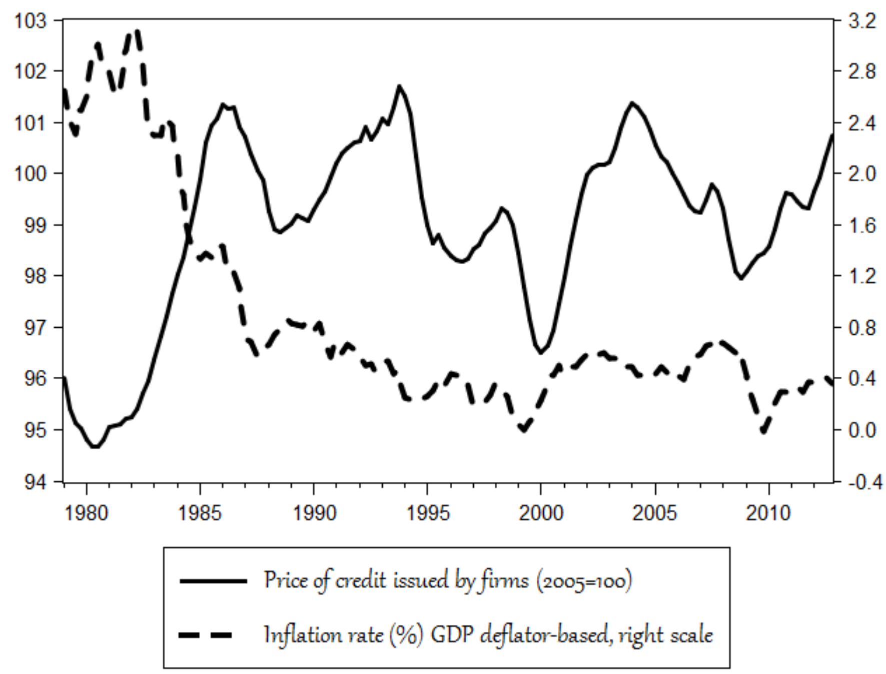

Figure 5.16 – Price of firms' debt function, components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

From 1980 to 1986 the price of credit issued by firms went from 94.7 to 101.3. In the same time span the quarterly inflation rate went from 3 to around 1.3%. Neither series have not come back to their corresponding 1980 levels. Overall, it can be observed that, whenever the inflation rate falls, the price of loans increases. This stylized fact confirms what we have claimed all along, mainly that the change in the capital structure of firms was the product of the control of inflation, and that this in turn had dire consequences for the French economy. This is reflected in the negative association found between the price of loans and the interest rate paid by firms, equation 5.29:

$$p^f_{l_l} = -352.7 r^f_l \tag{5.29}$$

Note that the components of the real interest rate (the nominal interest rate and the inflation rate) enter this specification separately. Given the difficulty in finding an adequate long-term equation, or a short-term one, that includes both elements simultaneously, we were only able to find a negative long-term association between the interest rate and the $p^f_{l_l}$, and a positive one between $\Delta infl$ and $\Delta p^f_{l_l}$.

$$\Delta p^f_{l_l} = 1.04 \Delta p^f_{l_l-1} - 0.25 \Delta p^f_{l_l-2} + 0.17 \Delta infl_{-2} \tag{5.30}$$

The rationale for proceeding in this way is seemingly counterintuitive, given the negative association between the inflation rate and the price of loans paid by firms observed above. However, we justify this finding in terms of the economic logic. The rationale is that, following an increase in the real interest rate paid by firms, credit becomes more expensive. As a consequence, the expected sign of the slope of the function $\Delta p^f_{l_l} = f[\Delta(r^f_l - infl)]$ is negative, therefore the link between changes in inflation and credit is positive. As we mentioned above, we were unable to find a solid statistical relationship between the real interest rate, so that we were obliged to separate its components in these specifications.

5.3.8 Price of equities held by firms

Equities held by firms are clearly dependent on the leader equity price. This can be seen in the following equation:

$$p^f_{e_a} = 0.95 p^f_{e_l} \tag{5.31}$$

The relationship between these two series is close to being one on one. The short term specification (eq. 5.32) confirms that when there is a rise in the change of $p^f_{e_l}$, its asset-side counterpart ($p^f_{e_a}$) rises as well.

$$\Delta p^f_{e_a} = 1.09 \Delta p^f_{e_a-1} - 0.38 \Delta p^f_{e_a-2} + 0.76 \Delta p^f_{e_l} - 0.83 \Delta p^f_{e_l-1} + 0.26 \Delta p^f_{e_l-2} - 0.007 vc^{peaf}_{-1} \tag{5.32}$$

5.3.9 Firms' demand for credit in foreign currency

Firms' demand for credit in foreign currency as a proportion of the total value of the stock of credit liabilities has closely followed the business cycle. This can be seen in Figure 5.17, where we include the variable of interest and the price of equities issued by firms (whose long-term evolution, as we saw before, mimics that of the net physical capital accumulation, see Figure 1.6). Our reasons for doing so is that there are no clear direct links between the accumulation rate and the demand for credit in foreign currency. Nonetheless, we suspect that there are reasons why this has been the case.

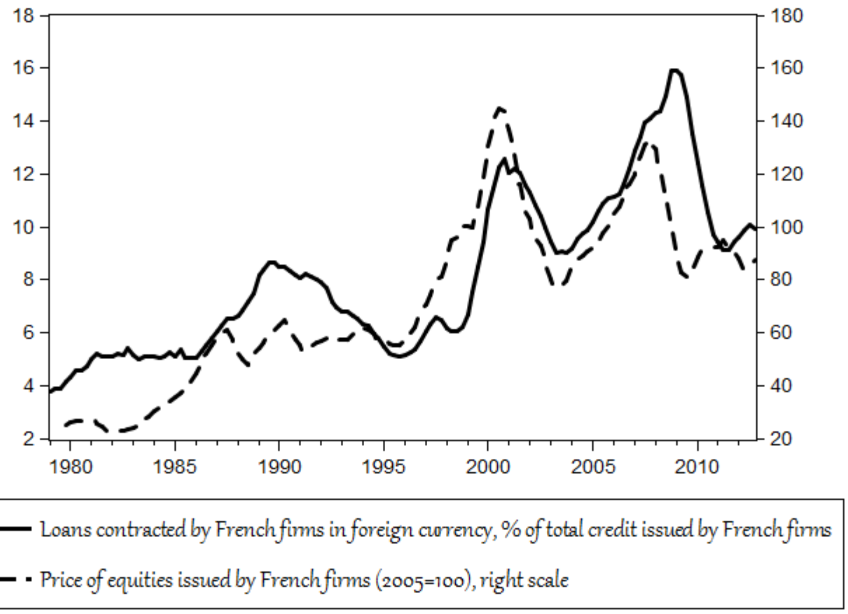

Figure 5.17 – Firms' demand for credit in foreign currency and interest rate differential; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

First of all, as we mentioned before, the price of equities in France is highly dependent on the world leader financial indicator: the stock (equity) price in the United States. By way of example, the evolution of the *S&P 500* and the *CAC 40* is quite similar from the mid-eighties up to 2008. The correlation coefficient of these two series for this period only is 0.95, and 0.94 for the whole sample period. As a consequence of this, following a rise in the price of equities in the U.S. makes French holders of titles from that country richer, who in turn demand more credit in dollars.

The second empirical justification for treating this ratio as a function of the *CAC 40* and not of the *S&P 500* (as the discussion in the previous paragraph suggests) is that, following Fischer and Merton 1984, we give an important weight to the price of equities[27] as a key determinant of firms' valuation. As a consequence of this, our hypothesis is that when firms become wealthier through the stock market (i.e. when $p_{e_l}^{f}$ increases) this leads them to contract more debt. Now, since debt is, in general terms, a competing instrument for own funds, this cannot be observed as a simultaneous rise in both debt and own funds, but is in turn observed as a rise in the debt liabilities of firms in foreign currency[28].

Moreover, in Gavin 1986 the author proposes a model in which a "good news" scenario pushes output up, and this has a positive effect on the stock price. Since this implies that the national economy becomes more profitable than, say, other economies that did not follow the same policy, this attracts foreign capital and thus provokes a capital inflow. This could be actually the case of France in the period under study.

Thus, equation 5.33 says that there is a positive association between the demand for credit denominated in foreign currency and the price of equities issued by firms.

$$L_f = -0.002 + 0.12 p_{e_l}^{f} \tag{5.33}$$

where

$$L_f = \frac{-L_{F_e}^{L} p_{l_l}^{f} + p_{l_l}^{f} L_F^{L}}{p_{l_l}^{f} L_F^{L}}$$

This positive association is reinforced in the short-term, as in the following equation:

$$\Delta L_f = 0.63 \Delta L_{f-1} + 0.24 \Delta L_{f-2} - 0.26 \Delta L_{f-3} + 0.008 \Delta p_{e_l}^{f} - 0.03 vc_{-1}^{LFfc} \tag{5.34}$$

5.3.10 Firms' demand for equity in foreign currency

Figure 5.18 displays two interesting stylized facts. The first is that the financial rate of return differential (that is, the difference between the growth rate of French equities and the growth rate of the *S&P 500*) and the interest rate differential (the series used in most equations as determinant of the demand for financial instruments denominated in foreign currency) follow more or less the same pattern. The direct consequence of this is

[27] Fischer and Merton 1984 deal with q instead.

[28] This would imply that, following a favorable event in stock markets, firms finance their investment by also building up their demand for debt denominated in foreign currency.

that the latter is confirmed as a good proxy for the demand for foreign exchange[29].

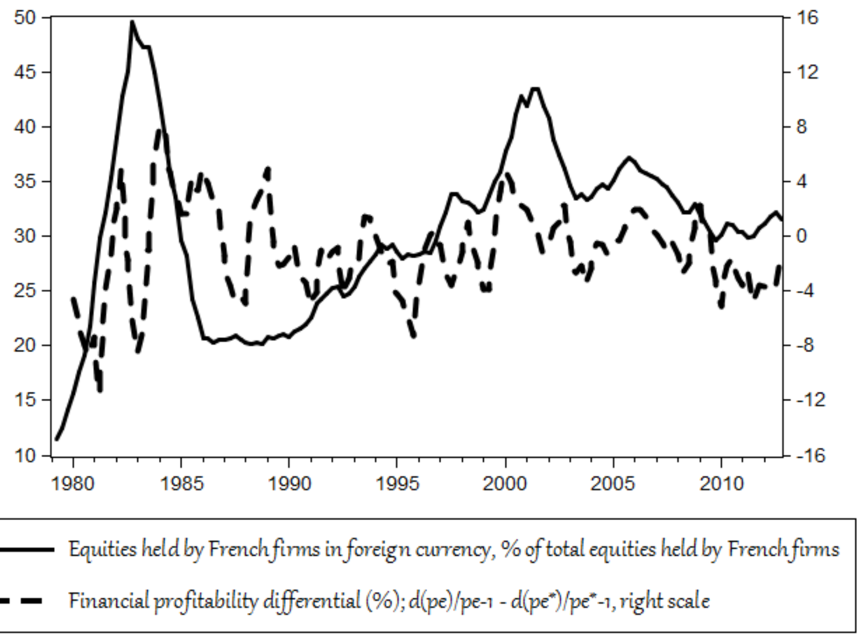

Figure 5.18 – Firms' demand for equity in foreign currency and interest rate differential; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

The second interesting stylized fact is that the proportion of equities held by French firms in foreign currency is sensitive to changes in the financial rate of return differential. From 1979 to 1982 the share of equities denominated in foreign currency out of the total went from 11.5 to 49%, a sharp increase indeed. However, with the strong revaluation of the franc taking place at around 1982, this trend was reversed, but the increase in firms' equities held in foreign currency kept on rising until the introduction of the euro, date after which it becomes more difficult to tell whether the trend continued or not[30].

$$E_f = \frac{-E^A_{F_e} p^f_{e_a} + p^f_{e_a} E^A_F}{p^f_{e_a} E^A_F}$$

[29]This is further reinforced in our estimates for the exchange rate, equation in which the interest rate differential is also included.

[30]The difficulty lies in the fact that the French currency is now that of several other countries. As a consequence, the value of aa financial instrument held in national currency may be hard to distinguish from those held in other euro holder countries.

$$e_{diff} = \left(\frac{\Delta p^{f}_{e_a}}{p^{f}_{e_a-1}}\right) - \left(\frac{\Delta p^{US}_{e}}{p^{US}_{e-1}}\right)$$

$$\Delta E_f = 0.59\Delta E_{f-1} + 0.22\Delta E_{f-2} + 0.03\Delta e_{diff} \qquad (5.35)$$

Equation 5.35 indicates that the short term evolution of both series in the graph is such that the positive link between the two is respected and further carried onto the model.

5.4 Estimates for general equations

We specified and estimated equations for total employment, active population, the price level and unit labor costs. These equations are key in determining the link between prices, unemployment and wages. As we argued in previous chapters, the inflation rate has been successfully brought under the control of the monetary authorities. This has been achieved by mix of economic policy (mainly driven through the interest rate) and a different set of rules in labor markets (mainly through wage and employment compression). The arguments set forth in this first section surround this discussion. The equations estimated in this section follow closely the specifications of Mazier and Saglio 2008.

5.4.1 Employment

Employment is modeled as the ratio of real output in logs ($ln(N/Y)$). Note that such term does not have any particular theoretical meaning, but we use it in order to model N. Therefore, the analysis in the graph is carried out in terms of $ln(Y/N)$, i.e. the labor productivity variable that makes sense, but the equations are explained in terms of N.

Thus, $ln(N/Y)$ is a function of a linear trend and four other deterministic terms. As can be seen in Figure 5.19, the evolution of the trend of labor productivity (the inverse of $ln(N/Y)$) has not been uniform. Indeed, from 1988 to 2008 (the shaded area in the figure) real output per worker increased more than proportionately than before and after this period, mainly as a consequence of the strong rise in unemployment (which went from around 5.2% in 1980 to 9.1% in 1987, and never fell below 7% thereafter) and the corresponding fall in demand. Mainly as a consequence of this shift, once the new low-employment regime settled, labor productivity remained at a higher level than before. But this shift ended with the 2008 crisis, when output fell drastically. Despite the strong fall in employment, production per worker fell below its previous trend because its numerator was hit much harder than its denominator. This *structural change* is captured by the coefficient of the dummy variable *d_str_chg* (-0.06). This variable takes the value of 1 from 1998q1 to 2008q1, and 0 otherwise.

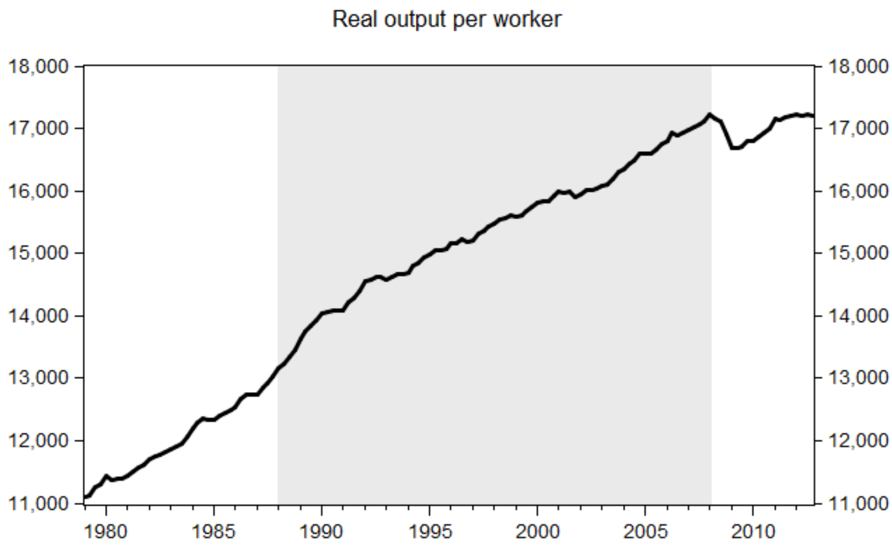

Figure 5.19 – Real output per worker; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

$$ln\left(\frac{N}{Y}\right) = -2.06 - 0.003t - 0.06d\_str\_chg + 0.03d1988q1 - 0.04d2008q2 - 0.04d2008q3 \quad (5.36)$$

$$\Delta ln(N) = 1.7\Delta ln(N_{-1}) - 0.79\Delta ln(N_{-2}) + 0.04\Delta ln(Y) - vc^{N}_{-1} \quad (5.37)$$

Equation 5.36 shows the OLS estimates of the long-term employment function. It states that the ratio $ln(N/Y)$ consistently fell at the rate of 0.3% quarterly[31], from an

[31] The average (negative) growth rate of the corresponding ratio, which translated to the labor productivity graph means that the average quarterly growth rate of this variable is 0.32% ($(1/0.0031) \times 1000 = 0.32\%$).

initial average level of -2.06 in 1979q1 ($ln(1/11.093) \approx -2.06$, where 11.093 is labor productivity in thousands). However, during the period 1988q1-2008q1, the level of the corresponding series was at 0.06 level below the trend which departed from -2.06. In fact, the trend was respected, but the departure was from a lower level ($-2.06 - 0.06 = -2.12$), which captures the fact that labor productivity was at a higher level in the corresponding period. These movements in $ln(N/Y)$ were accompanied by some outliers (significant departures from the parameter -2.06) in 1988q1, 2008q2 and 2008q3, which are captured by the coefficients of $d1988q1$, $d2008q2$ and $d2008q3$, respectively.

We call the residual term from the previous long-term specification vc^N, and we use its lagged value in the estimation of the corresponding short-term equation 5.37. Its coefficient is interpreted as the speed of adjustment which, as is standard in cointegration analysis, must lie between -1 and 0 and be significant. We are well aware of the fact that the dependent variable in this equation does not fully correspond to the previous long-term specification (at least as it is standard in the present work). However, it is worth to notice that this mix (long-term inverse of labor productivity and short-term employment) is more straightforward to interpret from a theoretical point of view.

Thus, the growth rate of French employment ($\Delta ln(N)$) is determined by the output growth rate ($\Delta ln(Y)$) in the current quarter, with an overall impact of 0.04. This in turn can be interpreted as an increase of employment by 4% given an increase in output of 1%.

5.4.2 Active population

Following Jacquot 1997 (see also the discussion in part 2.1.3 of the second chapter) the log of active population (AP, the sum of employed and unemployed) is a function of employment (N) and total active population (TAP, the sum of AP and the inactive IN). Since all variables are expressed in logarithms, we can interpret the coefficient 0.43 of equation 5.38 as the percentage change of active population given a 1% change in employment, and the coefficient 0.55 as the percentage change in active population given a 1% increase in total active population.

As a consequence, 1-0.43 is the percentage *fall* in the number of unemployed (U), given a 1% *rise* in the number of employed[32], and $1-q_2$ (where q_2 is the coefficient linking

[32]This can be derived from

$$q_1 = \frac{\%\Delta(N+U)}{\%\Delta N}$$

TAP and AP) is the percentage change in IN given a 1% increase in TAP[33]. It must also be noted that $q_1 + q_2$ must be very close to 1[34], given that as the number of employed individuals grows, and if total active population expands, this must be offset by the increase in employment.

Figure 5.20 – Active population and its determinants; 1979-2012. Source: author's calculations based on data by *INSEE*.

$$ln(AP) = 0.43ln(N) + 0.55ln(TAP) \tag{5.38}$$

$$\Delta ln(AP) = 1.51\Delta ln(AP_{-1}) - 0.78\Delta ln(AP_{-2}) + 0.11\Delta ln(AP_{-3}) + 0.05\Delta ln(N) - 0.07\Delta ln(N_{-1})$$

(where q_1 is the coefficient linking N and AP) therefore

$$1 - q_1 = 1 - \frac{\%\Delta(N+U)}{\%\Delta N} = \frac{\%\Delta N - \%\Delta(N+U)}{\%\Delta N} = -\frac{\%\Delta U}{\%\Delta N}$$

given that being employed (N) and being unemployed (U) are mutually exclusive events.

[33]This result is obtained in the same way as in the previous footnote.

[34]Indeed, according to our estimates $q_1 + q_2 = 0.9816$, which is close enough to unity.

$$+ 0.03\Delta ln(N_{-3}) + 0.09\Delta ln(TAP_{-1}) - 0.06\Delta ln(TAP_{-2}) - 0.002vc_{-1}^{AP} \qquad (5.39)$$

This long-run equation includes two structural change dummies which, like single-period dummies, are included in the *second step VAR in differences*, in this and the following long-term estimates[35]. The first one runs from 1992q2 to 2008q3 (the shaded area in Figure 5.20), and corresponds to a sudden rise in active population. The second shift occurs from the end of the former one, and runs up to the end of the sample (to the right of the shaded area). During this second structural change, active population rises above the former trend, thanks to the strong rise in the number of unemployed, which can be seen in the fact that employment falls. This is, of course, also observed in the coefficient of the corresponding dummy variable in the system for the vectors analyzed (not shown). Again, the red lines which are perpendicular to the time axis represent single-period dummy variables.

Our short-term interpretation of the following equations come from Error Correction Mechanisms. Since *ECM*s show the link between the long- and the short-run, these are the estimations included in the simulations. Therefore, the evolution of the series estimated (shown in this part) depends on the parameters found. In any case, the short-term influence of employment and the total active population are positive on AP.

5.4.3 Wage per worker

The log of wage per worker, defined as the ratio of wages paid[36] and the number of salaried workers (W_{paid}/N_{sal}), is a function of the consumer price index (p_c), of average labor productivity (Y/N) and the unemployment rate[37] (u).

Figure 5.21 shows the series that determine the wage per worker. As can be seen from the upper left panel, the evolution of wages paid as a proportion of salaried employment has not been regular. Indeed, from the beginning of our sample period to the second quarter of 1984, wages grew at a quarterly average of 3% and salaried employment at

[35]See EViews' User's Guide - Multiple Equation Analysis - Vector Autoregression and Error Correction Models - Vector Error Correction (VEC) Models.

[36]By individual entrepreneurs, firms and the government to workers.

[37]It must be noted that this is a non-monetary series and that it is used in this model as natural logarithm, so that we can render its interpretation more straightforward (that is, as elasticity) and to reduce the risk of heteroskedasticity of the error term. In order to avoid taking logs of a series whose values lie between 0 and 1 (which would yield a negative value, thus potentially rendering our estimates misleading) we multiplied this series by 100 and before transforming it to logs. We follow the same procedure when facing similar issues. As we mentioned at the beginning of the current chapter, we proceeded in this way for other series as well.

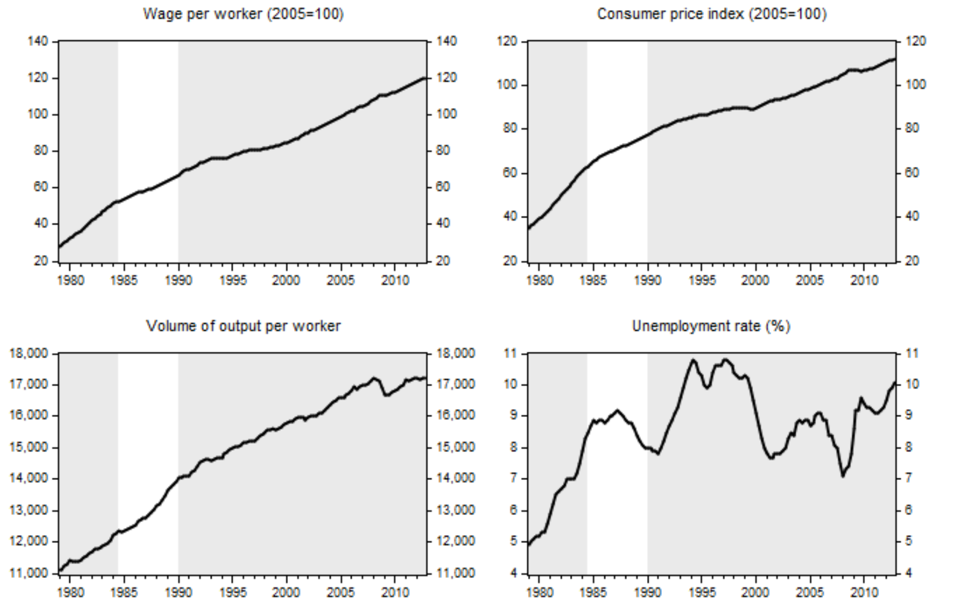

Figure 5.21 – Wage per worker and its determinants; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

0.01%. However, from then on, and until the end of the eighties, the numbers were 1 and 0.2% respectively. Nevertheless, from the nineties on wages grew at an average of 0.6%, whereas the number of employees receiving a salary continued growing at a quarterly speed of 0.2%. These movements explain the evolution of the left-hand upper panel of the figure, and indicate that there were two structural breaks in the corresponding series. The first and last of the three time spans are the shaded areas in the graph. However, the second and third correspond to the structural change dummies included in the *VECM*, with the first span being the reference period (i.e. the one with respect to which the other two are compared). These dummies are also significant for the price index, which is not surprising, given the strong relationship existing between these two series.

Thus, a consequence of wage moderation is reflected in real output per worker and lower prices. Moreover, this had as a counterpart a self-reinforcing effect, which is seen in the fact that consumer prices have also been contained, and this had a direct effect in containing costs[38]. This can be seen in the elasticity of wage per worker to consumer

[38]The ultimate end of the regime shift was the fight against inflation (see Burns, Cirovic, and Polak 1979), mainly caused by the oil shock, in turn the result of the collapse of the Bretton Woods system (see chapter

prices, which is of the order of 0.9. Labor productivity, in turn, has an elasticity of 0.7 with respect to wages. On the other hand, unemployment has had a negative effect on wage costs, mainly stemming from the fact that as employment increases, a higher wage bill must be paid. This is reflected in the fact that, as unemployment rises by 1%, wages per head will fall by 1.3%. It must be noted, however, that this wage-employment link may have a strong psychological-ideological component. Furthermore, we also want to highlight the fact that the strong increase in unemployment at the beginning of the eighties (from an average of 4.5% between 1975 and 1981, to 8.8% afterwards in average) was indeed effective in containing prices, but the correspondingly strong fall in demand is seen here as being more harmful than the positive supply effect.

$$ln\left(\frac{W_{paid}}{N_{sal}}\right) = 0.91ln(p_c) + 0.7ln\left(\frac{Y}{N}\right) - 1.28ln(u) \tag{5.40}$$

$$\Delta ln\left(\frac{W_{paid}}{N_{sal}}\right) = 0.41\Delta ln(p_c) + 0.38\Delta ln(p_{c-1}) + 0.16\Delta ln\left(\frac{Y}{N}\right) - 0.0013ln(u) - 0.005vc_{-1}^{wages} \tag{5.41}$$

In the short-term (with the growth rate of the long-term specification as dependent variable) wages per worker have closely followed he evolution of the inflation rate. This is reflected in the fact that $\Delta ln(p_c)$ and $\Delta ln(p_{c-1})$ are preceded by positive coefficients. Labor productivity also has a positive effect on $\Delta W_{paid}/N_{sal}$. Note also that we included the unemployment rate in level (instead of differenced, as it would normally be expected) in order to give our estimate of the elasticity of the growth rate of wage per worker with respect to the unemployment rate a standard interpretation in terms of the Phillips curve. Of course, the speed of adjustment lies between 0 and -1.

5.4.4 General price level

The general price level index (p_y) is a logarithmic function of unit cost[39] (W_{paid}/Y), the capacity utilization rate (gap, our proxy for this series) and the price of imports (p_m). Figure 5.22 shows the corresponding series in non-logarithmic form.

$$ln(p_y) = 0.82ln\left(\frac{W_{paid}}{Y}\right) + 0.91gap + 0.29ln(p_m) \tag{5.42}$$

1).

[39]It is important to highligh that W_{paid} is defined as wN, where w is the wage bill and N is total employment.

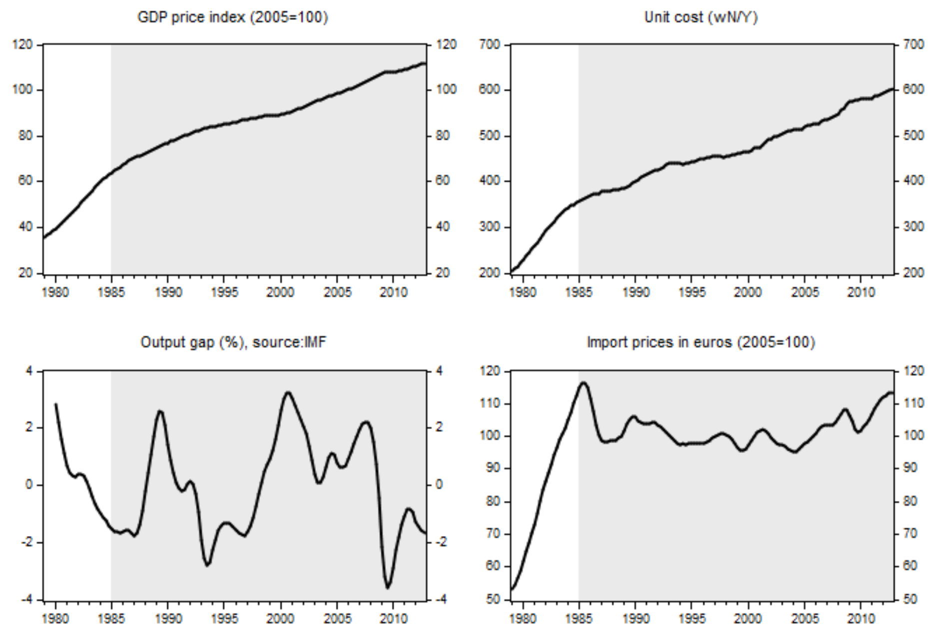

Figure 5.22 – General price level and its determinants; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

$$\Delta ln(p_y) = 0.43\Delta ln(p_{y-2}) + 0.32\Delta ln\left(\frac{W_{paid}}{Y}\right) + 0.25\Delta gap + 0.04\Delta ln(p_{m-1}) - 0.04vc^{py}_{-1} \quad (5.43)$$

Our estimates suggest that there is a close to one on one relationship (in percentage terms) between prices and unit (or average) costs, which can be seen in the first term on the right-hand side of equation 5.42. This implies that, as unit costs increase by 1%, prices follow lead by increasing 0.82%. The output gap (our proxy for capacity utilization and thus demand) and the price of imported goods (our proxy for the price of *imported capital goods*) also have a positive impact on prices, with elasticities of 0.91 and 0.29, respectively.

The short-term specification shown in equation 5.43 says that the inflation rate is positively affected by itself two periods later, which means that, following a 1% increase in the quarterly growth rate of the general price level causes a further 0.4% rise in itself a period later. A 1% rise in the growth rate of unit costs provokes a 0.32% increase in inflation in the same quarter. A rise in the change of the output gap leads to a rise in inflation. Also, following an increase of 1% in the price of imported goods, there is a corresponding overall increase in prices of 0.04%. Finally, the *annual* speed of adjustment is about 15% (four times the coefficient of vc_{-1}^{py}, rounded up to the nearest decimal).

5.4.5 Price of value added

As it was seen above, the price index of value added follows the evolution of the general price level. This close relationship can be seen in equations 5.44 and 5.45.

$$p_{va} = 0.07 + 0.93p_y \tag{5.44}$$

$$\Delta p_{va} = 0.84\Delta p_{va-1} + 1.13\Delta p_y - 0.98\Delta p_{y-1} - 0.001vc_{-1}^{pva} \tag{5.45}$$

5.4.6 Exchange rate

As it was mentioned in part 2.1.3, the exchange rate is a direct function of the interest rate differential ($r^r - i^r$, with i^r expressed in national currency) and the ratio of the outstanding stock of assets held by French residents with respect to the liability counterpart. The corresponding series can be seen in Figure 5.23.

The long- and short-term specifications for this series are shown in equations 5.46 and 5.47, respectively.

$$x_r = -0.49 + 58.7(r^r - i^r) + 1.47\left(\frac{A}{L}\right) \tag{5.46}$$

$$\Delta x_r = 1.67\Delta x_{r-1} - 0.69\Delta x_{r-2} + 0.99\Delta(r^r - i^r) - 0.67\Delta(r_{-1}^r - i_{-1}^r) + 0.002\Delta\left(\frac{A_{-1}}{L_{-1}}\right) - 0.0004vc_{-1}^{xr} \tag{5.47}$$

These estimates can be interpreted as follows. Given a widening of the interest rate differential (positively, of course) the exchange rate tends to appreciate (a rise in x_r), both in the short- and the long-term. This is due to the fact that, when this happens, this means that the French economy is more profitable for financial actors than is the rest of the world. An appreciation of the exchange rate can be observed whenever the stock of assets held by French residents exceeds their liabilities. This is so because a surplus in the balance of indebtedness is a reflection of the fact that France is a better destination as a source of financial profitability than its counterparts.

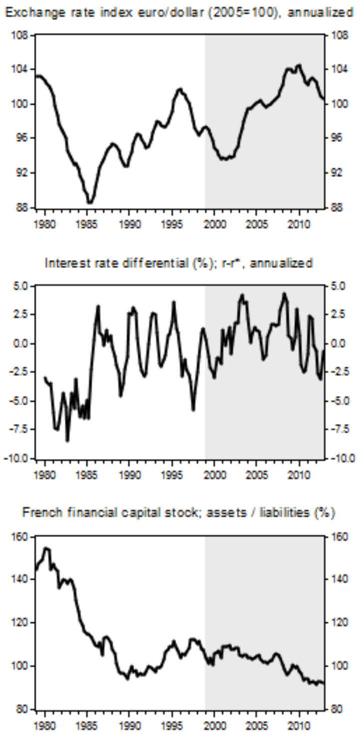

Figure 5.23 – Exchange rate and its determinants; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

Fundamentalists and chartists

As it was pointed out before, another interesting characteristic of our model is that we distinguish between the observed interest rate and the expected one. The latter is here defined as a weighted average of the expected exchange rate calculated by fundamentalists (x_r^f) and the one calculated by chartists (x_r^c). At this stage, weights assigned to each type of speculator are equivalent, but could easily be modified whenever we decided to do so in order to analyze the effects of having more of each type of financial actors in the French economy. The equations defining the rules used by each group of speculators ate the following:

$$\Delta x_r^f = -0.59(x_r - x_r^{f*}) \tag{5.48}$$

$$\Delta x_r^c = -0.51\Delta x_{r-1}^c + 0.38\Delta x_{r-2}^c + 0.77\omega_{-1} \tag{5.49}$$

Equation 5.48 says that the exchange rate expected by fundamentalists is equal to

-0.59 times the gap between the actual exchange rate (x_r) and the one these speculators consider as fundamental (x_r^{f*}). These estimates were obtained by plain *OLS* in a single step (that is, there is no corresponding *VECM* equation).

Equation 5.49 is in turn estimated using a standard *ARMA*(2,1) model that says that chartists take into consideration the previous information of the exchange rate (and their errors in forming these, i.e. ω) for their estimates of this macroeconomic fundamental. We write the expected exchange rate as x_{r*}.

5.5 Estimates for the general government

Given that several equations have been already anticipated (notably those concerning prices), this section and the following for banks will be much briefer than the previous ones in which we focused on the equations that determine the behavior of households and firms. In any case, as we mentioned before, banks and the government are relatively passive actors in the hypothetical economy we are describing.

5.5.1 Price of public investment

The price index of public investment is set as a function of the general price level. The relationship between these two series is described in the following equations:

$$p_i^g = -0.78 + 1.65 p_y \tag{5.50}$$

$$\Delta p_i^g = 1.43 \Delta p_{i-1}^g - 0.61 \Delta p_{i-2}^g + 0.32 \Delta p_y - 0.005 vc_{-1}^{pig} \tag{5.51}$$

Since these are mainly "protocol estimates", we do not delve deeper into the corresponding interpretations, given that these are straightforward (and also given that we do not pretend to bore the reader with so many estimation descriptions).

5.5.2 Price of public expenditure

The price index that corresponds to public expenditure is determined as a short-run equation only. It s results are the following:

$$\Delta p_g = 0.94 \Delta p_{g-1} + 0.32 \Delta p_y - 0.26 \Delta p_{y-1} \tag{5.52}$$

5.5.3 Price of public non-financial assets

Also quite standard, and already seen for the case of households and firms, the price of public non-financial assets is defined in the long-term by the housing price, whose evolution it closely mimics.

$$p_k^g = 0.78 p_k^h + 0.24 p_i^g \tag{5.53}$$

The short term equation is simply a reparameterized version of the former with a few more lags and determinants (the price of investment and the interest rate):

$$\Delta p_k^g = 2.16 \Delta p_k^{g-1} - 1.86 \Delta p_k^{g-2} + 0.67 \Delta p_k^{g-3} + 0.73 \Delta p_k^h - 1.56 \Delta p_{k-1}^g + 1.31 \Delta p_{k-2}^g - 0.46 \Delta p_{k-3}^g$$

$$+ 0.001 \Delta p_{i-1}^g + 0.0007 \Delta p_{i-2}^g - 0.001 \Delta p_{i-3}^g - 0.02 r_b^g - 0.006 vc_{-1}^{pkg} \tag{5.54}$$

5.5.4 Price of equities held by the government

The same applies to the price of equities. See Figure 5.10 and the discussion in that section for the empirical justification of the following equations:

$$p_{e_a}^g = 0.46 + 0.61 p_{e_l}^f \tag{5.55}$$

$$\Delta p_{e_a}^g = 0.65 \Delta p_{e_a-1}^g + 0.46 \Delta p_{e_l}^f - 0.31 \Delta p_{e_l-1}^f - 0.03 vc_{-1}^{peg} \tag{5.56}$$

5.5.5 Bonds issued by the government in foreign currency

Figure 5.24 shows the proportion of bonds issued by the French government in foreign currency out of the total. Two things stand out from the graph. The first is that, contrary to our own preliminary beliefs, such proportion has not been very high. Note that the maximum of the corresponding series is 3.7% in 1997q4. The second characteristic that stands out from the figure is that the interest rate differential (corrected for changes in the exchange rate) follows more or less the same evolution, but the link between both series is not so evident.

From the late seventies up to the end of the 1980s the association between our measure of demand for bonds in foreign currency and the interest rate differential is much closer

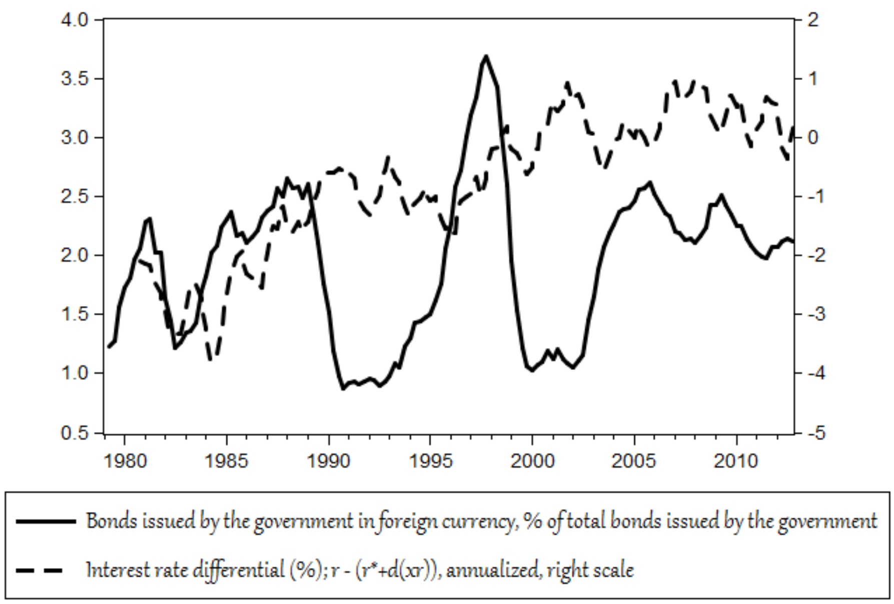

Figure 5.24 – Bonds issued in foreign currency (% of total) and interest rate differential; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

than afterwards. Nevertheless, our estimates confirm that the evolution of the former can be explained by the latter.

We start out by defining

$$BLG_{fc} = \frac{-B^L_{G_e} p^g_{b_l} + p^g_{b_l} B^L_G}{p^g_{b_l} B^L_G}$$

in order to yield the long-term equation:

$$BLG_{fc} = 28.3[r^r - (i^r + \Delta x_{r*})] \tag{5.57}$$

This has as a short-term counterpart the following specification:

$$\Delta BLG_{fc} = 0.16\Delta BLG_{fc-1} + 0.42\Delta BLG_{fc-2} + 0.08\Delta BLG_{fc-3} + 0.41\Delta[r^r - (i^r + \Delta x_{r*})] - 0.002vc^{BLGfc}_{-1} \tag{5.58}$$

5.6 Estimates for banks

5.6.1 Price of equities of banks

The price of equities held by banks are estimated in standard fashion, as a dependent variable of the leader equity price (of equities issued by firms). So far the only "innovation" is that the corresponding long-term specification includes a time trend that affects this variable positively.

$$p^b_{e_a} = 0.12 + 0.81 p^f_{e_l} + 0.0002t \tag{5.59}$$

$$\Delta p^b_{e_a} = 0.85 \Delta p^b_{e_a -1} + 0.59 \Delta p^f_{e_l} - 0.49 \Delta p^f_{e_l -1} - 0.007 vc^{peab}_{-1} \tag{5.60}$$

The prices of the same instrument, but included on the liability side, is likewise straightforward to interpret.

$$p^b_{e_l} = 0.71 + 0.27 p^f_{e_l} \tag{5.61}$$

$$\Delta p^b_{e_l} = 0.88 \Delta p^b_{e_l -1} + 0.24 \Delta p^f_{e_l} - 0.22 \Delta p^f_{e_l -2} - 0.007 vc^{pelb}_{-1} \tag{5.62}$$

5.6.2 Price of deposit liabilities of banks

Figure 5.25 shows the evolution of the price of deposit liabilities of banks and the interest rate paid by banks. It is clear from the figure that the series have moved in opposite directions. Note that the price series fell persistently during the first half of the eighties, then went back up once the new equity-based financialized regime settled in the economy and stabilized at around a level of 101. Throughout the stock-market bubble the price of deposits grew above its previous trend, and even past the 2000 crisis, but in 2002 it constantly fell.

It is perhaps particularly important to note that, by the time the $p^b_{d_l}$ index was falling drastically (which indicates a cheapening of the given currency) France was already experiencing a liquidity trap. This is even more evident when we observe the evolution of the nominal interest rate paid by banks in the same period. Clearly, this indicator also falls in the long term, although somehow respecting its negative association with the price of deposit liabilities. Before 2002, the counterclockwise association between deposit price and interest rate is more evident.

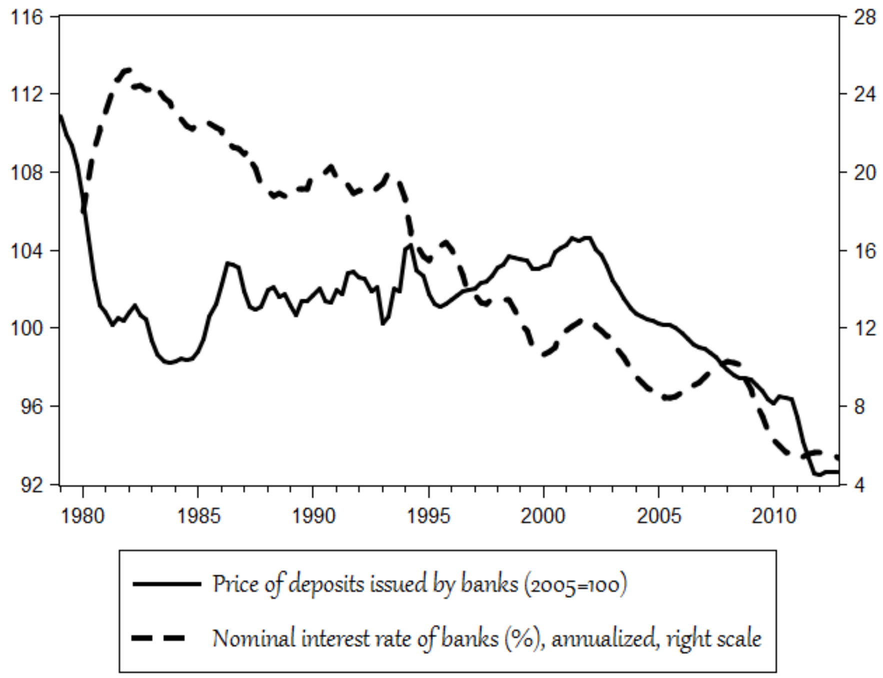

Figure 5.25 – Price of deposit liabilities by banks interest rate paid by this sector; 1979-2012. Source: author's calculations based on data by *Banque de France*.

$$p^b_{d_l} = -13.8 r^b_b + 228.8 infl \tag{5.63}$$

$$\Delta p^b_{d_l} = 0.27 \Delta p^b_{d_l-1} + 0.33 \Delta p^b_{d_l-2} - 0.25 \Delta r^b_{b-2} + 0.64 \Delta infl_{-1} - 0.0005 vc^{pdlb}_{-1} \tag{5.64}$$

Equations 5.63 and 5.64 confirm that the link between these two series is negative. Furthermore, in each specification we included the inflation rate, which has the expected positive influence on prices that we were expecting, so that an increase in the general price level is translated to financial markets.

5.6.3 Price of loans made by banks

In this part we lend further support to another stylized fact upon which we have insisted so far: the link between q (the ratio equity prices/physical capital prices) and the price of loans granted by banks. Figure 5.26 shows both series which, apart from a few exceptions, seem to move in unison.

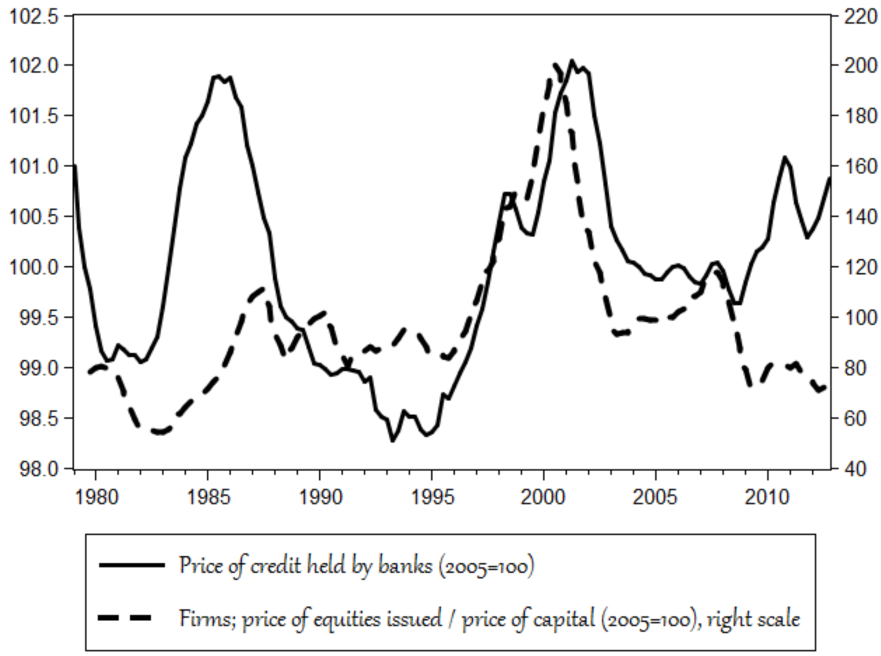

Figure 5.26 – Price of loans made by banks and its determinants; 1979-2012. Source: author's calculations based on data by *Banque de France*.

Note that timing is not perfect, particularly at the beginning of the sample period. In 1982, to take an example, the direction of q was down, whereas the price of banks' credit holdings were already on the rise. The latter series reached its peak in 1985, whereas that of q occurred a year later. The evolution of both series was not much synchronized until the stock market boom that began in the middle of the nineties, when both series rose drastically. The lag between the two drew narrower for the next few years after 1995, and they finally parted ways right after the 2008 crisis.

This description fits the ideas put forward in the first chapter, whereby the price of equity replaced the interest rate as a key macroeconomic fundamental. The period during which this happened coincides (at least since the mid-nineties and up to 2008) with the period characterized by the liquidity trap. The latter, according to our analysis carried out in part 1.1.4, spans from (roughly speaking) 1986 to 2008.

Thus, an increase in Tobin's q brings about a rise in the price of credit granted by banks. This is confirmed in equations 5.65 and 5.66.

$$p^b_{l_a} = 1.08 + 0.37\left(\frac{p^f_{e_l}}{p^f_k}\right) \tag{5.65}$$

$$\Delta p^b_{l_a} = 0.65\Delta p^b_{l_a-1} + 0.012\Delta\left(\frac{p^f_{e_l}}{p^f_k}\right) - O.011\Delta\left(\frac{p^f_{e_l-1}}{p^f_{k-1}}\right) + 0.004\Delta\left(\frac{p^f_{e_l-2}}{p^f_{k-2}}\right) - 0.0004vc^{plab}_{-1} \tag{5.66}$$

5.6.4 Securities held in foreign currency

Securities held by French banks in foreign currency are modeled in standard fashion. That is, as share of the corresponding total. Figure 5.27 shows this series along with the interest rate differential. Unfortunately, the association between the two is not so straightforward as it was the case for other instruments. In fact, the long-term trend of the variable of interest (BAB_{fc}) is quite irregular, going from as high as 37.5% in 1984, to as low as 12.4% in 2004. We suspect that the introduction of the euro might interfere in the evolution of the series, given that, since its introduction, no distinction can be made between the holdings of this instrument in foreign countries sharing the same currency.

We were unable to estimate a long-term equation for this series (perhaps due to the difficulty just mentioned), and contempt ourselves with a short-term specification (eq. 5.67) in which the positive association between the two series shown in the graph is respected.

$$BAB_{fc} = \left(\frac{-B^A_{B_e}p^b_{b_a} + p^b_{b_a}B^A_B}{p^b_{b_a}B^A_B}\right)$$

$$\Delta BAB_{fc} = 0.57\Delta BAB_{fc-1} + 0.22\Delta BAB_{fc-2} - 0.41\Delta[r^r - (i^r + \Delta x_{r*})] + 0.71\Delta[r^r_{-2} - (i^r_{-2} + \Delta x_{r*-2})] \tag{5.67}$$

5.6.5 Loans made by banks in foreign currency

Figure 5.28 shows the previous subsection's equivalent for loans made by banks. The evolution of the share of loans granted by French banks in foreign currency (presumably to non-French residents) also lends support to our argument whereby French banks turned to the foreign sector when they realized that firms were no longer demanding credit. More specifically, from 1979 to 1984 (when French monetary policy was the most

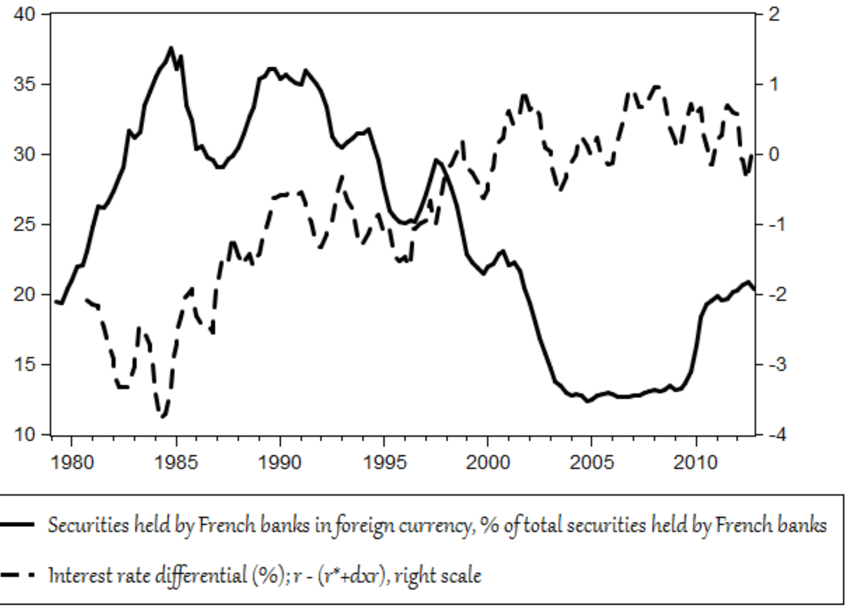

Figure 5.27 – Securities held by banks in foreign currency (% of total) and interest rate differential; 1979-2012. Source: author's calculations based on data by *Banque de France*.

restrictive), credit granted in foreign currency went from representing roughly 5.4% of the total, to 12.1%.

Coincidentally, this period matched one of the most extreme episodes of balance of payments crisis in Latin America (1982) due to strong capital inflows and outflows. Of course, we can only speculate at this point, and we humbly recognize that this might only be illusory. Nonetheless, what is important to highlight is that an integral story of where capital comes from and where it goes to is a necessary step in understanding the current international financial system.

The evolution of both series after this episode is less clear, for the credit series (LAB_{fc}) fall at an even lower point than its 1979 level, whereas the interest rate differential stabilizes at around -1%. Starting in 1995, the overall trend of both series seems more in accordance, and particularly important is note that, during the stock-market boom (1995-2000) the series LAB_{fc} grew persistently. This also lends support to our claim that firms tend to built up their reserves of instruments denominated in foreign currency during this period.

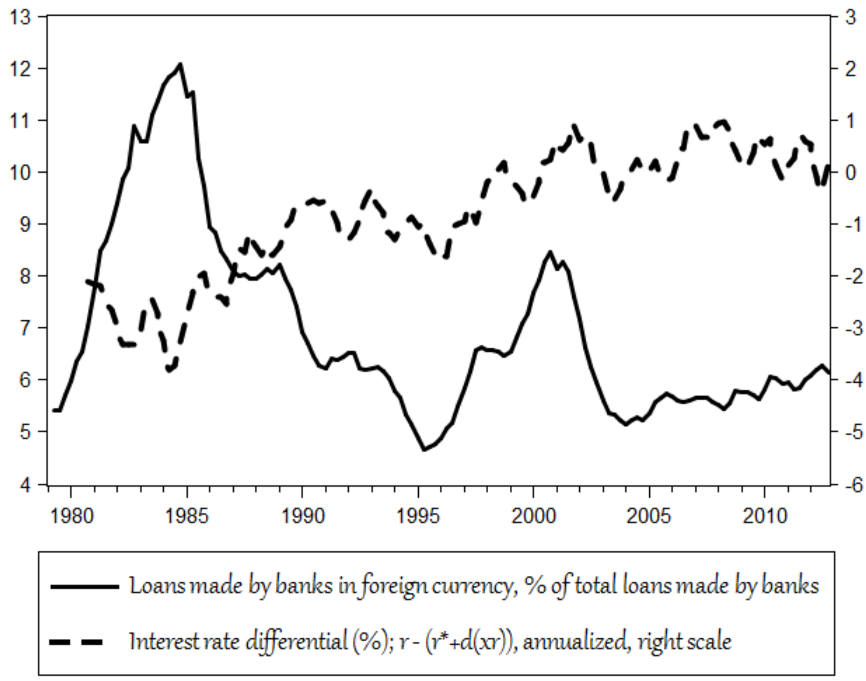

Figure 5.28 – Credit held by banks in foreign currency (% of total) and interest rate differential; 1979-2012. Source: author's calculations based on data by *Banque de France*.

$$LAB_{fc} = \left(\frac{-L^A_{B_e} p^b_{l_a} + p^b_{l_a} L^A_B}{p^b_{l_a} L^A_B} \right)$$

$$\Delta LAB_{fc} = 0.58 \Delta LAB_{fc-1} + 0.34 \Delta LAB_{fc-2} - 0.09 \Delta LAB_{fc-3} + 0.11 \Delta [r^r - (i^r + \Delta x_{r*})] \quad (5.68)$$

Equation 5.68 shows that the short-term specification between these two series is, as expected, positive.

5.6.6 Equities held by banks in foreign currency

As in the case of non-financial firms, banks also demand equity denominated on foreign currency. The percentage of these in the total value of the stock of equities they hold is also quite interesting to look at. Like non-financial firms, banks also increased their demand for foreign equities strongly from 1979 to 1982 (the capital flight episode alluded to in the first chapter), going from 9 to 32% in that short span. The corresponding percentage then fell and settled at around 10%. This average value was gradually abandoned with the arrival of the new millennium, when it went from 10 to 14% in 2005, but it fell afterwards.

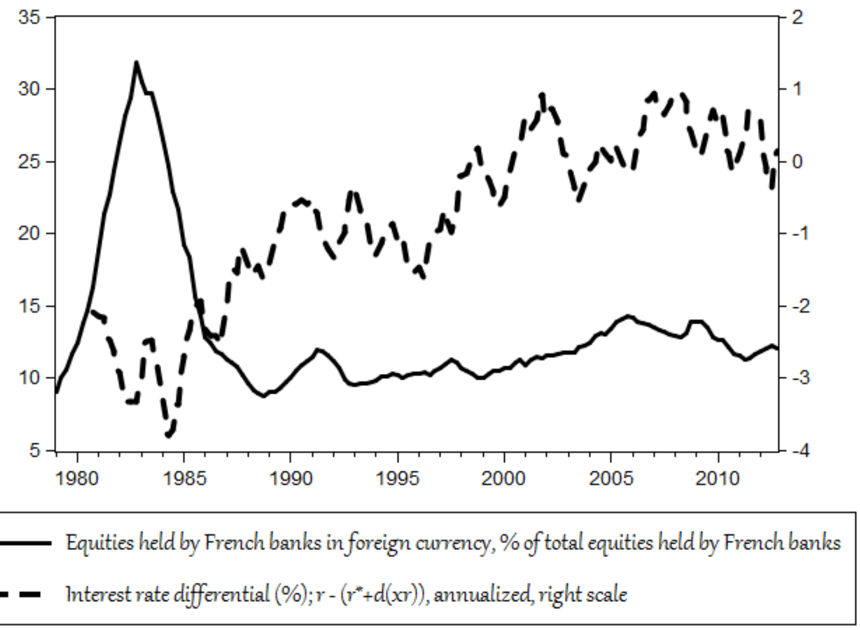

Figure 5.29 – Equities held by banks in foreign currency (% of total) and interest rate differential; 1979-2012. Source: author's calculations based on data by *Banque de France*.

As in the previous cases, unfortunately the long-term data does not confirm the expected positive relationship graphically, so we contempt ourselves with ding so in the following short-term specification:

$$EAB_{fc} = \left(\frac{-E^A_{B_e} p^b_{e_a} + p^b_{e_a} E^A_B}{p^b_{e_a} E^A_B} \right)$$

$$\Delta EAB_{fc} = 0.53 \Delta EAB_{fc-1} + 0.26 \Delta EAB_{fc-2} - 0.17 \Delta EAB_{fc-3} + 0.11 \Delta [r^r - (i^r + \Delta x_{r*})] \quad (5.69)$$

5.7 Estimates for the rest of the world

The French trade balance has gone through several stages since the early seventies. In real terms, the difference between exports and imports, as a proportion of *GDP*, went from an average 0.5% deficit during the seventies to a 0.2% surplus in the first half of the eighties, and then went back to the previous negative figure. The current account continued to move counter to the evolution of the physical capital accumulation rate until the stock-market boom took place in 1995. From then on, and until 2010, both series move pro-cyclically. However, in 2011 and 2012 the trend was again reversed[40].

Indeed, there have been important changes in the trends of foreign trade for French producers. These trends explain (and have been explained by) movements in export and import prices, as well as foreign and domestic demand. Perhaps even more important is the fact that the counterpart of the current account (of which the trade balance is a great part) is the financial account with respect to the rest of the world. The latter, in turn, affects (and is affected by) the evolution of the financial accounts of the domestic sectors. In the previous sections we have seen that there have been important changes in the debt and equity markets, therefore these developments weight with respect to the rest of the world.

5.7.1 Exports

The volume of exports (X) in logs is a function foreign demand (Y^f), and of a measure of competitiveness that was obtained from the *OECD*[41]. The latter is the ratio of domestic-to-foreign export prices ($p_x/(p_{x*}/x_r)$). Needless to say, this specification is inspired in a standard IS-LM-BP (or Mundell-Flemming) model. Figure 5.30 shows the corresponding series.

$$ln(X) = 1.98ln(Y^f) - 0.93ln\left(\frac{p_x}{p_{x*}/x_r}\right) \tag{5.70}$$

As expected, the volume of exports depends importantly on foreign demand. In fact, a 1% increase in demand from France's trade parters will be translated into roughly a 2% rise in French exports. Following the same logic, a 1% increase of French export prices above those of competitors will diminish the demand for exports by 0.93%.

[40]For a more complete analysis of open economy issues in France see the part "The exchange rate and the current account" in chapter 1.

[41]In fact, this indicator is measured as the ratio of consumer price indexes rather than exports, and we use it as an imperfect proxy.

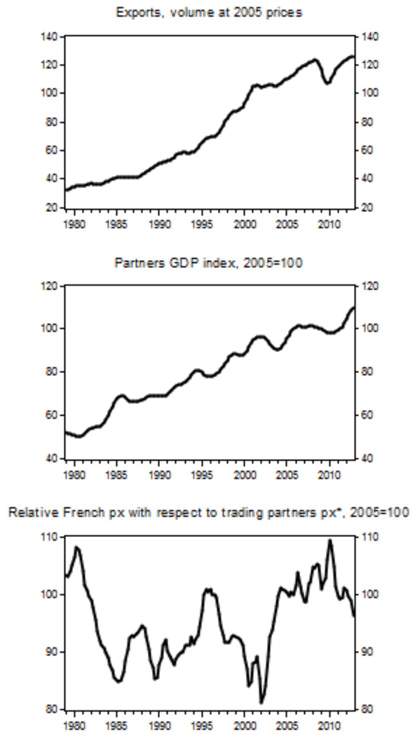

Figure 5.30 – Exports function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *OECD* (p_{x*}).

Equation 5.70 shows our short-term estimates for this trade element.

$$\Delta ln(X) = 0.28\Delta ln(X_{-1}) + 0.41\Delta ln(Y^f) - 0.06\Delta ln\left(\frac{p_{x-1}}{p_{x*-1}/x_{r_{-1}}}\right) \tag{5.71}$$

Equation 5.71 shows that a 1% increase in the growth rate of foreign demand provokes a 0.41% increase in the growth rate of exports. Note that the coefficient of $\Delta ln(p_{x-1}/(p_{x*-1}/x_{r-1}))$ has a negative sign in both the long-term and short-term specifications. This is natural, since a rise in the export prices of France undermine the country's competitiveness. Likewise, whenever competitors' prices rise (or the exchange rate is depreciated) this cheapens French goods and has a favorable effect on the demand for French goods. It must be noted, however, that a depreciation also has negative consequences for the capital account, which may ultimately counterbalance any positive effects this may have on, say, *GDP*.

5.7.2 Export price

The (log of) the price of exports is a function of the general domestic price level, and the export price of competing economies (see equation 5.72). Since, by definition, the coefficient linking $ln(p_y)$ and $ln(p_x)$ is the percentage change in the price of exports given a 1% in domestic prices and the one linking $ln(p_{x*}/x_r)$ an the latter is the percentage change of the price of exports given a 1% change in the price of exports of competing economies, as a general rule, the sum of both coefficients must be close to unity (also see the discussion in the part "Foreign trade" in chapter 2). Our estimates confirm this, and also tell us that, throughout the period under analysis, France has behaved as a price-maker, given that the coefficient of $ln(p_y)$ exceeds that of $ln(p_{x*}/x_r)$, if only by little[42]. This implies that domestic French prices have weighted more on export prices than those from competitors.

$$ln(p_x) = 0.54ln(p_y) + 0.44ln\left(\frac{p_{x*}}{x_r}\right) \tag{5.72}$$

Figure 5.31 shows the series included in the corresponding specification. Export prices have clearly suffered important shifts. This is evident in the first half of the eighties, when this series went up rapidly and settled almost at double its previous 1985 level. This, however, is explained by the corresponding paths of the general price level and the price of partners' exports, instead of being explained by structural change dummies as was the case in previous equations. As we have suggested throughout the present work, 1985 is perhaps *the* key turning point for France. This is more clearly seen in the graph, where the effects of employment and wage compression[43] are fragrantly shown at work, and which allow us to leave aside structural change dummies for this *VECM*.

$$\Delta ln(p_x) = 0.42\Delta ln(p_{x-1}) + 0.66\Delta ln(p_y) + 0.014\Delta ln\left(\frac{p_{x*-3}}{x_{r-3}}\right) - 0.008vc_{-1}^{px} \tag{5.73}$$

Equation 5.73 shows our short-term specification of the corresponding series, where it can be seen that the growth rate of the price of exports is determined by its previous one-period lagged values. A 1% increase in the inflation rate generates a rise of 0.66% in the growth rate of exports. In the same vein, a 1% increase in the price of competitors'

[42]In OECD 2009 it can be seen that, for France, the explanatory power of price competitiveness indicators has been diminished since at least 2000.

[43]Note that 1985 is also the year in which firms' stock of equities issued exceeded the stock of debt obligations, and that this trend has not (yet?) been reversed.

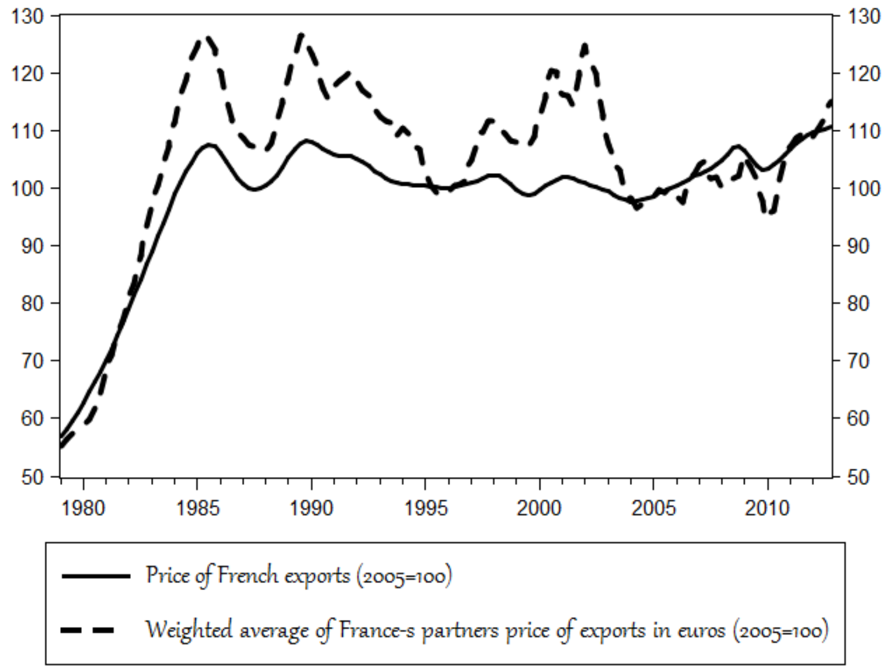

Figure 5.31 – Exports price function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

prices lead to a slight rise in the growth rate of export prices (the value of the coefficient of the series $\Delta ln(p_{x*-3})$ is positive). Finally, the speed of adjustment (the coefficient of vc^{px}_{-1}) indicates that the short-term evolution of the corresponding series approaches that of its long-term trajectory at a 3.2% annually (four times 0.8%).

5.7.3 Imports

The log of the volume of imports are a function of the log of domestic demand and of another measure of the exchange rate. The latter is the ratio of the domestic price level with respect to the price of imports (expressed in euros).

$$ln(M) = -12.8 + 1.9ln(Y) + 1.3ln\left(\frac{p_y}{p_m}\right) \tag{5.74}$$

Figure 5.32 shows the long-term evolution of the series included in this specification. Imports have followed more or less the same trends as exports; mild growth in the first half of the eighties and more dynamic in the second one (where we included a structural

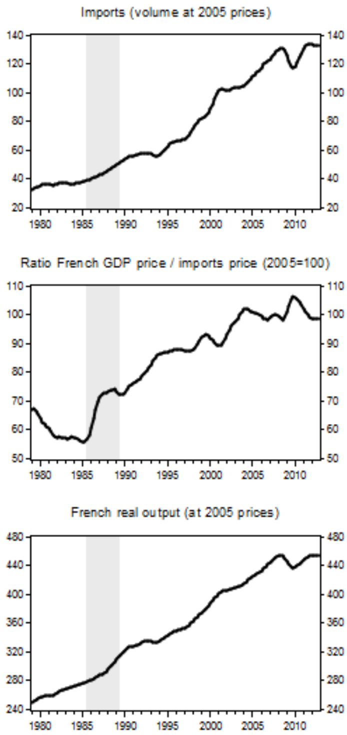

Figure 5.32 – Imports function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

change dummy). In the first half of the nineties however, imports stagnated, whereas exports increased slightly (which clearly explains the trade surplus at the beginning of the nineties). Imports soared during the stock market boom that took place between 1995 and 2000, fell considerably afterwards, and jerked even more when the 2007-08 crisis hit.

Such uneven evolution is explained by movements in relative prices and domestic demand. In the first half of the eighties import prices were growing at a slower pace than domestic prices, which is tantamount to a real exchange rate appreciation that (given that the Marshall-Lerner condition is satisfied) favors the demand for foreign goods above domestic goods. The effects of this appreciation were felt within a couple-of-years delay (from 1985 to 1990, the period of the structural change dummy we included), despite the fact that import prices were growing much faster than domestic prices in the corresponding period. In the first half of the nineties, nevertheless, the progression of this price ratio had the expected result of containing imports. From then on the link between these two series is less clear (except during the crisis). Clearly, the role of domestic demand in determining the size of imports has been more important.

$$\Delta ln(M) = 0.09\Delta ln(M_{-1}) + 2.8\Delta ln(Y) + 0.08\Delta ln\left(\frac{p_y}{p_m}\right) - 0.006vc_{-1}^{M} \quad (5.75)$$

The growth rate of imports, on the other hand, is determined sensibly by changes in demand, as is clearly seen in the coefficient of $\Delta ln(Y)$ in equation 5.75. This means that a 1% rise in the growth rate of French income leads to an increase of 2.8% of the percent change in imports. By the same token, a 1% fall in the growth rate of income (as is happens today more often since the crisis hit) makes the percent change in imports fall by 2.8%, thus improving the trade balance. The estimated speed of adjustment 0.006 implies that the short-run evolution (the *ECM* estimation) approaches its long-term evolution at a rate of 2.4% annually.

5.7.4 Import price

The log of the price of imports is a function of the general price level and the price of imports of competing economies, both in logarithms. 0.57 is the elasticity of the import price with respect to a change in the general price level, and 0.39 is the elasticity of the import price with respect to the import price of major trading partners.

$$ln(p_m) = 0.57ln(p_y) + 0.39ln\left(\frac{p_{m*}}{x_r}\right) \quad (5.76)$$

Figure 5.33 shows the series used in the estimation of the long-term equation described above. The price of imports followed the same upward trend at the beginning of the eighties that we saw for the price of exports. Once this steep increase ceased (in 1985) the import price index settled at around 116 (where 2005 is the reference period). The series shown in the figure with a scale on the right is a weighted average of the import prices of France's main partners. As it can be observed, this index went from 110 in 1980 to 85 in 1990, then began rising, until it reached a value of 104 in 2002. It is during this period (1990-2002) that the volume of imports reached a quarterly average growth rate of 1.2% (as compared to 0.6% afterwards). This is clear sign of the deterioration of the terms of trade of France vis-à-vis its partners.

The shaded area in the Figure indicates that we included a structural change dummy for the corresponding period which, in comparison to the export price *VECM*, was necessary to account for the sudden rise in the corresponding variable (by 3.1% quarterly, i.e. the size of the corresponding coefficient in the p_m vector).

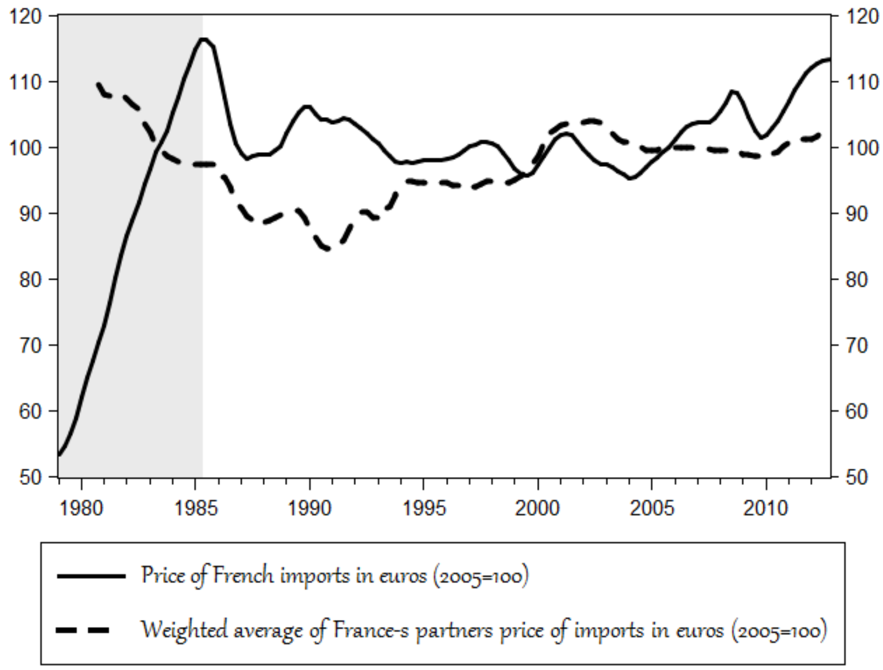

Figure 5.33 – Import price function components; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

$$\Delta ln(p_m) = 0.012 + 0.31\Delta ln(p_{m-1}) + 0.85\Delta ln(p_{y-1}) + 0.15\Delta ln\left(\frac{p_{m*-1}}{x_{r-1}}\right) - 0.06vc_{-1}^{pm} \quad (5.77)$$

The short-term equation 5.77 confirms that the evolution of import prices is determined by itself (with a growth rate elasticity of 0.31), by the inflation rate lagged one period (by 0.85), and by the weighted average of competitors' import prices (by 0.15). The speed of adjustment is relatively high (0.06), and what this means is that the short- to long-term adjustment takes place at a 24% per year.

5.7.5 Price of deposits held by the rest of the world

The price of deposits held by the rest of the world is shown in Figure 5.34, along with the corresponding interest rate received by the rest of the world. It is important to highlight that the latter was constructed as the ratio of interest payments received by the foreign sector from France, and the sum of the stocks of interest-bearing financial instruments held (lagged one period). As a consequence of this, the interest rate (corrected for changes in the exchange rate) shown here does not correspond to deposits only.

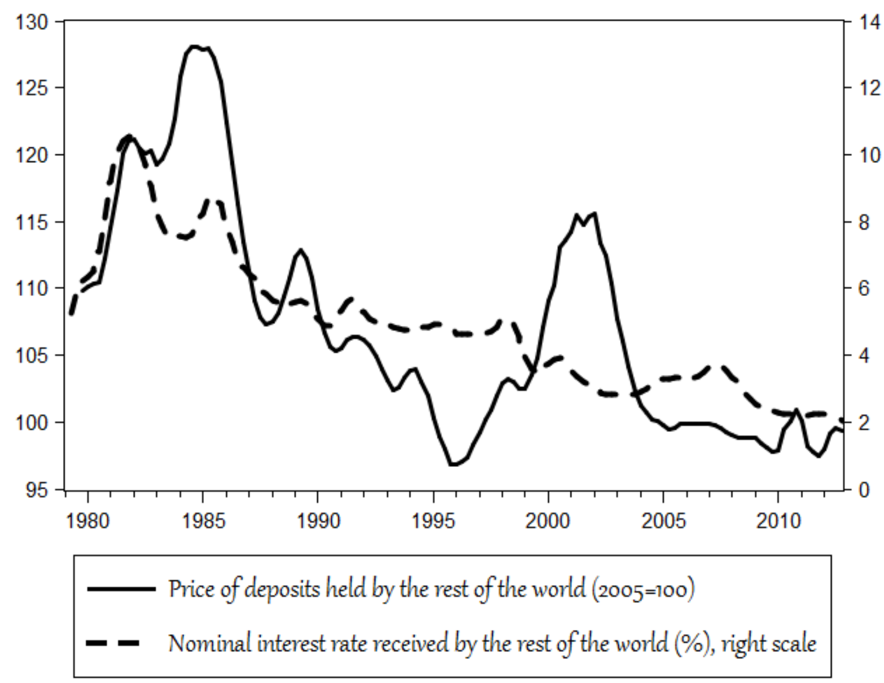

Figure 5.34 – Price of deposits held by the rest of the world and interest rate received by this sector; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

Despite this drawback, we decided to keep a single interest rate received (and another one paid) by the rest of the world in order to keep the system as simple as possible (or at least not way too complicated). Now, as can be seen from the graph, the long-term evolution of both price and interest rate have followed the same long-term trend; up in the first half of the eighties, down thereafter. Nonetheless, the negative association between the two is more evident from the second half of the eighties on.

$$\Delta p^r_{d_a} = 0.86\Delta p^r_{d_a-1} - 0.14\Delta(i^{r-1} + \Delta(x_{r*-1})) + 1.85\Delta infl_{-1} - 0.9\Delta infl_{-3} \tag{5.78}$$

This negative relationship is more evident in short-term equation 5.78, which shows that following (say) a rise in the interest rate, or a fall in the inflation rate, there will be a corresponding increase in the price of deposits held by the rest of the world, which in turn has a positive and strong self-feedback effect.

5.7.6 Deposits held by the rest of the world in foreign currency

Figure 5.35 shows the share of deposits held by the rest of the world out of the total (both in stocks), together with the interest rate differential. The evolution of these two series is at first irregular, notably negative for the first half of the eighties, thereafter positive to varying degrees. From 2003 to the end of the sample period, the variable of interest in this part (DAR_{fc}) had an important upward structural change that is not taken into account, given that we only estimated a short term equation, shown below.

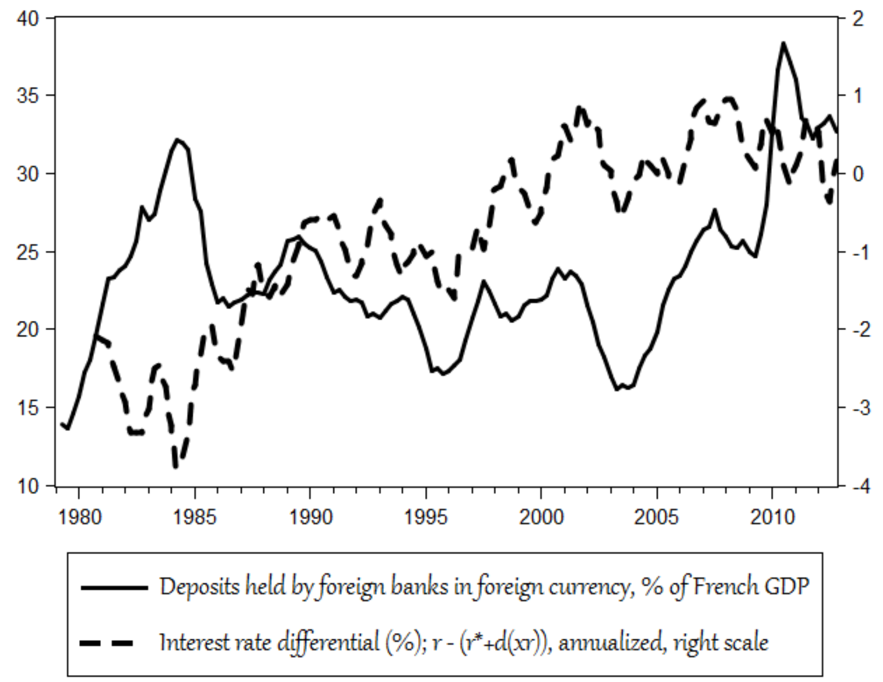

Figure 5.35 – Deposits held by the rest of the world in foreign currency and interest rate differential; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

$$DAR_{fc} = \frac{-D^A_{R_e} p^r_{d_a} + p^r_{d_a} D^A_R}{p^r_{d_a} D^A_R}$$

$$\Delta DAR_{fc} = 0.48\Delta DAR_{fc-1} + 0.36\Delta DAR_{fc-2} - 0.18\Delta DAR_{fc-3} + 0.52\Delta[r^r_{-2} - (i^r_{-2} + \Delta x_{r*-2})] \quad (5.79)$$

Equation 5.79 shows the short-term specification of the demand for deposits in foreign currency of the rest of the world. As expected, this series depend positively on the interest rate differential.

5.7.7 Price of deposit liabilities of the rest of the world

As we mentioned before, deposit liabilities of the rest of the world include the reserves and *SDR*s of *Banque de France*. The evolution of this series (shown in Figure 5.36) do not differ so much from that of deposits held by this institutional sector. The same applies to the interest rate. However, what does change is the scale, and this fact alone justifies the presence of this estimation in the system.

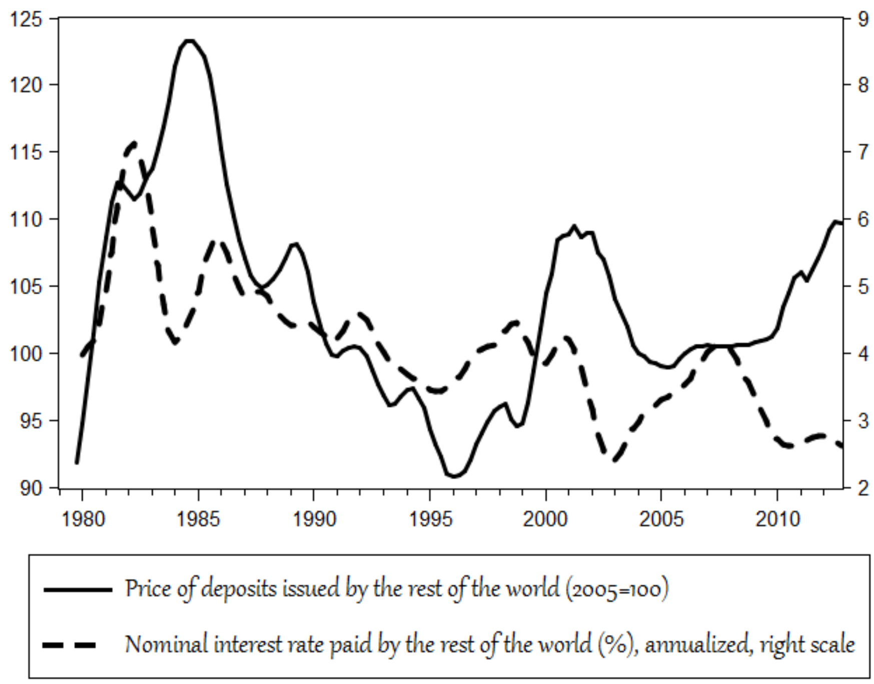

Figure 5.36 – Price of deposit liabilities of the rest of the world and interest rate paid by this sector; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

The long term specification (eq. 5.80) is a function that links the price of deposit liabilities of the rest of the world to the interest and the inflation rates. Clearly, following a rise in the interest rate paid by this sector to French banks, the demand for French currency will fall. The opposite applies when there is a rise in the inflation rate.

$$p^r_{d_l} = -89.9r^r + 412.5infl \tag{5.80}$$

The short-term specification (eq. 5.81) confirms that the negative association between the interest rate and the price of deposit liabilities is negative, but not so for the inflation rate.

$$\Delta p^r_{d_l} = 1.27\Delta p^r_{d_l-1} - 0.43\Delta p^r_{d_l-2} - 1.87\Delta r^r_{-1} - 0.0003vc^{pdlr}_{-1} \tag{5.81}$$

5.7.8 Securities held by foreign financial firms in foreign currency

Foreign financial firms hold securities denominated in foreign currency, and the proportion of these out of the total securities in their vaults is clearly positively associated with the interest rate differential. Both series are shown in Figure 5.37.

$$BAR_{fc} = \left(\frac{-B^A_{R_e} p^r_{b_a} + p^r_{b_a} B^A_R}{p^r_{b_a} B^A_R} \right)$$

$$\Delta BAR_{fc} = 0.96\Delta BAR_{fc-1} - 0.05\Delta BAR_{fc-3} + 0.15\Delta[r^r_{-1} - (i^r_{-1} + \Delta x_{r*-1})] - 0.03\Delta[r^r_{-3} - (i^r_{-3} + \Delta x_{r*-3})] \tag{5.82}$$

The short-term specification (eq. 5.82) confirms the direct association between these two series.

5.7.9 Price of loans made by the rest of the world to France

The price of loans made by the rest of the world to France (solid line in Figure 5.38) has also gone through several stages. Notably, this implicit index went from 74 to 98 from 1980 to 1985. It then fell for the next two years, but went back up from 1987 to 1993, passing from 92 to 120.

In contrast, the interest rate received by the rest of the world has persistently fallen since the mid-eighties, going from annual levels higher than 7% before 1986, gradually

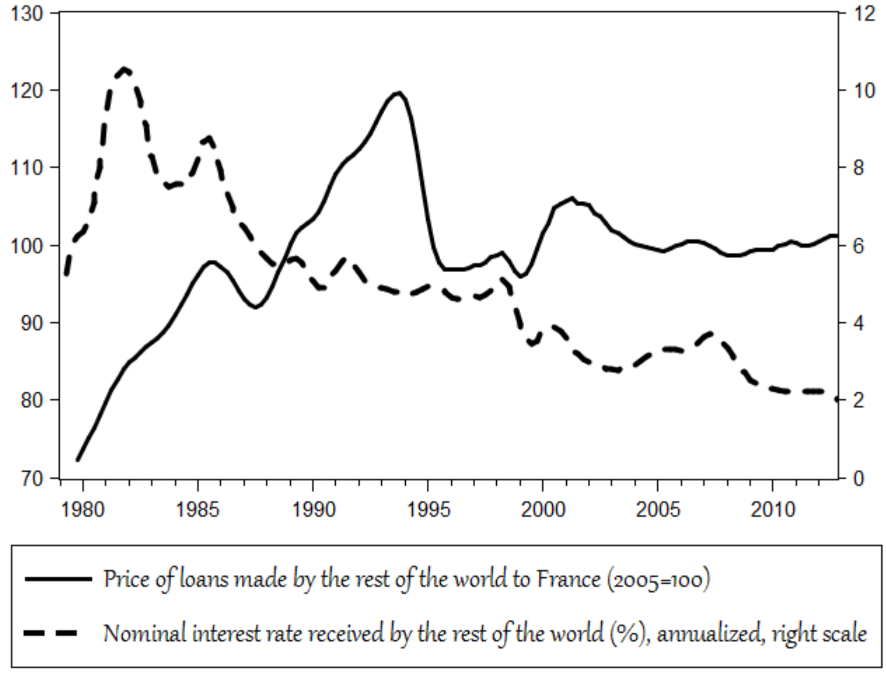

Figure 5.37 – Securities held by rest of the world (% of total) and interest rate differential; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

falling to 5% and stabilizing at around that level throughout the nineties, and further falling in the subsequent decade to levels closer to 2%.

The long-term specification (eq. 5.83) confirms that there is an inverse association between the price of loans contracted by French residents from abroad, and the corresponding interest rate. We also see that the inflation rate is positively related to the former, and that, starting from a level of 2.9[44] and falling at a speed of 0.006 (the value of the long term trend).

$$p^r_{l_a} = 2.9 - 68.5(i^r + \Delta x_r) + 14.5infl - 0.006t \tag{5.83}$$

Equation 5.84 confirms the results found above but for the short-term.

$$\Delta p^r_{l_a} = 1.13\Delta p^r_{l_a-1} - 0.32\Delta p^r_{l_a-3} - 0.34\Delta(i^r_{-1} + \Delta x_{r*-1}) + 0.31infl_{-1} - 0.008vc^{plar}_{-1} \tag{5.84}$$

[44]We remind the reader that the equations including price indexes were set at 1 in 2005, whereas we show them in the graphs base 100 in the same year for presentation purposes. This is important to note here because the constant term in the equation is closer to 1 than to 100.

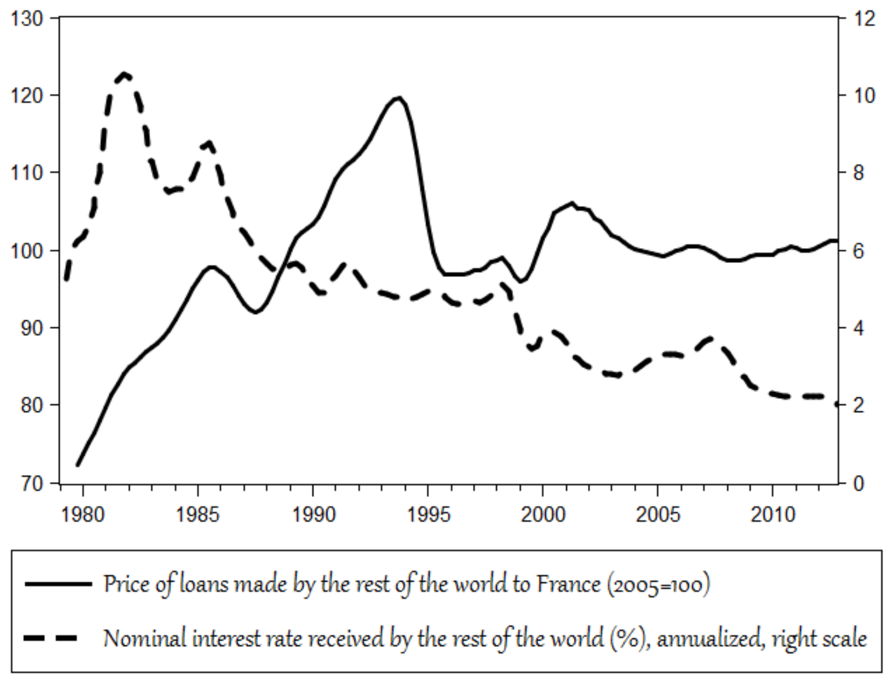

Figure 5.38 – Price of loans made by the rest of the world to France and interest rate received by this sector; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

5.7.10 Price of loans contracted by the rest of the world with respect to France

The last estimated equation presented is that of loans contracted by the rest of the world (the sector's liabilities) with the economy under study. Figure 5.39 shows the corresponding series, along with the interest rate paid by the foreign sector. As in the case of deposits, the two series follow the same long-term trend (rising until 1985, then falling for the next decade, increasing and decreasing again around the internet boom).

What is also common to the previously mentioned deposit price figures is that, despite this common long-term trend, price and interest rate have a negative association.

$$p^r_{l_l} = 3.4 - 148.1 r^r + 32.5 infl - 0.006t \tag{5.85}$$

$$\Delta p^r_{l_l} = 0.78 \Delta p^r_{l_l - 1} - 3.9 \Delta r^r + 1.02 \Delta infl - 0.0004 vc^{pllr}_{-1} \tag{5.86}$$

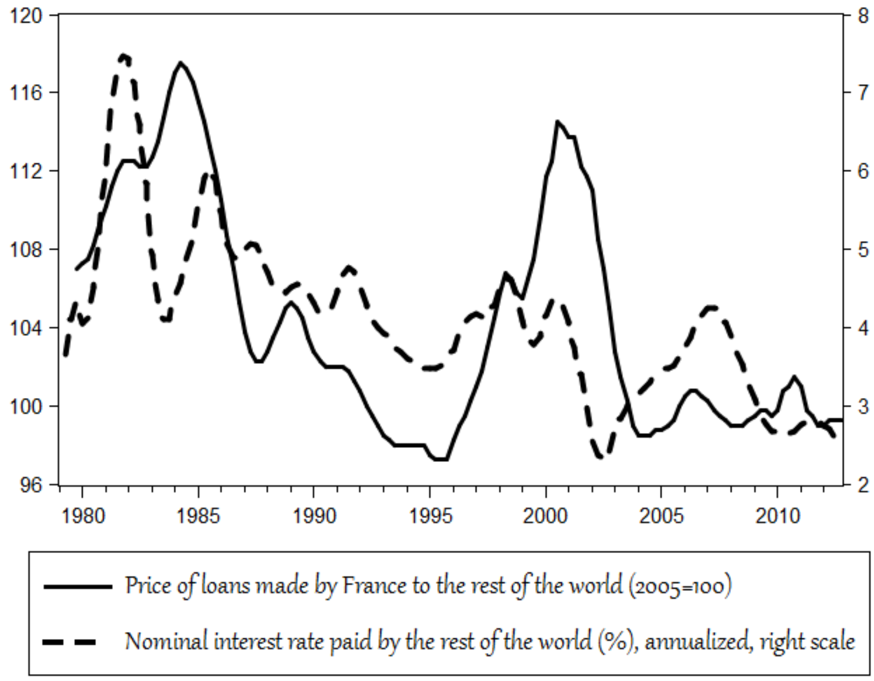

Figure 5.39 – Price of loans made by France to the rest of the world and interest rate paid by this sector; 1979-2012. Source: author's calculations based on data by *INSEE* and *Banque de France*.

Equations 5.85 and 5.86 confirm that the interest rate is negatively associated with the price of loans contracted by the rest of the world from France, whereas the inflation rate is positively linked to the latter.

Chapter 6

Model simulations, results and final thoughts

To discuss accumulation we must look through the eyes of the man of deeds, taking decisions about the future, while to account for what has been accumulated we must look back over the accidents of past history.
Robinson 1953-1954, p. 100.

6.1 Introduction

We begin this chapter with the wise words of a major figure in the field of economics, Joan Robinson. The citation above comes from a key article that is part of the so-called Cambridge capital controversies entitled "The Production Function and the Theory of Capital". Interestingly, this article, which quite obviously sets forth several criticisms to neoclassical producer theory, is contested by Robert Solow[1]. We are, however, interested in the meaningfulness of Robinson's quotation, and so we deal with it rather than on the controversies[2].

In the previous pages we have attempted to describe the main issues concerning the causes and consequences of economic policy decisions in France since the early seventies (chapter 1). We also set forth several theoretical arguments that justify them (chapter 2). We then showed the results of a simulation exercise that contained many aspects that

[1]"We have reason to be grateful for her annoyance, for she seems to have written her article the way an oyster pearl – out of sheer irritation" (in the introduction to his critique). It is perhaps relevant to note that this lecturing tone is quite frequent throughout his reply.

[2]For the reader interested in such passionating (and forgotten) subject, see Cohen and Harcourt 2003.

could shed light on a financialized growth regime (chapter 3). We then extended the same system of equations of the former in order to make it fit into an empirical model (chapter 4). Finally, we showed the results of the estimated parameters, together with several series (clearly not all) used in the model (chapter 5).

Accumulation through the eyes of the man of deeds

The aim of this last chapter is to take stock of the previous discussions and findings and show the major results that stem from our model. Before getting there, however, let us take stock of the quotation above. As Robinson points out, accumulation is a continuous decision made by *men of deeds* concerning the future. At least in the case of the French economy (so far the only country for which we have evidence), this decision has been made on the basis of the cost of capital. By capital we mean here financial liabilities which, in the case of French non-financial firms, can be separated into two broad groups: debt and equity. The former comes from banks and is thus considered external to the property of the firms' owners. The latter (also called own funds) are issued by the firm in order to fulfill the same need, except that by selling these titles, the ownership of the firm may be at stake.

French entrepreneurs and captains of industry constantly face the challenge of choosing the 'right' (or *optimal* in the neoclassical jargon) combination of these two liabilities, in order to maintain healthy balance sheets. However, we have seen that neither excessive indebtedness nor excessive own funds have proved to be performing. Of course, there are as many definitions of *performance* as the number of vested class interests. For instance, back in the sixties, when French firms' investment was being financed mainly by means of debt, economic policy was such that inflation was tolerated for the sake of maintaining the maximum level of employment. Both firms and workers benefited from this, but this was not the case of bankers, who were being "euthanized" by means of low (and even negative) real interest rates (their reward for their unproductive though necessary activity). With the paradigm shift that occurred in the first half of the eighties, which contrasts highly with the previous so-called "Keynesian" one, prices were tamed and bankers had again the upper-hand in the economy, but naturally at the expense of their main debtors (households and foreign governments).

When the primary aim of central banks became minimum inflation, rather than maximum employment as was the case up to the late seventies, non-financial firms sought for the cheapest liability, and this was no longer debt but equity. As this liability shift occurred several destabilizing and unsustainable processes were unchained, which ultimately led to the current crisis (see chapter 1 for the full discussion). Unfortunately, the ultimate goal of firms (whether or not it is to maximize their profits) is rarely that of providing its workers with the best labor market conditions. On the contrary, it seems as though today firms aim at the opposite extreme while at the same time showing workers "who is the boss" in wage negotiations. Now, the economic authorities act in a way that they are encouraging this divide and win strategy, instead of correcting the internal demand deficiency.

Perhaps the main and most basic insight current policymakers (in our opinion, the men who have the power to control other men of deeds) are missing is that capitalism is a supply and demand story. Thus, when economic policy aims at reducing costs, this creates an incentive for firms to invest, though this also provokes a reduction of demand. Clearly, if demand is sluggish in the home country and abroad, no matter how low costs are, investment will hardly bear any fruition.

The accidents of past history

In the first chapter we insisted on the fact that there are no such things as mere "accidents" in economic policymaking. The results of the latter are, however, just that. We provided an explanation of how the collapse of the Bretton Woods system brought about a series of bad consequences[3] that were in turn dealt with in not-so-wise ways.

The immediate consequence of the collapse of the aforementioned *limping gold standard* set after WWII was the oil shocks[4], which in turn aggravated the already existing inflation problem. Again contrary to widespread perception, we believe that the *main* problem was *not* the welfare state as such[5]. The major problem to be solved was rather the oil shocks, in turn caused by the decision to close the gold window.

Unfortunately, these two major events (the collapse of the Bretton Woods system and the oil shocks created by it) unchained a series of "accidents" which are now past history, but which we still live with. As was stressed over and over throughout the present work, the decision to rein in the inflation rate (and, with it, them infamous labor markets) was like punishing workers for something they had only partly done, but with a strong emphasis on the blaming of unions and, up to that point, accomplice paternalistic

[3]By this we do not mean that "everything" that has happened since then has been bad. We simply mean that other ways (for instance, the Keynes plan) could have worked better. To prove so, however, would be a much more ambitious project than the present one.

[4]These were *not*, as some may think, the product of diplomatic/religious tensions in the middle-east. See the part "The oil shocks and the paradigm shift" in chapter 1.

[5]See footnote 20 in the first chapter, and the discussion about this issue.

governments.

A major accident in the course of (recent) past history is the fact that Keynesianism[6] fell from grace as a preferred paradigm. 'Whispers and giggles' (in Krugman talk) about Keynesian ideas became the norm thanks to fierce anti-Keynesians, most of which adhered to either the Austrian school (with Hayek at the head) or the monetarist front (Friedman, Lucas and their followers). The effects of such bashing are being seriously being questioned as we write, but given that the monetarist counter-attack was so effective in its witch-hunting and similar techniques (thanks to the aid provided by heads of state such as former actor Ronald Reagan and the Iron Maiden Margaret Thatcher), this is taking longer than it took the Roosevelt administration to implement a New Deal.

Indeed, governments around the world reacted strongly to the crisis with strong countercyclical fiscal policies when "it" finally happened again, and even the *IMF* campaigned for these fiscal stimulus packages to take place. Nonetheless, neither such packages were sufficiently large to bolster the economy, nor was this the only solution at the disposal of economic authorities. Even worse, a few years after the crisis, when most economies were still struggling to get back on track (which by the way was by then already shaky) austerians stroked back and even harder than before the crisis.

6.2 Simulation: aims and issues

6.2.1 Simulation aims

The model we built has two aims. The first and most obvious is to show how and why the economic policies implemented and/or proposed by the orthodoxy are doomed to fail. Several theoretical works have already proven the logical inconsistency of these. Nevertheless, to our knowledge, few empirical works in the spirit of the Cowles Commission and/or from the stock-flow literature have been dedicated to do so. Our work aims at doing this from a different perspective than the existing models for France[7].

We do not claim originality, neither do we claim to have found the 'Holy Grail of

[6]Even if Keynesianism as so-called Keynesians had it is not the same thing as the economics of Keynes (as Axel Leijonhufvud reminded us back in the sixties), we refer here to the basic idea that economic policy *should* aim at stabilizing the economy, with a strong emphasis on the demand side.

[7]As we mentioned several times in the previous chapters, two major models are used by the French Ministry of Finance: *MÉSANGE* and *OPALE*. Both of these models were built following a somehow standard New-Keynesian approach, and so far have been overly optimistic concerning the alleged positive effects of pursuing budget consolidation and inflation targeting. Our model challenges their theoretical framework and, as a consequence, their results.

Macroeconomics' (as Richard Koo does). We humbly recognize that models are, and always will be, imperfect representations of the reality they attempt to portray. Ours is no exception. We also recognize that the model can (and will) be improved in the not-so-distant future. Furthermore, in order to avoid transparency issues à la Reinhart and Rogoff concerning the modeling exercise, we will put our model at the disposal of other users as soon as time allows[8].

The second aim of our model is to provide support to the already existing Cowles Commission structural macro-econometric modeling technique. To this, we want to add a touch of the "pitfalls"/stock-flow literature by creating a link between the real and financial sectors of the economy, while at the same time respecting accounting issues for (at least) three levels: stocks, flows and revaluations (not shown for the latter). Not that this is the very first model combining all of these, but what we are confident about is that, in heterodox circles at least, this way of modeling is rather rare. Again, an important exception is the model made for the U.S. economy by the Levy Institute of Bard College.

6.2.2 Simulation issues

Accounting equilibrium

As far as the issues are concerned, these are several. One of these is the gap between estimation and simulation *per se*. Chapter 5 was exclusively dedicated to showing the series and the results of the estimations, but in doing so we occasionally mentioned a few details about the inclusion of the equations in the simulations. However, we did not delve too deep into those details.

An important issue was thus the compatibility between the estimates and the model convergence. This is quite common in empirical work of the type we carry out in the present work (see, for instance, chapter 7 in Brillet 2010). Convergence may, or not, be achieved depending on the *quality* of the estimates, but also depending on whether the simulated series are compatible with a feasible steady-state, which in turn depend on the reference baseline of other simulated (and, in some cases, estimated) series.

This is one of the main reasons why we were unable to estimate all equations in both *VECM* and *ECM* form. Whenever we were unable to either obtain the "correct" signs, or a statistically well-specified equation, or even a negative coefficient for 'speeds of adjustment', we preferred to keep a short-term specification that filled in the gap in a

[8]In the meantime, we contempt ourselves with applying the usual "available from the authors upon request" disclaimer.

somehow satisfactory way. That is, as long as the signs are respected, we retained the corresponding estimates.

Lack of convergence can be also due to misspecifications in the structure of the model. One way in which we checked for this property is through graphical inspection of the main identities (in stock and flow forms), either dividing the left by the right hand side (stocks) of the corresponding identities, or by dividing the current account by the capital account preceded by a negative sign. Figure 6.1 shows that equilibrium of the baseline series (that is, of the reference path of the series once the model was put to work) is guaranteed at these three levels for most of the periods under analysis, with (in our opinion) minor gaps.

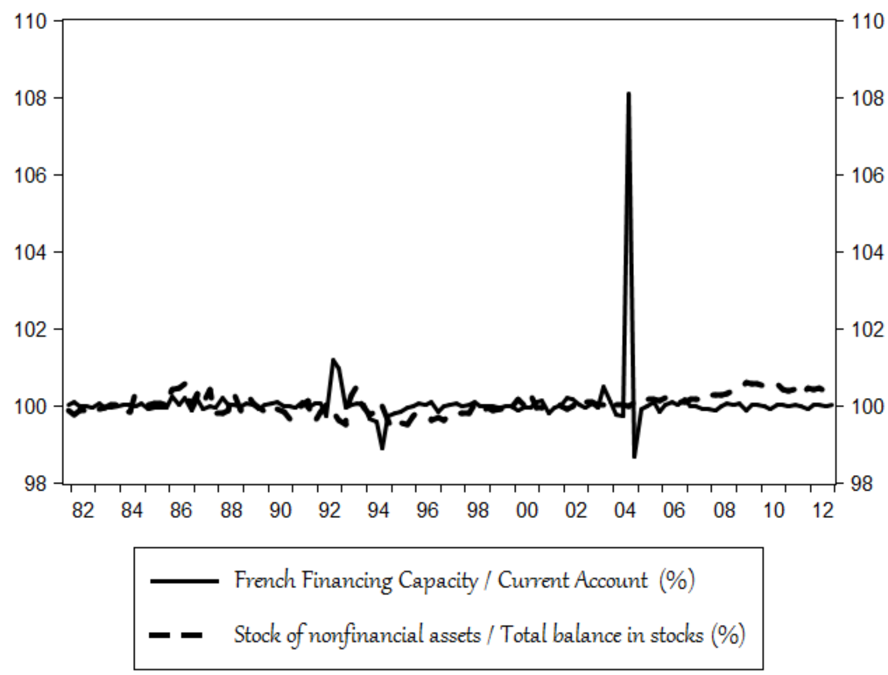

Figure 6.1 – Unwritten equation; 1979-2012. Source: author's calculations based on the model.

As it was briefly mentioned in the previous paragraph, the current account equilibrium (solid line) in the figure was calculated as the ratio of two series. These are equations 4.154 and 4.153 so that the corresponding flow equilibrium line is

$$Flow_{eq} = \frac{FC_H + FC_F + FC_G + FC_B}{p_x X + W_R + T_{2_R} + INT_R^p + DIV_R^p + T_{3_R} - p_m M - INT_R^r - DIV_R^r - SC_R - SB_R}$$

where the resulting ratio is then multiplied by 100. This ratio is tantamount to dividing the French financing capacity (or the rest of the worlds' current account with a negative sign, i.e. the unwritten equation) and the French current account. Since these two series must be equal, the resulting ratio must be always 100 for flow equilibrium to be respected. This is the case in most periods, except in 2004q4, when there is a departure of the numerator and the denominator by 8.1%. Apart from this minor gap, the resulting series are kept very close to the 100 target.

The second series in the figure (dashed line) is calculated as the ratio of the outstanding stock of non-financial capital and the sum of all the sectors' net wealth (multiplied by 100):

$$Stock_{eq} = \frac{p_k^h K_H + p_k^f K_F + p_k^g K_G}{NW_H + NW_F + NW_G + NW_B + NW_R}$$

Net wealth is defined as the difference between the holdings of the corresponding sector in their balance sheets and their liabilities, as it was shown in Tables 4.2, 4.6, 4.9, 4.12 and 4.15. The corresponding ratio is closer to the 100 target, except for instance in 2009q4, when the numerator exceeded the denominator by 0.6%[9].

Note that we called this section "Accounting equilibrium" and not simply "Equilibrium". We did so in order to avoid confusion between theoretical economic equilibrium, in the neoclassical sense (Ramsey-type, for instance), and books equilibrium, in the broad sense. Any accounting-tight model must fulfill the latter (so is the case here), but the former is not a prerequisite for model validation.

Baseline solutions and simulations' fit

Having described the core elements of the model in the previous chapters, let us now say a word about the baseline, defined as the reference path of the endogenous series of

[9]We carried out the same procedure for revaluation terms, but are not shown here. All elements were obtained as in tables 4.4, 4.7, 4.10, 4.13 and 4.16. Notably, the terms included in the denominator are the lines at the bottom of the corresponding fifth columns in the tables mentioned. The calculated ratio from the baseline also yields satisfactory results, except for the periods 1991q3, 1995q1, 1995q4, 1997q2, 1997q4 (the major imbalance; 113.4%), and after 2008. Despite these outlying observations, we believe the fitness of the model is adequate at the three levels we are interested in.

the model. Identities were included in the software using the code '@identity', which is used to designate non-random series in the model. In contrast, variables that were estimated were included in the program using the code 'merge'. Naturally, all series accounting were verified before entering the model. In fact, the treatment of the data in the corresponding file (rymz_data.prg) are such that they are also guaranteed in the simulation program, thus ensuring accounting consistency before and after treatment.

The baseline solution was calculated twice. The first calculation stems directly from the model solution, whereas the second is a recalibrated version of the former that in turn overlaps the observed series. The purpose of doing this is the following. Because the simulated series do not fit *perfectly* the observed data, so that if we want to analyze the behavior of an endogenous series following a shock, while comparing it to the baseline, the simulated data will not do justice to the observed series. It must be noted that what we are mainly interested in is in showing the results of the model as compared to a baseline. Therefore, the comparative results do not change whether we use the original baseline or its recalibration. What does change, however, is the presentation of the observed series as compared to the after-shock ones, which are consistent once this recalibration is done.

After considering lags and initial conditions, our simulations run from 1981q4 to 2012q4. Figure 6.2 shows GDP (in volume) and the corresponding simulated series for the period under study. The fit is certainly not perfect, but is quite good, taking into consideration that the *data generating process* (or *DGP*) for output is not even estimated, but is instead the result of the sum of its components, in the product of other endogenous series in the model, from the demand side.

The fit of the simulated GDP series is much better at the beginning of the sample period than at the end of it. This is a natural consequence of the fact that the evolution of the endogenous series in the model will in turn depend on the evolution of other (exogenous and endogenous) variables.

Of course, since the number of equations included in the model is large, so are the number of comparisons between observed and simulated series possible. Instead of doing this, which would be both time consuming and useless, we focus here on a few key variables that provide a hint of the 'goodness of fit' of our simulations. Figure 6.3 shows the evolution of the accumulation rate of firms.

Two comments about this graph are in order. First, in contrast to the GDP series shown above, the accumulation rate of firms was estimated (see equation 4.44 and part 5.3.1). The goodness of fit of the estimation as such is different from the goodness of fit from the simulation. This is so because the code 'addassign(v) @stochastic' in EViews

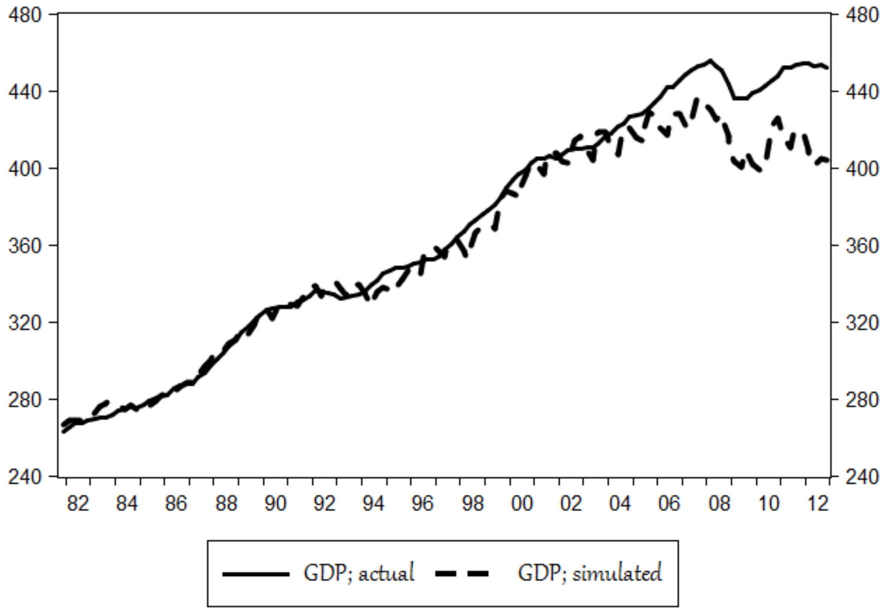

Figure 6.2 – GDP (billions), actual vs simulated; 1981-2012. Source: *INSEE* and author's calculations based on the model.

"assigns a variable shift to all equations in the model"[10]. After introducing this code, we initialize the corresponding 'add factors' and set the baseline/actual add factors through the command 'addinit(v=b) @stochastic'. Finally, the options set for the model to solve are '$d = d, o = g, m = 10000$', where "$d = d$" stands for the dynamic solution option, $o = g$ stands for our preferred solving method (g, Gauss-Seidel), and $m = 10000$ is the number of iterations for solution[11] (set to 10,000).

This means that, before the model is even solved, the software computes the difference between the estimated and the observed accumulation rate and this difference is then added to the corresponding series so that the observed variable (not the estimated one) enters the simulation. However, since there are rather important periods for which the adjustment between simulated and observed is more important than others, this deserves an explanation. This is due to several reasons: (1) the specification that enters the system is the equation as it was estimated, with its stochastic and deterministic determinants (i.e.

[10] see EViews 8 Object Reference guide, p. 376, available with the software or in the following link `https://remote.bus.brocku.ca/files/Published_Resources/EViews_8/EViews%208%20Object%20Ref.pdf`

[11] See p. 401 of the EViews 8 Object reference manual.

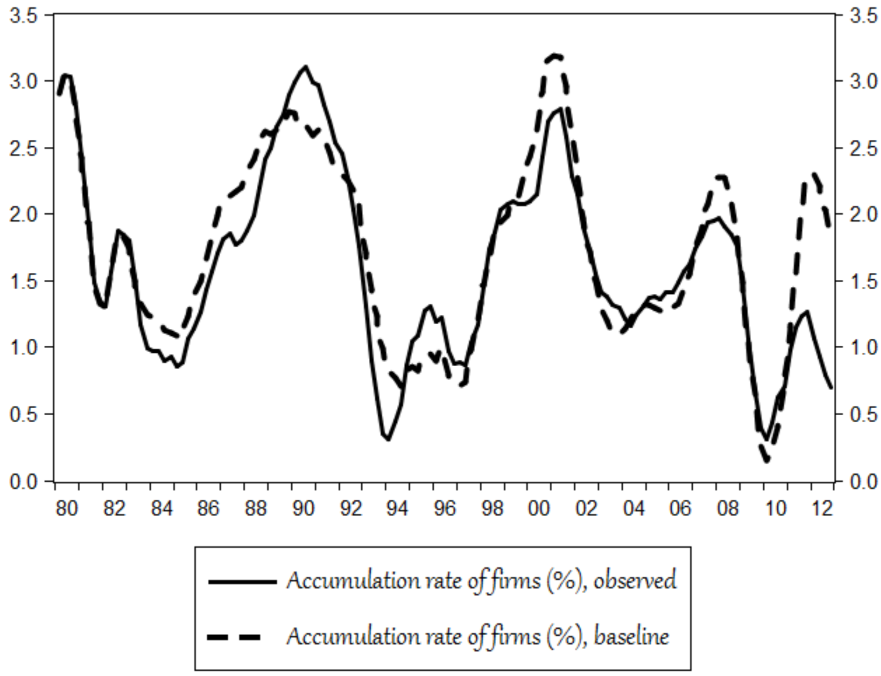

Figure 6.3 – Firms' accumulation rate, actual vs simulated; 1980-2012. Source: *INSEE* and author's calculations based on the model.

dummy variables) and with its corresponding parameters estimated[12], as a consequence (2) some of these elements are endogenous to the system, so that the goodness of fit of the accumulation rate depends in turn on the goodness of fit of other endogenous series that determine it, and (3) some variables enter the system in growth rates, others in logs, or in differences, or simply in levels, and if there are systematic differences in these specifications, these are likely to be present in the corresponding series expressed in other forms, as well as on the other series they determine. Clearly, this applies to all variables in the system.

The second comment about the series in Figure 6.3 is that the closeness between the observed and the simulated accumulation rates is due to the relative good performance of the series that make up the corresponding variable. In this case, the capital accumulation rate (*car*) is the result of dividing net investment and the stock of capital, as in the

[12]It is perhaps important to note that these parameters change over time, depending on the sample period. This property has to do with the relative stability of the given coefficients. Of course, if these are subject to structural changes, this will be reflected in the equations. This is indeed something we tried to account for using the dummy variables for breaks and for one-period events.

following formula:

$$car = \frac{p_k^f \Delta K_F - FCC_F}{p_k^f K_{F-1}}$$

Therefore, the series shown depend on the baseline solutions for three variables on the left-hand side of the corresponding equation (p_k^f, ΔK_F and FCC_F), as well as the right-hand side variables (the output gap, the profit rate, financial profitability and the real interest rate).

The exchange rate, the expected exchange rate(s) and the price level

As we mentioned in parts 2.1.3, 4.2.4 and 5.4.6, an interesting feature of our model is that it distinguishes between the actual exchange rate and the expected one. The latter is here obtained as a weighted average of the expected exchange rate of chartists and fundamentalists, with equal weights for both. Figure 6.4 exhibits the observed exchange rate (solid line), the simulated exchange rate (dashed line), along with the two expected exchange rates of chartists (solid line + hollow circles) and fundamentalists (solid line + crosses).

The figure shows that the long-term evolution of all four series follows the same pattern. In the short-term, however, important differences arise, notably between the expected exchange rates. Note that the gap between the observed and the simulated series (solid and dashed lines, respectively) is relatively small. There is, however, a gap between the evolution of the two series which is explained by way the exchange rate enters the model; in differences (see equation 5.47). As a consequence of this, any gap between Δx_r and $\overline{\Delta x_r}$ (the estimated exchange rate) will be carried over to x_r.

This is one of the reasons why it is important to use the impulse-indicator saturation (IIS) technique proposed by Hendry and Mizon 2011 (see the part "Outliers and cointegration" in chapter 5). To continue with the example of the exchange rate, whenever there are important gaps between Δx_r and $\overline{\Delta x_r}$ (that is, when the corresponding residual term is significantly different from zero), this will have important consequences for the evolution of the corresponding series in levels. More specifically if, say, the estimated model does not take into account an important increase at period t that is neither explained by the lags of the same variable, nor by the other determinants (in this case the interest rate differential and the A/L ratio) and we *do not* include an event-specific dummy to account for this difference the result will be that $\Delta x_r > \overline{\Delta x_r}$ only at t, and thus, starting in $t+1$, x_r will permanently exceed $\overline{x_r}$. Of course, the situation can be the inverse.

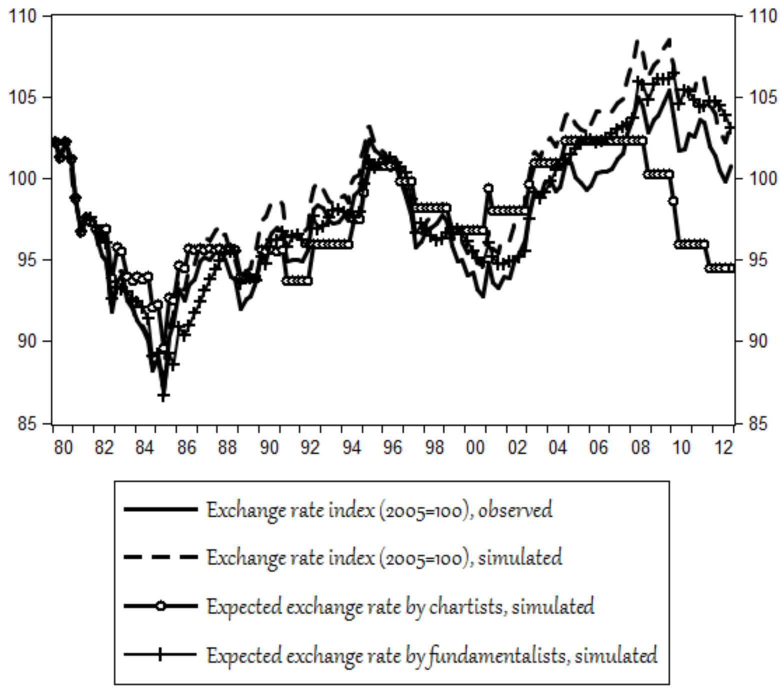

Figure 6.4 – Exchange rates, observed vs simulated; 1980-2012. Source: *INSEE* and author's calculations based on the model.

Before showing an interesting graph that illustrates this point, let us say a few words about the expected exchange rates. As we saw in part 5.4.6 of the previous chapter, fundamentalists base their expectations on the formula[13]

$$\Delta x_r^f = -0.59(x_r - x_r^{f*})$$

whereas chartists do so in a more deterministic way:

$$\Delta x_r^c = -0.51\Delta x_{r-1}^c + 0.38\Delta x_{r-2}^c + 0.77\omega_{-1}$$

This difference in expectations by 'type of speculator' in turn implies that they will end up measuring different rates. This is clear in Figure 6.4 (solid line + hollow circles, and solid line + crosses). Naturally, the exchange rate expected by fundamentalists is closer to the simulated exchange rate (which is in turn also close to the observed series) than that expected by chartists. This is so because they only look at past information and

[13]See chapters 2 and 5 for further details.

are thus blinded by short-term gains.

Now, going back to the technical detail highlighted above, let us take a look at Figure 6.5, which shows two ratios that are related to the discussion on specification and dummies.

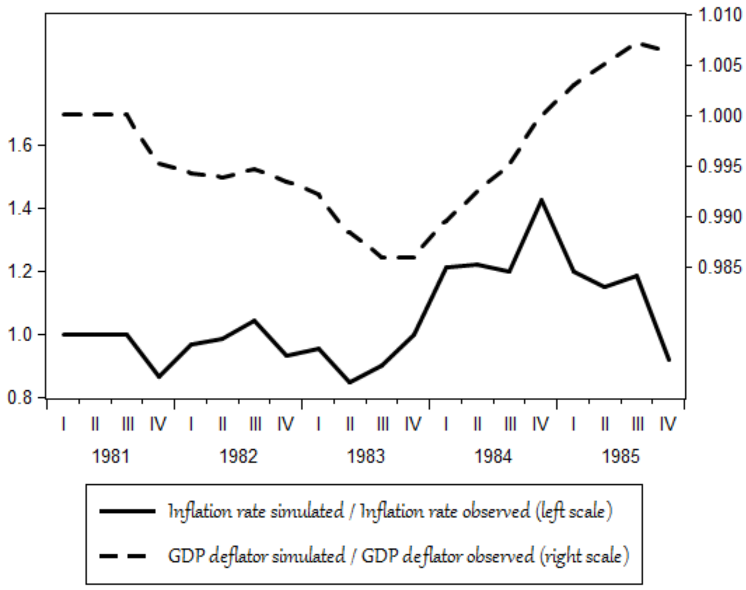

Figure 6.5 – Prices and inflation, observed vs simulated; 1981-1985. Source: *INSEE* and author's calculations based on the model.

The figure shows the ratio of the observed inflation rate with respect to its simulated baseline (solid line), as well as its counterpart but in levels, that is the observed GDP deflator divided by the simulated GDP deflator from 1981 to 1985 (we just need a sample for this example). Indeed, in the absence of errors in the model (an impossible task) the two ratios would equal 1 in every period. However, what we want to highlight with this graph is the fact that the ratio of the series in levels is less volatile than the ratio of the series in growth rates and that the former depend on the latter.

This can be seen right from the start of the simulations. From 1981q3 to 1981q4 the simulated inflation rate was 13% lower than the observed rate. As a consequence, the simulated price level is also at a lower level (though in a much lesser scale than the former). Immediately after, the gap between the observed and simulated inflation rate is reduced and close to being null, whereas the gap for the GDP deflator stabilizes at the same level. This interplay between observed and simulated and between growth rates and series in levels is present in the model for a large number of series. However, important to note is the fact that the gaps in the inflation rate (see part 5.4.4) are much more important than for the price level, but also note that any discrepancy not accounted for by dummy variables in the former may yield an undesired departure of the simulated series from the observed ones in level.

Having discussed the properties of the model in some detail, let us (finally!) show the results of the model.

6.3 Hypothetical shocks on key policy variables and their effects on some fundamentals in the French economy starting in 2015

This section shows the results of the model in different ways. One of these ways is by graphically comparing the original series under a baseline scenario with hypothetical scenarios, starting in 2015, in which we assume certain changes in key policy variables. But before jumping to these let us briefly remind the reader that our database was built back in 2013, so that the last observation available in it for all series is for the fourth quarter of 2012. Therefore, the observations of the endogenous series that span the period 2012-2015 are extrapolated.

The method used to extrapolate (actually the correct term is forecast[14]) these series (as well as the exogenous variables for the period 2013-2019, most of which are unknowable) is the code 'smooth' in EViews. The details of such method are explained in Hyndman et al. 2002. This technique is based on the Holt-Winters equations for smoothing exponential time series and, depending on the options set by the user, it may take into account all (or some) of the three observable components of time series: trend, seasonal component and cycle.

We carried out this procedure in different ways for the series depending on their characteristics. For instance, for variables in levels that contain a strong cyclical and/or seasonal component, we set the program to calculate such components and integrate them in the corresponding forecast. This is, however, not the case for all variables. Some ratios were set as the last observation from that period on[15]. Other series were set with

[14]To be sure, these univariate forecasts are not the ones shown in the graphs below. In fact, the forecasts for the endogenous series in the model are significantly different from these, and stem from the equations estimated (see chapter 5) and/or from the identities shown in the appendix for the specifications.

[15]Note, since the French economy has gone through several important changes, it is natural that some key ratios have increased dramatically over the last decade or so (like ϕ_4, the share of deposits held by

only a trend, again calculated automatically by the software[16].

One time shocks vs permanent shocks

We base our exposition of 'one time shocks' with an example of equation 5.41, which is reproduced here in order to explain the procedure. This is standard to the 'shocked' equations that were estimated and then embedded in the system.

As we saw in part 5.4.3 of the preceding chapter, the right-hand-side of the wage per worker equation is a function of the consumer price index, labor productivity and the unemployment rate:

$$\Delta ln\left(\frac{W_{paid}}{N_{sal}}\right) = 0.41\Delta ln(p_c) + 0.38\Delta ln(p_{c-1}) + 0.16\Delta ln\left(\frac{Y}{N}\right) - 0.0013ln(u) - 0.005vc_{-1}^{wages}$$

So, in order to apply a shock to this equation there are (at least) two ways to do so. The first and most standard one (exemplified in part 3.5 of the third chapter) is by assuming that there is a rise in the constant term on the right hand side of the corresponding equation. The first difficulty in doing this for the wage equation above is that there is no constant term in it. So, why not add one that takes the value of zero all along the period under study, and the value of the shock to be applied in the period chosen for this to take place (in our case 2015q2)?

The answer is that this proved difficult because we embedded the estimated equations (through the command 'merge') in the model. As a consequence, including a term on the right-hand side of the equation which is zero all along the period of estimation (roughly 1979q1-2012q4) that equals zero everywhere would run into consistency problems (i.e. singularity of the variance-covariance matrix $X'X$) when attempting to run the corresponding regression. So, two other alternatives were tried but we retained the one that seems the closest in spirit to the former[17]. We did the same thing but on the left-hand side of the corresponding specification, as is illustrated in the following equation

households out of GDP). So, in order to bound the values of these "share" variables, we proceeded as explained above.

[16] Further details on this issue are available from the authors upon request.

[17] Another alternative that we tried (and did not pursue here) was to include such variable with zeros everywhere except in the period of the shock by adding it to the vc terms in the short-term specifications. Two problems were present with this, one is that the shock may have a indirect damped effect, depending on whether the corresponding cointegration vector is significant, highly significant or barely significant. The other problem is that not all short-term specifications have vectors of cointegration. See chapter 5 for further details on this.

$$\Delta ln\left(\frac{W_{paid}}{N_{sal}}\right) - shock_W$$

This expression shows that the left-hand side of equation 5.41 was actually rewritten in this way so that a positive shock on wage per worker can be observed. So, the logic is that the term $shock_W$ is equal to zero before 2015q2, equal to -0.02 in that period, and zero again afterwards. Note that when the left-hand side variable of a given equation is solved (which EViews does), this turns into a positive shock; the one we were expecting. Of course, the same procedure is carried out for other estimated equations, including the exchange rate (eq. 5.47) and the GDP deflator (eq. 5.43), whose shocks on output are shown above.

In contrast to these one time shocks, we also applied *permanent* shocks to some deterministic equations. By deterministic we mean that we did not estimate the corresponding equation, but instead we treated these as ratios of another related variable. This was the case of government spending, taxes and interest rates. To take the first example that appears in the graphs below, the reader will note that we assumed that the term λ_1 (see eq. 4.83) increases from its baseline value 0.251 in 2015q2 to 0.263 afterwards. Of course, this means that the share of public expenditure out of GDP goes from 25.1% before 2015q2 to 26.3% starting in that quarter and remaining there afterwards.

6.3.1 Output under alternative scenarios, as compared to the baseline

Output after shocks on wages, the exchange rate, government spending and prices

Figure 6.6 shows GDP under four different scenarios, all as ratios of the baseline solution. The results are multiplied by 100 in order to facilitate visual inspection and comparative interpretation among shocks.

In the figure we can see that, following the hypothetical increase in wages per worker, there is an immediate weak rise in GDP (compared to the baseline) that lasts for a year, period after which it falls below the "100 threshold". The immediate effect of an increase in wages is its positive influence on prices (eq. 5.43) and its negative impact on firms' profits. The inflationary effect generates a positive impact on firms' investment, despite the fact that profits have now fallen. Another consequence of this wage rise is that the current account worsens for the same span that the wage rise has a positive impact on output, given the appreciation of the real exchange rate, via also export prices (eqs. 5.71 and 5.73). However, after one year the current account improves by 0.5% of GDP and

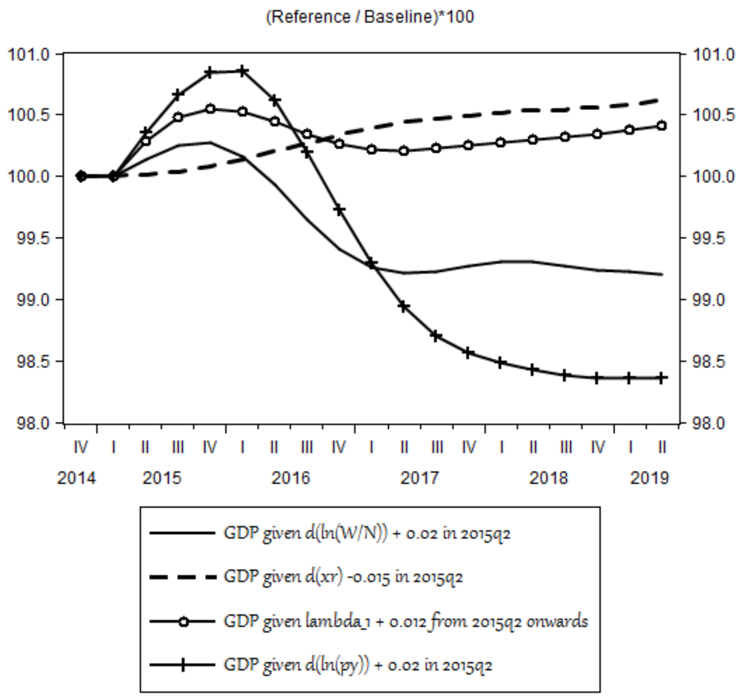

Figure 6.6 – GDP under several scenarios as ratio of baseline (1); 2014-2019. Source: author's calculations based on the model.

remains at that level thereafter. This improvement is in part aided by the fall in output that in turn makes imports fall (eq. 5.75), and output is in its turn at a lower level than the baseline after 2016 because households' debt increases (eq. 5.12).

The dashed line in the figure is the ratio of a hypothetical post-depreciation GDP and its baseline. It is clear that, if the *ECB* were to decide to let the euro depreciate by 1.5% in the second quarter of the current year, French GDP would be higher from then up to 2019, reaching as much as 1.6% more production than if nothing is done. This happens even when the effect of this depreciation on the current account is initially positive (for the first two quarters), but then turns negative. However, the value of the real exchange rate falls constantly and this has a positive effect on prices (eq. 5.43), the profit rate and the accumulation rate (eq. 5.20).

A permanent rise in the parameter λ_1 (the share of government expenditure out of GDP in volume) from 0.251 (its level in 2012 and thereafter in the baseline) to 0.263 from 2015q2 on allows demand to expand, and this has an overall positive effect on output. This can be seen in the solid line + hollow circles in the figure, which is persistently above the 100 threshold, below which there would be a negative effect of this shock, but this is not the case. As expected, this hypothetical shock has a negative effect on the current account that goes hand in hand with the worsening of the public balance. Interestingly, the public debt-to-GDP ratio improves following this permanent shock. Of course, this is so because output growth is more important than public debt growth under this scenario. Firms' profits will improve for the first year, then fall (but not too much). This long-term negative effect and the positive one from government demand have an almost null effect on the accumulation rate, but this is more than offset by the positive effects this has for households' budget[18].

Now, if the economic authorities decided (if only by miracle) to relax their inflationary stance, this would have the desired effect of boosting output for the next year and a half, period after which GDP would fall below the baseline. Under this policy, firms' profits and accumulation would rise strongly for at least three consecutive years. This is so because higher prices make sales receipts increase while at the same time it makes the *ECB* print more bills and coins, for the demand for these will go up. This will also boost housing and equity prices, thus improving the private sector's balance sheets and creating an incentive for it to keep on building up their wealth.

Another natural advantage this hypothetical shock would bring about is its desired negative impact on the value of debt. Indeed, households' debt would fall up to 1% of GDP in the first year and would remain at a lower level than under the baseline. Public debt would be up to 3% (as percentage of GDP) lower than under the baseline in just a year, and would continue to fall (though less) in the next few years. Finally, firms' debt-to-GDP ratio would fall 2% in the next year, and would remain below the baseline for a few more quarters. However, starting 2017 this ratio will increase strongly. This can be explained by a new shift in the capital structure of firms that would favor debt over equity.

Interestingly, and even shockingly for banking sector lobbyists, the first year after the inflationary shock takes place the share of loans granted by banks out of GDP falls by less than 2.7%, but by 2019 it exceeds the baseline by 8.3%. The degradation in the value of debt holdings via prices is more than offset after a year via volume effects, for the demand for credit by firms will improve, and firms, the government and households will be better off, at least for a year. Nonetheless, note that GDP worsens after 2016. We interpret this as a sign that other measures should be taken into consideration in order to offset the negative consequences of inflation. For instance, the worsening of savings.

[18]On what the government spends may also play a role in this case. For instance, if the public sector decides to create jobs (through construction of infrastructure) and/or social benefits, this would have a more important effect than just current expenditure as is the case here.

Of course, these are *naïve shocks*, in the sense that they assume no other change in economic policy would occur other than the ones assumed in the model. Now, so far we have only mentioned that these shocks are either 'positive' or 'negative' before or after a certain date, but we have remained silent about the *size* of the corresponding shocks.

It may seem as though the after-shock evolution of the GDP series is weak compared to the baseline one. However, several things have to be taken into consideration before making generalizations. The very first one is that, what we care about in the model (or any qualitative model for that matter) is the trend of the endogenous series, rather than the absolute numbers. A second argument is that the remedies that could have been implemented, say, before the collapse of the Bretton Woods system, are likely to bear fruition in a very different way (*quantitatively* speaking).

A third argument is that, through strong anti-inflationary policies, the authorities have striven to make the French economy behave as though it were profits that led the demand regime[19]. That is, in the context of globalization and outsourcing (in the case of France because national workers are still 'too demanding') competitiveness bears an important weight in the economy, so that this rise in wages, as long as workers in foreign countries (i.e. South East Asia, Latin America, Africa, and even Central and Southern Europe) keep the same cheap-labor strategy, the rise in wage per worker in France would ultimately impinge upon cost competitiveness.

The same may apply to government expenditure. As we saw in the figure, GDP rises by 0.5% three quarters after the initial increase in the volume of expenditure, and then gradually falls to 0.25% by 2017 and increases again up to 2019 to levels comparable to those of 2016. The mechanism that leads to this weak multiplier effect is complex, and is mainly driven by the government budget, which naturally worsens. This in turn has a negative effect on prices[20] (see below), which dampens the positive effect of the shock. Again, this weak effect of expenditure on output may be explained by the fact that production has become less sensitive to fiscal policy *alone* (though it is still the case). Yet another possibility of the weak multiplier effect is the fact that, according to the model's results, a rise in public expenditure has a null effect on firms' investment.

[19]However, this is not the case. As we saw in Figure 6.6, a rise in wages brings about weak but positive results in the short term. So, even if the authorities have behaved as if this had been the case, this is not so, not even now after close to forty years of "structural reforms".

[20]This may seem paradoxical to inflation fighters, given that they usually associate deficit spending with inflation. This may be due to the fact that they often ignore the mechanisms through which this may happen.

Output after shocks on taxes, housing demand and accumulation

Another set of shocks that was carried out on the system are shown in Figure 6.7, where we can see their effects on output. We present these shocks in the same way as we presented those of the previous subsection, as ratio of their corresponding baseline. We are now interested in the effects of taxes, housing demand and accumulation on GDP.

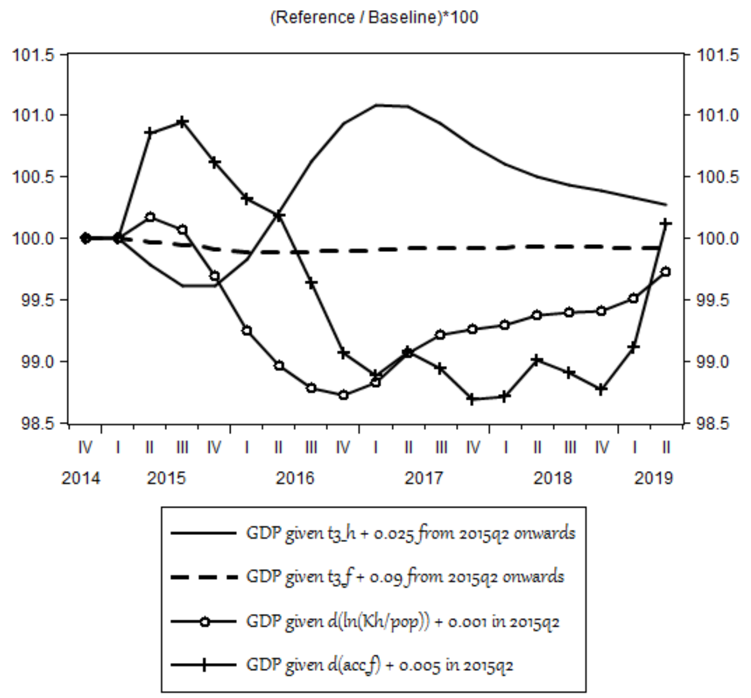

Figure 6.7 – GDP under several scenarios as ratio of baseline (2); 2014-2019. Source: author's calculations based on the model.

The solid line in the figure shows that, when there is a rise on the households' income tax rate from 16.4% to 18.9% in 2015q2 and remains at that level, output compared to its baseline (solid line) falls for the next four quarters, then begins rising. The reason why the effect of higher taxes on households' income turns positive on output after a year is simple, but the mechanics of the model are not. Following the increase in t_{3_h} households' purchasing power deteriorates, and this in turn diminishes their demand for credit more than 1.5% with respect to the baseline and, as a consequence of this, their demand for dwellings falls (eq. 5.6). With the fall in the demand for dwellings there is a corresponding fall in the price of housing (eq. 5.8). This has the same effect on the price of firms' non-financial assets (eq. 5.21), which in turn makes the profit rate increase.

Following this increase, there is a corresponding rise in the accumulation rate (eq. 5.20), which in turn makes investment and output grow.

The effect of taxes on corporate income (dashed line), from 7.1 to 16.1% after 2015q2, is almost null. This is mainly due to the fact that the positive effect of higher revenue for the government is offset by the negative one it creates by discouraging investment (through lower profits).

An increase in the demand for housing (solid line + hollow circle, eq. 5.6) has an initial positive effect on output, but this is eroded in the next three quarters and turns negative. The reason again has to do with the working of the model. Higher demand for housing leads to higher prices of non-financial assets (eq. 5.8), and this has a negative effect on profits, thus on accumulation and on output.

An exogenous increase in accumulation (solid line + crosses) has an important initial positive effect on output, but it turns negative after a year and a half. This is so because the strong increase in the accumulation rate boosts profits (if only for a couple of quarters), whereas at the same time firms' capital structure shifts in favor of equities. With more accumulation (and no other change either in policy or decisions made by firms themselves) prices fall. As a consequence, own funds will be the preferred instrument to finance the new investment[21], and this ultimately bears negative consequences for accumulation itself. Thus, if (say) an industrial policy aiming at boosting investment alone is implemented, this will be successful for only a short period, so that it must be accompanied by other measures that guarantee that firms will not issue more equity than credit.

Output after shocks on housing prices, equity prices and financial accumulation

We are now interested in seeing what happens to output, as compared to the baseline, when housing or equity prices rise, as well as the effect of financial accumulation on the same variable. Figure 6.8 shows the results.

An exogenous increase in the housing price[22] (solid line, eq. 5.8) has a negative effect

[21] From the moment the shock is applied to 2017, own funds as share of GDP represent nearly 9% of GDP more than on the baseline. This strong increase in issuance of equity is unbearable under current circumstances, both because it would impose a heavy weight on the liability side of the balance sheet of firms, and possibly also because the unemployment rate and inequalities are positively related to this macroeconomic (up to now ignored) fundamental (see Figure 2.2 in the second chapter and the corresponding discussion).

[22] Note that the shock on this variable is quite small. The main reason why this is so is because the current levels of the price of dwellings are comparable to those observed before 2008, when the bubble did not burst. The baseline values for this variable are comparable to those of 2012, so that they did not fall as in other countries like the U.S. or Spain. Therefore, housing prices at already high levels are equivalent to a high sensitivity of related variables to it (as is the case of housing demand).

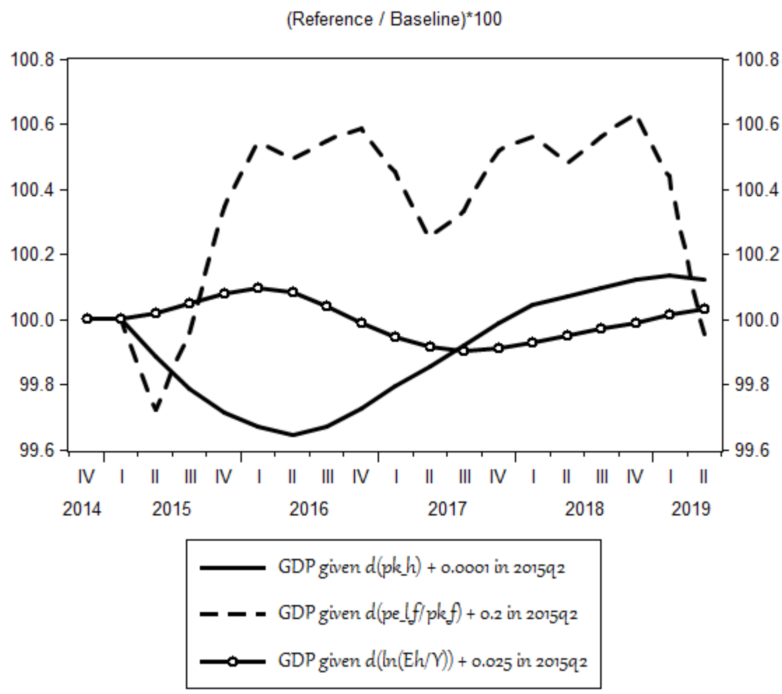

Figure 6.8 – GDP under several scenarios as ratio of baseline (3); 2014-2019. Source: author's calculations based on the model.

on the demand for dwellings, as a consequence on the accumulation of non-financial wealth, which ultimately has a negative impact on output. Nevertheless, it must be noted that this initial increase is slightly reversed at around 2018. The main reason for this is that the general price level also rises, and we saw above that this has positive effects on a number of series in the model.

Another interesting result of our model is that, following an increase of the price q ratio $p^f_{e_l}/p^f_k$ of 2% (i.e. the double of the standard deviation of the series for the sample period) yields an initial negative effect on output (dashed line). But this trend is reversed after two quarters, and the after-shock series remains above the baseline. Two important remarks are in order. The first is that the size of the shock leads the price of equity to rise importantly, and despite this speculative bubble[23] GDP rises only 0.63% above baseline by the end of 2018. Of course, after this short-lived and mediocre increase reaches this point, the French economy quickly enters into a recession. What is important to note here (the second remark) is that the rise in output is not even due to this favorable outcome

[23]In fact, these levels are easily comparable to those observed between 2003 and 2007.

for financial accumulation. On the contrary, because financial profitability of equities issued increases strongly, this has an important negative effect on own funds (eq. 5.25), and a positive one on corporate debt (eq. 5.28). Thus, the capital structure of firms shifts in favor of the latter liability, and this is what makes output grow above baseline, if only slightly and for a relatively short time[24].

Finally, an increase in the volume of equities accumulated by household as proportion of output[25] (solid line + hollow circles) has a meager effect on output. This is so because, on the one hand this has no corresponding effect on the price of equities. On the other hand, after having increased strongly since 1998 and reached a peak in 2010, households' net wealth has become less sensitive (than say, before 1988) to changes in volumes, whereas it has become much more sensitive to changes in prices.

Output after shocks on interest rates and debt

We now ask ourselves, what would be the consequences, according to our assumptions, for French output if nominal interest rates fall or if the volume of debt contracted by the private sector increase. The answer is found in Figure 6.9, where we show the ratios of after-shock output with respect ot the baseline, and we separate interest rates into paid and received. Details on who pays or receives the corresponding interest are explained below.

The solid line in the figure shows that, if the monetary authorities were to decide that the interest rate on private debts and public bonds were to fall (and remain at that level) in the second quarter of 2015q2, the immediate effect this would have on output would be a standard Keynesian recovery that eventually turns negative. But, before getting to why this the case, let us say a few words about who would benefit (or otherwise) from such policy.

This shock was applied simultaneously to the interest rates paid by (1) households (r_l^h), (2) firms (r_l^f), (3) the rest of the world (r^r) and the government (r_b^g). Naturally, at the receiving end there are domestic and foreign banks. So let us say a few words about the budgets of each of these sectors. With the fall in r_l^h, households have access to more credit, so their demand for this liability rises (eq. 5.12). This in turn makes their demand for dwellings increase (eqs. 5.5 and 5.6). This in turn has a positive impact on the housing

[24]The driver of growth is obviously investment, which increases importantly. Nonetheless, the profit rate erodes after a while (by the end of 2017) given the strong weight of interests and dividends.

[25]As we mentioned previously, we were unable to integrate a financial accumulation function for firms. As a consequence, it proved difficult to show the effects of a shock on this variable for firms.

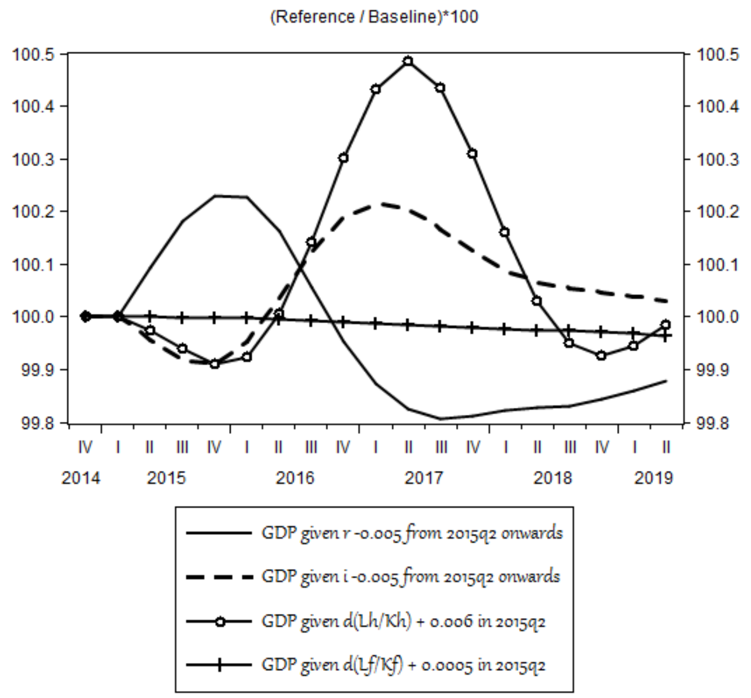

Figure 6.9 – GDP under several scenarios as ratio of baseline (4); 2014-2019. Source: author's calculations based on the model.

price (eq. 5.8). The overall result is that, despite the ups and downs of households' assets and liabilities, this sector finds itself better-off than under the baseline situation.

As we saw in chapter 1, the interest rate paid by firms r_l^f is currently at low levels[26]. So, as soon as debt becomes more attractive via a fall in this financial indicator, their demand for this liability increases drastically (eq. 5.28). In fact, with the fall in the interest rate, firms' debt as a ratio of GDP initially falls quite lightly for the next three quarters (as compared to the baseline), but it starts rising quickly, and it reaches more than 4.5% more than under the baseline in 2019. Their physical capital accumulation rate increases ostensibly, but more importantly their capital structure turns in favor of indebtedness. The combination of these effects boosts their profit rate, so that the overall effect of reducing interest rates leaves firms better off.

[26]Note, as mentioned above, we have data up to 2012. Therefore, for the period 2013-2015 we assumed that all interest rates remained at the same level as in the last observation (2012q4). In the case of firms, r_l^f is close to 2%, so that after the shock this interest rate is at around 1.5%. We are aware that there have been changes since then (mostly in the downward direction), but for the purposes of the simulation exercise (and given that to compute these series would imply an extension of the entire database) we present them 'as if' they had not changed.

As for the government, a similar scenario takes place. With the fall in r_b^g (the interest rate on public bonds) public debt falls as proportion of GDP in the first year after the shock, but grows rapidly afterwards.

As for the foreign sector, the fall in the interest rate brings about a depreciation of the exchange rate, and this would normally bring about an improvement in the trade balance, and thus on the current account. As for the trade balance, the so-called J-curve is at work, so that exports increase more than imports after almost two years, period after which we find the expected boost on trade as share of GDP. The current account, on the other hand, remains at a lower level than on the baseline for the whole 2015-2019 period. This is so because the interests paid by the rest of the world (at the interest rate r^r) fall drastically, thus dampening the improvement in the current account as share of GDP (see eqs. 4.127 and 4.153). In fact, the current account worsening is the main factor that makes the after-shock output fall below the baseline after almost two years.

The dashed line in Figure 6.9 shows the evolution of the ratio of the after-shock output and the baseline, where the shock this time is on interest rates received by households (on deposits), the rest of the world (on deposits, loans and securities) and French banks (on loans[27]). We would normally expect this effect to have the opposite impact than a fall in the interest rate paid, and to a certain extent this is the case. There are, however, some differences.

With a fall in i_d^h (the int. rate on deposits held by households, eq. 4.3) there is an initial strong fall in households' savings as share of GDP. As a counterpart of this, there is a corresponding fall in personal consumption, and a worsening in the financing capacity of households. However, this is coupled with a slight increase in their investment but also notably by a fall in their demand for money. In the end, households' net wealth is left worse-off, as compared to the baseline.

The rest of the world benefits from a reduction in i^r, first of all because this implies an appreciation of the exchange rate (eq. 5.47), thus a temporary improvement in their trade balance (deficit for France). However, with the fall in the interest rate they receive, their interest receipts fall as well, and this worsens their current account (improvement for France). As a consequence, the French current account remains positive all along the forecast period, and this offsets the negative effect of the exchange rate appreciation that dampens output growth at the beginning.

An increase in the issuance of debt by households, with no other change in the model,

[27] Note that the model does not contain an interest rate received by banks on loans. However, in this part we assumed that, instead of there being a fall in the interest rate banks receive, there is a rise in the interest rate they pay (r_b^b, eq. 4.98).

brings about a fall in GDP compared to the baseline, but this trend is reversed after a year, until another cycle appears, also a year later (see the solid line + hollow circle in the figure). Interestingly, in our simulation exercise shown in chapter 3 we found similar results for firms' debt. However, we are now dealing with households, and the working of the model is somehow different. First, note that this is a one-time shock applied on equation 5.12, so that the volume of households' indebtedness increases exogenously (that is, not due to a price or interest rate effect). This seemingly innocent and small increase in the debt-to-capital ratio of 0.6% implies a strong rise in households' indebtedness, reaching in four quarters almost 16% more as proportion of GDP and as compared to the baseline. This quickly erodes the sectors' saving rate, but as it also makes housing investment more dynamic, the initial negative effect turns positive, but the corresponding cycle lasts barely a year. It is also worth noting that households' financial accumulation (eq. 5.16) depends positively on debt issuing[28], so that this impedes the sector's net wealth to be completely eroded.

Finally, an exogenous rise in firms' indebtedness has an almost null, though slightly negative, effect on output (solid line + crosses in the figure). Naturally, corporate debt increases strongly as proportion of GDP, reaching 5% a higher level in 2019 as compared to the baseline. Profit and accumulation rates fall (though not so much when compared to other shocks) as a consequence of the higher interests they now have to pay. However, this also has a somehow positive effect: a shift in the capital structure in favor of indebtedness. Not that this is the ideal policy (in fact, it is far from being so), but this confirms the idea that as firms commit themselves to finance their investment by issuing more credit than equity, this should have a compensatory effect in financial markets that would allow monetary authorities to get the economy (fully) out of the liquidity trap (see the discussion in part 1.1.3 of the first chapter).

6.3.2 How the authorities *could* fight unemployment, but haven't so far

The current paradigm has it that inflation is the number one enemy, so that any attempt to either boost the economy or promote employment has to ensure *first* that prices are under control. As we mentioned above, in their attempt to 'target inflation', the economic authorities might at some point be successful at making this happen... but we believe this

[28]Since we assumed debt issuing and equity holdings for households are closely intertwined, this implies that the strong increase in households' liabilities are partly offset by an increase in their assets.

is not 'yet' the case. In fact, we think that, even under the current circumstances and after important roller-coaster-like changes in the macroeconomic fundamentals have taken place, there is still room (and quite a lot of it) for Keynesian/Kaleckian ideas and policies to bring about an egalitarian recovery (at least in the 'west').

The French authorities' most important mandate appears to be 'do whatever the *ECB* commands'. Since the latter's preconditions for prosperity (promised even before the introduction of the Euro, in the infamous Maastricht treaty) are price control and strict public debt and deficit surveillance, the goals of the current administration have become (or were from the start?) exactly those two. Notwithstanding, the model used by the French Ministry of Finance to 'predict' the so-expected results (*MÉSANGE*, which resembles the present one only in number of equations) has failed over and over in providing the 'accurate' results of the post-2008 crisis budget consolidation and price control policies implemented by the government since at least 2010. We believe that this lack of consistence is due to an ideological component, that is present in their model (yes, just like ours, but hopefully ours is 'less stringent' or 'more objective').

We saw above the behavior of output after-shocks as compared to the baseline. Fifteen possible scenarios were analyzed, and at least three of these (on the exchange rate, government spending and the interest rate) depicted feasible and desirable policies. We are, however, skeptic about the possibility of implementation of any of these (except maybe for the exchange rate, though it is more of a byproduct of the dollar appreciation).

In this part we focus on what we believe (and our model proves) are effective measures to fight unemployment. Figure 6.10 shows the unemployment rate for the period 2012-2019.

The solid line in the figure belongs to the unemployment rate under a hypothetical depreciation of the exchange rate of 2.5%, one percentage point higher than the one shown in Figure 6.6 above for output. The dashed line shows the evolution of the same fundamental under an increase of government spending of 2.5% (also higher than in the figure for output). The solid line + hollow circles is the unemployment rate under a fall in the interest rate by 1% (also a higher absolute value than in Figure 6.9).

As we saw above (from the text), an exchange rate depreciation has a positive effect on output and, since employment is a direct function of production (eq.5.37) it is all the more natural that the unemployment rate (eq.4.68) falls once GDP rises. Of course, the same applies to the hypothetical activist fiscal and monetary policies.

Thus, the unemployment rate falls gradually after a one-time depreciation takes place

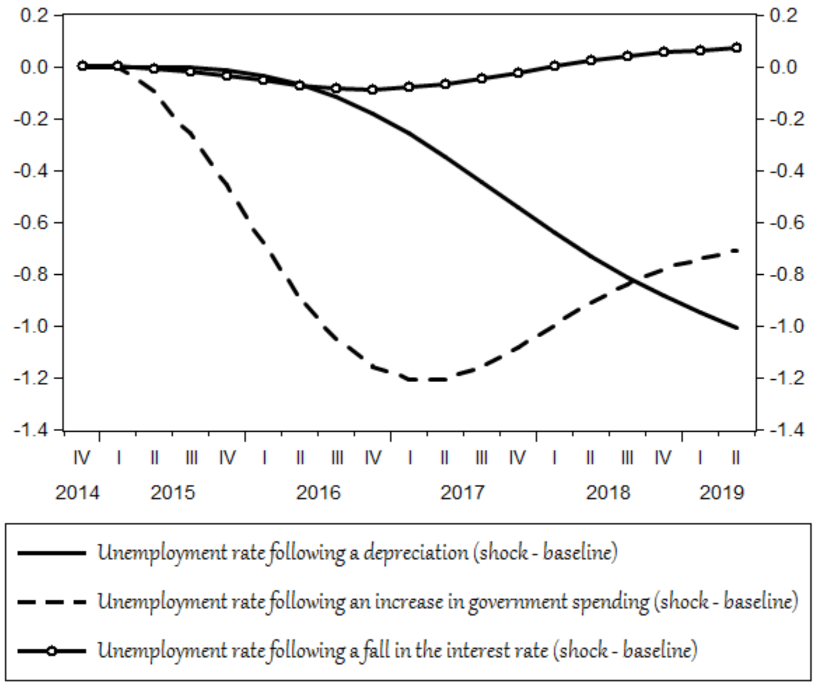

Figure 6.10 – Unemployment rate (%) under alternative scenarios as compared to the baseline; 2014-2019. Source: author's calculations based on the model.

in the second quarter of 2015[29] when compared to the baseline. This implies that, if a "wait and see" approach is taken (with respect to the policies implemented up to 2012), the unemployment rate would reach 11.8% in 2019. This is in contrast to the 10.9% seen under the depreciation scenario.

If no depreciation takes place, but instead the so-desired "fiscal discipline" is relaxed and the public sector is allowed to spend 2.5% more than it currently *does*[30], the unemployment rate would fall rapidly compared to the baseline. We find this finding particularly important, given that, if the administration keeps on insisting on reducing government expenditure (and so far they have) this implies that employment today is at a lower level than that the one at which it *would be* if they had not done so.

A fall of the already low interest rate *still* has an overall positive effect for the French economy, even though it is of a lesser magnitude than the other two we already described in this subsection. With lower interest rates *paid*, the unemployment rate would be mildly

[29]We are aware that, by the time of defending the current thesis the second quarter of the current year will be history. However, similar results would hold for different periods after this date.

[30]The correct term is *would*. But this would only complicate our wording.

lower than what it would be today under the baseline, but still lower.

Of course, a combination of these three policies (and possibly also combined with other types of policy, like incomes policy) would boost demand, reduce unemployment and (to the surprise of adherents of crowding-out doctrine) all this without discouraging investment.

So, how could the authorities fight unemployment? By letting the exchange rate depreciate, by increasing (not reducing) the level of government spending, or by letting the interest rate fall. Why have the they not done so? We believe that the answer has to do with an ideological component that makes them see a different picture. But let us see what are two other ideologically different points of view on competitiveness and debt that the current administration has been implementing for some years now, but unfortunately have not been quite successful.

6.3.3 How the authorities plan to boost competitiveness, and what the consequences would be

The world we live in is globalized, and every second that passes it becomes more interconnected. No doubt, this has brought about great advantages to humanity, be it in the cultural, medical, social or even economical senses. However, globalization in the context of *laissez-faire*, as understood by the fathers of liberalism, has also been a drawback to human development. One of the reasons why this is the case is de-industrialization of the 'west', which has been coupled with the outsourcing from the 'east'. Our purpose here, however, is *not* to get into the details of how and why this is so[31], but to attempt to explain some of its consequences for France in the context of policymaking.

As was explained in chapter 1, the French economy has undergone important transformations of its economy in the last forty years or so. One of these changes is that today, as compared to say the sixties, firms rely more intensely on outsourcing. Why? Since it is no secret to anyone that French workers are often depicted as being lazy and/or unproductive (cliché with which we disagree), the answer frequently involves labor costs. Therefore, a more direct answer as to why French firms rely more on outsourcing would be: because French workers are too expensive. In other words, they are 'uncompetitive'.

However, labor cost reductions, in the form they are taking place at the time of writing, are not always so effective because on the other side of the coin there is the demand from

[31] The interested reader on the de-industrialization process may find it useful to take a look at Palma 2005.

workers. This subject touches upon one of the oldest debates concerning the classical theory of income distribution and determination (a part of which was seen in part 2.1.2 of the second chapter).

In part 1.2.4 of the first chapter we saw that price competitiveness has deteriorated severely in France. Nonetheless, this has been more the outcome of a labor cost reduction program being followed in most of the countries that trade with this economy, rather than the fact that French workers are ’uncompetitive’ as the cliché has it.

Now, since the exchange rate is no longer under the control of *Banque de France* but of the *ECB*, and given that the latter does not seem to aim at a ’competitive euro’ (rather, it aims at a ’strong euro’), the exchange rate channel to bring about a competitive ’French euro’ has to come either from reduction in domestic wages, costs of raw materials or costs of physical capital (broadly speaking, the price of exports), or it will have to come from abroad (either in the form of trading partners’ appreciations or from increases in the price of French imports).

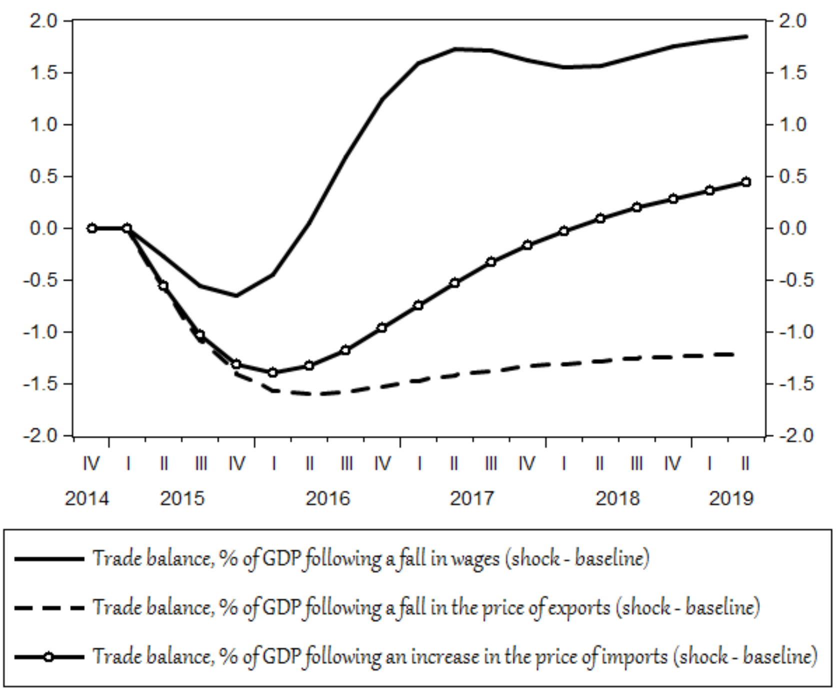

Figure 6.11 – Trade balance as % of GDP under alternative scenarios as compared to the baseline; 2014-2019. Source: author’s calculations based on the model.

Figure 6.11 shows the French trade balance under four different scenarios. The three scenarios are meant to represent improvements in the trade balance, but they seem paradoxical (although they are not, see below). The growth rates of wage per worker (solid line) and export prices (dashed line) fall 5% in 2015q2, whereas the growth rate of the price of imports increases by the same percentage in that period as well.

The first striking feature of these scenarios is that only one of them (the fall in wages, the dashed line) exhibits a temporary improvement in the trade balance when compared to the baseline. This improvement takes place only for a short time (2015q2-2016q2) and at a high price; the strong deterioration of disposable income[32]. In fact, even the volume of output falls at first and then recovers, but again this is not such a good thing because prices fall continuously and in turn makes leverage ratios (as percentage of GDP) rise.

The second striking factor is that, after the fall in export prices (eq. 5.73) takes place, there is a worsening (and not an improvement, as economic logic suggests) of the trade balance. However, this is explained in the model by the fact that the volume of exports (eq. 5.71) increase less than proportionally to the fall in prices. As a consequence, the value of French exports (which is the product of both, price and volume) falls. We believe this (seemingly counterintuitive) result is well explained by the equations estimated in the previous chapter, and that these are a reliable guide to empirical analysis, for they were subject to a battery of misspecification tests that turned out to be satisfied.

A similar story can be told for the shock on import prices (solid line + hollow circles). The increase in the price of imports (eq. 5.77) is such that the resulting fall in the volume of imports (eq. 5.75) makes the value of this variable increase, thus worsening (instead of improving) the trade balance. Again, these results are highly dependent on the estimates, which in any case we believe are correctly specified.

Let us go back to the question asked (though in an affirmative way) in the title of this subsection: how do the authorities plan to boost competitiveness? International and domestic organizations do not grow tired of insisting that competitiveness has to come from an effort of reducing wages (see for instance IMF 2014b and Ciournohuz and Cucchiarini 2014). However, what arguments like those of the current administration look at is just one side of the coin: supply. The other side (demand) is assumed to adjust magically to whatever happens to the only side that, according to the model on the back of their heads, matters.

Nevertheless, lowering wages more than they have already fallen in the past three decades (and counting), even in countries that still dare ’pamper’ their workers (like France), is no longer an alternative, simply because demand lags behind supply. As a

[32]Close to a 3% fall in real terms in just two quarters, and a relative improvement thereafter, but still below the baseline.

consequence, competitiveness-enhancing policies that depend on price adjustments are already exhausted (as it was seen just above), mainly because changes in the values of trade-related variables have taken place mostly (clearly not only) via prices, not volumes (as is now needed). So, what can the authorities do to boost French competitiveness? We saw above that a possible solution is a depreciation of the euro (which is still quite limited). Another alternative solution would be trade agreements that aim at protecting low-paid workers in developing economies, instead of impoverishing all workers alike (except the high-skilled) as has so far been the case.

6.3.4 How public and private debt ratios *could* fall, and why they haven't so far

In part 1.2.2 of the first chapter we saw that the public debt-to-GDP ratio in France has increased dramatically since the early eighties (see Figure 1.9). We argued that this was the consequence (not the cause) of policy mistakes that were in turn inherited from Washington and its so-called consensus. This does not mean that every single economic policy decision made since then has been wrong[33], either in France or in the United States. Rather, what we mean is that some major unilateral decisions were made that drastically changed the international financial system in a significant way (namely the closing of the gold window and the Volcker shock).

As long as debt-to-GDP ratios are measured in value this means that a key component embedded in these is the evolution of the general price level, namely the inflation rate. At this point at least, we are not interested in whether this is the 'correct' indicator for judging if the aggregate debt of a given institutional sector is *high* or *low*, whatever those words mean in the context of an economic system made up of lenders and borrowers (and not only the latter, as debt-averse academics, politicians and journalists seem to think). Rather, we are concerned here with how debt-ratios got so high and how these could go back down. The short answer that not many seem to like is: via inflation[34].

[33]There have also been some good outcomes. For instance, the *IMF* promoting fiscal stimulus after the collapse of Lehman Brothers (despite the fact that it was the same organization that recommended back-pedaling before the world economy was back on track). Also, the 1987 episode in France when the government stepped in to prevent a slump transmitted from the stock market crash, and the stimulus package implemented during the Obama administration are worth mentioning.

[34]"Why do people dislike inflation?" This is the question Shiller 1996 asks and attempts to answer. Interestingly, one of the points raised in that article is that people often ignore that inflation has not always been considered such a bad thing, nor is it well understood by the general public. Unfortunately, this is so thanks to (among others) the media, which is often not very well versed on economic matters and often delivers politically motivated ideas rather than exposing arguments and counterarguments (this last part is

As we mentioned before, the sharp taming of the price level back in the first half of the eighties caught the public debt by surprise. Not that the government was unaware of the policies implemented back then (by itself and *Banque de France*) so that it could retrench from borrowing all of a sudden. What we mean instead is that, in the midst of the restrictive policies going on in the United States, the French authorities had acquired debts and other contracts (for instance, retirement plans) in the past that could hardly be undone by the stroke of a magic wand. Public receipts (most of them in the form of taxes) were also set on the basis of past decisions that would take some time to be modified. Bearing this in mind, and taking into account that rolling-over debt is a common practice of governments, we can see that the numerator of the debt-to-GDP ratio was not meant to fall back then.

If on top of this we add that the volume of GDP was growing mildly and at lower rates than before the eighties (or not growing at all), then it is easy to see why the restrictive monetary policies implemented at around 1982 did not help bringing down debt ratios. On the contrary, while it was (and still is) quite difficult to reduce their numerator, the corresponding denominator was falling quickly, for the product of price and volume of output was being reduced through contractionary fiscal, monetary and incomes policies.

Enough has been said on what everybody who frequently reads Paul Krugman's blog on the *New York Times* knows (or should know) by now. Let us now focus on the numbers for the French economy, and for that let us take a look at Figure 6.12, which shows the debt ratio of the government with respect to GDP under different scenarios[35] that would help reduce it (other than austerity).

The first striking factor seen in the graph is that all four methods proposed here are helpful in bringing down the public debt-ratio. Not only that, these are also measures that would restore the dynamism of output, via demand. Even more, the figure also highlights an important lesson in economics that is clear to some (but clearly not all): fiscal consolidation and price stability are contradictory goals.

The solid line in the figure shows the ratio of interest under the assumption that prices increase 5% than expected in 2015q2. Clearly, with a one-time price hike of this nature there would be persistently higher prices after the initial shock, given that (as we saw in equation 5.43) any 1% increase in the inflation rate brings about a rise in the same variable by 0.43% two quarters later. Therefore, following the logic explained above, with a sudden one-time 5% rise in prices there would be a reduction of the public debt-to-GDP

not mentioned in the article, at least not in the same way).

[35]Note, all shocks were set at 5% in the figure.

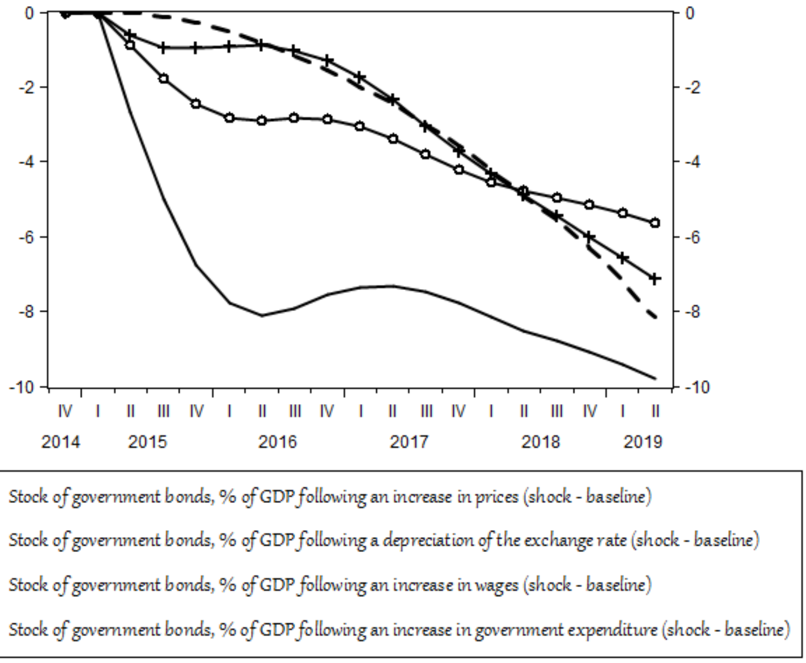

Figure 6.12 – Stock of government bonds as % of GDP under alternative scenarios as compared to the baseline; 2014-2019. Source: author's calculations based on the model.

ratio by almost 8% in a year. Perhaps even more importantly, this would make output grow above baseline for at least a year and a half, period after which unfortunately the latter would fall. But this is only due to the fact that we are dealing here with a single event, and not a set of policies implemented at once that aim *both* at reducing public debt leverage and boosting demand. If, for instance this price relaxation takes place together with an increase in the minimum wage, this would not only maintain real wages and aggregate demand afloat, but would further reduce the debt-ratio.

The debt ratio also falls after an exchange rate depreciation takes place (dashed line in the figure). As we saw above, a one-time fall in the value of the euro bears the expected positive results gradually. This applies not only to the current account, but to the leverage ratio as well. Note that public debt stabilizes at around 100% of GDP once the depreciation takes place whereas the baseline series keeps on growing until it reaches 110% in 2019. A measure of this nature, however, would reduce the labor share in national income, thus contributing to functional distribution inequality.

An increase in wages has the same positive impact on the debt ratio (solid line + hollow circles) than prices, although less so than the latter. The consequences of an incomes policy favoring workers' income would boost demand for only a short period (as was seen in Figure 6.6 above), but again this is so because the figure shows a one-time shock on a single variable in the system, and not a set of policies implemented at the same time as is (or should be) usually done. There are two possible negative consequences from such measure, one of which (competitiveness) is only partially true. The other one (an eventual fall in investment) could be avoided, if only the government decided to spend more (not less!) to keep firms' profit rates from falling, which brings us to our fourth proposal to pay for debt.

Finally, the solid line + crosses shows the evolution of the debt-to-GDP ratio under the assumption that the government decided to increase its level of expenditure by 5%. Compared to the continuous increase of the baseline series, where the level of public expenditure remains at 25.1% of GDP (the level observed in 2012), public debt stabilizes at around 100% of GDP from 2015 to 2019. A higher level of expenditure, as we saw above, does not 'crowd-out' private investment and does not generate inflation. On the contrary, through its positive effect on investment and consumption expenditures, it generates the effective demand that the private sector is currently unable to generate on its own.

So, how could public and private debt ratios fall? By (1) allowing prices to increase, (2) allowing the exchange rate to depreciate, (3) allowing wages to rise, and/or (4) increasing the level of expenditure. Why have debt ratios not fallen so far in France? Because the current administration has insisted in doing the complete opposite.

So, in spite of the contradiction of goals between fiscal consolidation (which is difficult and even painful to achieve in a non-inflationary environment) and price control (which represents a constraint on economic growth), why do politicians insist on these measures that benefit some (countries or groups of individuals) at the expense of others? Perhaps there there is an implicit political agenda these decision makers pursue, but (as Kalecki argued 73 years ago, see part 2.1.1 above) they advance economic arguments on their behalf.

6.4 Empirical stock-flow modeling

The existing literature on stock-flow models is mostly carried out for theoretical purposes. In chapter 3 we saw an example of how these models are built and used for modeling purposes. In chapters 4, 5 and the present one, in contrast, we have seen that several technical issues that were not present in a simulation exercise emerge.

6.4.1 Simulation, empiricism and 'credibility'

Simulation exercises are useful for several purposes, such as numerical verification of an analytical system, graphical analysis of a given theory (or set of theories), comparison between several models with different specifications, parameter and/or initial values, tests for a given set of postulates, among others. However, and despite all these advantages, these models lack an important component: empirical verification.

Empirical modeling solves this issue, but the gap between theory-based models (often the result of mathematical rigor) and existing statistics (which are not always well suited for a particular theory) can sometimes be wider than expected. This is particularly so for large-scale models.

Angrist and Pischke's 'credibility revolution' in econometrics[36] is related to this interesting subject. Economic theory (the backbone of structural modeling) makes postulates, usually based on deductive reasoning. This form of reasoning quite often depends on hypotheses that, when they are not fulfilled, the theory itself may either be reinforced or replaced by another one which is presumably better. Naturally, the usefulness of this procedure is that it guarantees logical consistency of the arguments.

However, if this *deductive* framework is further complemented with a link to specificities related to time and space, perhaps this combination will prove more useful than if it is left on its own. In economics, such link is possible thanks to methods that involve data handling. As mentioned above, the gap between theory and practice can have varying degrees of closeness, and this gap often depends on how 'close' the practice is to the reality that we are attempting to depict through the model. This approach is *inductive*, for it takes such reality as its reference and adapts it to the analytical tools available.

In the second section of the current document we have described a large-scale econometric model that aims at blending these two forms of reasoning. The results of these efforts shown in this chapter are, in *my* opinion, satisfactory in the sense that an inductive approach based on a large dataset of macroeconomic data for France was used in order to fit a given set of theoretical postulates that are in turn based on a deductive approach. Moreover, these results are not only theoretically meaningful, but also helpful in explaining several specificities that distinguish the French economy from any other (be it fictitious or otherwise).

The gaps between what is *desirable* and what is *feasible* in structural modeling can be as wide as the disparity between theory and practice itself. Let us take an example in order to see how wide this disparity can be. The standard Keynes/Kahn consumption

[36] See the corresponding discussion, citation and a comment in the Foreword.

function is a solid postulate whose logic defies time and space[37]. However, any sane econometrician will hardly ever regress consumption as a function of disposable income *only*. It is true that demand for consumption goods depends largely on disposable income, but consumption decisions are made *also* for other reasons and given other circumstances.

6.4.2 Economics, theory and practice recap

The consumption function that we included in our model *also* includes wealth, and the latter is in turn separated into housing wealth and stock-market wealth, as in Case, Quigley, and Shiller 2003. Now, this does not mean that Keynes ignored the relevance of wealth in consumption decisions by households, nor that Cowles modelers paid a blind eye to this issue either. By the time Case, Quigley and Shiller published their article, wealth data was available, which was not the case, say, during the forties or fifties[38]. Complementary ideas were also postulated during this rather long time span, which strengthened the existing body of deductive reasoning.

Despite all this, consumption decisions are not *only* the result of income and wealth effects. Other unobserved irregular factors have to be considered. This is where the so-called *dummy* variables enter the picture, for these allow modelers to take into account events that help explain the evolution of a given variable that are *not* explained by the postulated explanatory ones. These exogenous determinants (*dummies*) are no doubt useful, but they hardly account for the missing part of the story. Dynamic analysis (that is, the inclusion of lags in an equation), and other related tools are also important. But again, sometimes existing theory and data-handling tools are not enough.

Empirical analysis is useful *also* in that it allows researchers to find regularities where one would not suspect. This was the case, for instance, of our finding that the capital accumulation rate of firms is largely associated with the q price ratio (see Figure 1.6 and the corresponding discussion). However, it would be perhaps unwise to attempt to make an empirical model about this regularity without providing a solid theory that explains it[39]. Solidity, however, is often associated to deductive mathematical rigor which, despite the complexity of the model, we do not attempt at this stage.

It is rare to find a model that fits the data perfectly. In fact, this is one of the reasons

[37] For a thorough discussion of this see Haavelmo 1947, which is a source of inspiration for the example at hand.

[38] Flow-of-funds data have indeed been around since, at least, Richard Stone and his collaborators contributed to a large extent in stock-flow measurement. However, the availability and treatment of such data were very much limited back then.

[39] In our opinion, this regularity is well-defended on theoretical grounds. See the discussion in 1.1.3.

why every single regression is accompanied by an *error* term. When this error term is sufficiently close to its target (the observed series), the corresponding model is said to be 'statistically satisfactory', and when this is not the case the model is said to be misspecified. Now, bearing all this in mind, try including several equations estimated in two steps (which are in turn subject to errors and whose theoretical dependency is not always statistically satisfactory) into an accounting framework that has to satisfy identities, theory, be convincing enough and at the same time 'speaking' a standard language. This task is clearly not simple.

Combining statistical and theoretical rigor can be very difficult. We have attempted at delivering an ambitious project that will hopefully serve as an avenue for further research in the field of empirical stock-flow modeling. Of course, the project is far from being fully satisfactory to the eyes of either theory experts or practitioners, but it is a beginning. Small scale models have their own merits, but the fact that they remain small is what keeps them focused on one issue at the time. The merit of large-scale models is that (depending on the number of equations and their determinants) several issues can be tackled simultaneously.

6.4.3 Technical issues in empirical *SFC* practice

Several technical details were present during the elaboration of the model presented above. One of these was that the signs of the coefficients in the estimated equations were not always 'correct'. This is a common problem econometricians encounter that non-practitioners find hard to believe. If economic logic says that a given relationship between two variables must hold, then the data has no other choice but confess.

However, different specifications can yield to diverging results. In the case of the present model, there are differences in the number of lags, choice of the variables included in the equation, form of the corresponding series (logs, ratio, level, smooth, etc.), period, frequency, time series' peculiarities (seasonality, trend, cycle and randomness), source and proxies (to name but a few) make up this long list.

Another issue, proper of watertight models, is accounting consistency for terms that are often not included in theoretical specifications. Indeed, for a stock-flow model to be watertight, it suffices to define stocks and flows only. However, flow-of-funds data also include revaluation terms (sometimes also present in theoretical models) and *other changes in volume*. The inclusion of these a-theoretical terms, which are used in order to equilibrate the accounts, is a source of complication because equilibrium for it must also be fulfilled. At this point it is perhaps worth reminding the reader that every component of a given financial instrument deserves an equation, and that if this term has not yet been explored (i.e. revaluation terms or *other changes in volume*), an equation has still to be written, whether or not it is of interest to have it in the system. In the end, this term will be used to guarantee accounting consistency.

As it was mentioned at the beginning of chapter 4, we were obliged to build a theoretical model based on existing data from official sources. These data are consolidated by *Banque de France* and *INSEE*, and are also subject to constant revisions. This implies yet another source of dis-'credibility', for our statistical and simulated results do not only depend on their own goodness of fit, but on that of the methodology used by official sources[40].

Beyond this data quality issue, another problem emerges that has to do with the purposes of the model itself. Here, again, the spectrum is wide. A large-scale model can be used to forecast, for analytical purposes, to provide policy advice, for theoretical comparisons, and even as a wide field for experimentation in (for example) Monte-Carlo simulations. We tried to write the corresponding code in such a way that it can serve several (clearly not all) of these uses. Of course, there is still some way to go, but at least the seed is there.

[40] For an interesting discussion on "observed data" see the first chapter of Spanos 1999.

Conclusion

Economic policy in France has gone through important changes in the past four decades. Economic policy went from pursuing maximum employment to a regime characterized by inflation targeting. This was the result of the collapse of the Bretton Woods system in 1971, which allowed the dollar to depreciate. This in turn left oil producers unhappy because their oil-related revenues were curtailed, and their reaction to this came in the form of price hikes and embargoes for the U.S. and other economies (including France) that created important imbalances world-wide.

With the second major oil shock (1979) came a strong response which this time would not only affect oil producers, but virtually the whole world. The strong restrictive policies implemented by the federal reserve forced other countries to follow the same policy, and this in turn made firms demand less credit and, as a consequence, banks to seek for other sources of demand for loans. U.S. and other core economies' banks sought relief in households and other less-developed countries. The process of going from one type of regime where firms issued more credit than equity to an alternative one in which the opposite happened brought about a series of consequences that were treated in the first chapter.

Under the new financial regime, in which firms issue more equities than debt in order to finance their investment, the prices of equities were subject to a series of important imbalances and financial bubbles persisted. As this was happening, households increased their demand for credit drastically, and this eventually resulted in two major housing bubbles, with the second one coinciding with the third stock-market bubble (2007-2008). As if it were not enough, this was also coupled with a set of important economic reforms that aimed at making the economy more competitive, given that other less developed economies (which are endowed with more labor intensive techniques of production, mainly because labor is much cheaper) were gaining important shares in world manufacturing and agricultural markets.

Some of these reforms were particularly painful for the French economy. Disparities have increased between the low-skilled and specialized workers, and notably the disposable income of the former has diminished significantly. This is so due to several effects. On the one hand, since firms adopted more capital intensive techniques, the unemployment rate soared. On the other hand, given the economic authorities' priority in fighting inflation, taxes on workers' income increased in order to improve the rapidly growing public debt-to-*GDP* ratio. Other measures were implemented in order to contain the upward evolution of prices (for instance, lowering *VAT* rates), but notably the taming of inflation was achieved through interest rates and tight surveillance of the money supply.

Under this scenario, the current authorities (mainly the *ECB* and the French government) insist on pursuing fiscal consolidation under a low inflation/high competitiveness environment, which of course includes lowering labor costs. We have argued that this current set of policies are contradictory and that it is highly desirable for this mindset to change anytime soon. The severity of the 2007-08 crisis was the object of a set of countercyclical policies that aimed at making the world economy get back on track. But the relatively short duration of these policies was not enough to do the job, and only avoided sinking several ships (clearly not all).

We showed in the sixth chapter that pursuing expansionary fiscal, monetary and incomes policies promote employment (in our opinion a much more laudable goal to pursue than fiscal consolidation), reduce the debt-to-*GDP* ratio (mainly by boosting economic growth), and create new opportunities for firms to invest and innovate (rather than innovate in order to fire workers). The insistence on the achievement of fiscal consolidation by reduction in deficit spending is pointless in itself. As we have shown, it is not by reducing expenditure that it will be reached. On the contrary, it is by boosting demand that public debt will fall as percentage of *GDP*. Naturally, if public expenditure is being constantly reduced, the government' budget will reach equilibrium only when the French economy is so impoverished that it will hardly be able to sustain financing its own supply.

Finally, we have also insisted that reducing wages only makes things worse. As workers' remuneration are reduced, demand is likewise curtailed. The seemingly positive effects of wage moderation on export prices have a weak impact on the trade balance and are painful, and at the same time this policy promotes deflationary policies that worsen debt-ratios and demand. Moreover, wage moderation further enhances inequalities between credit holders and debtors, whereas at the same time it keeps demand and production from growing. This is so because, as our model has shown, moderate inflation (though higher than it is today) has positive effects on investment and output.

The drawback is that this diminishes real wages and worsens wage shares. However, if wages were to rise at the same time that an exchange rate appreciation and/or an increase in government expenditure take place, the fall in real wages can easily be avoided. Furthermore, if interest rates are kept at low levels while at the same time the monetary stance on inflation is relaxed (as it was the case back in the fifties, for instance) the only institutional sector 'euthanized' would be financial institutions... but of course, neither bankers nor the authorities would want this to happen.

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Appendix A

Appendix

A.1 Model's technical details

A.1.1 Sectors

Subscript H stands for Households; F for Firms; G for the Government; B for Banks; and R for the Rest of the World. As customary in the Stock-Flow literature time subscripts are dropped for simplicity (Godley and Lavoie 2007).

When dealing with transactions, when a superscript r is added, it means the item is received by the corresponding sector, whereas p means the item is paid by it. In the same vein, when dealing with the financial account, superscript A means the item is an asset for the corresponding sector, whereas L stands for its liability.

Firms are strictly non-financial ($S11$ in the official nomenclature).

Private financial institutions and *Banque de France* are included in the sector **Banks** ($S12$), which are assumed to carry out only financial intermediation operations. Therefore, the items included in the production and operating accounts (VA, T_1, W and Δ) belonging to this sector are lumped together with those of non-financial firms.

Government corresponds to the French equivalent *Administrations Publiques* (*APU*, $S13$). That is, public administrations, central public administrations, local public administrations and social security administrations, with the latter as the most important in terms of spending. The distinction is important, given that each administrative body is financed differently and, perhaps even more importantly, given that not all are directly administered by the State (see Budget des Comptes Publics et de la Réforme de l'État 2012).

Households include Non Profit Institutions at the Service of Households (NPISH or *ISBLSM* in French; $S14 + S15$).

A.1.2 Transactions (current account)

Note: the official code, from *INSEE*, for each item is shown in parentheses. We recommend the reader to follow this subsection and the following two along with the spreadsheet

Uses Resources Table 2010 of the file Transactions Flows 2010.xls.

T_1 is the sum of taxes less subsidies on products, e.g. VAT and excise duties. In the current system used in Europe (SEC 95), VAT is only received by the government without a counterpart (item $D21$ - item $D31$).

W are aggregate wages (item $D1$) are not inclusive of employees' contributions (which are accounted for under the variable SC, see below).

T_1 and T_2 are taxes (less subsidies) on production and imports, which include taxes on workforce and other taxes on production ($D2 - D3$).

INT is the sum of interests, revenues from foreign direct investment, income attributed to insurance policyholders and land rents ($D41 + D43 + D44 + D45$). This item is presented as net uses for firms and the government.

DIV stands for dividends ($D42$).

T_3 stands for taxes on income and wealth ($D5$). For simplicity, the sum of investment aid, other (net) capital transfers and capital taxes ($D9 + K2$) are included in (or deducted from) this variable.

SC stands for social security contributions ($D61$). For non-financial firms, this item was assumed to be zero and was correspondingly lumped in the item SB.

SB stands for social security benefits ($D62 + D7$).

p_cC is personal consumption in value, and p_gG is government consumption expenditure (both included in $P3$).

S is saving. Normally, this item is $B8$ in *INSEE*. However, it must be noted that, as we made some assumptions which modify some accounts (the fact that banks' production is lumped with that of firms, contributions paid by firms were lumped with the benefits they pay), the series used in our model may not match with those of *INSEE*. The same thing goes for financing capacity for all sectors except the rest of the world, households' disposable income, adjustment and financial account of all sectors except the rest of the world, given that these depend on saving. Even if this is the case, the reader will notice that all rows and columns guarantee equilibrium (accounting-wise speaking).

p_iI is the sum of Gross Fixed Capital Formation and variations in inventories ($P5$) for the corresponding sector, which is shown by a superscript. p_i stands for the price index of investment (as calculated in equations A.16, A.67 and A.136), which differs considerably from the **implicit price index of national heritage** (more on this below), which we denote by p_K with the corresponding sector superscript[1].

FC is financing capacity ($B9A$). As mentioned above, these series may not correspond to the ones published by *INSEE*.

A.1.3 Accounts consolidation

PERRRUC stands for the French acronym of the corresponding accounts as in Piriou and Bournay[2] (Piriou and Bournay 2012): compte de *P*roduction, compte d'*E*xploitation,

[1]This last distinction is relevant due to the nature of fixed capital each sector holds.

[2]See the .ods (or .xls) file Transactions_Flows_2010, which is the refreshed version of the TEE table presented in pages 128 and 129 of that book.

compte d'affectation des *R*evenus primaires, compte de distribution du *R*evenu, compte de redistribution du *R*evenu en nature, compte d'*U*tilisation du revenu, and compte de *C*apital.

A.1.4 Data sources

At the time of elaboration of this thesis, data belonging to the transactions accounts were available on a quarterly basis from *INSEE* for the period 1949-2013. Data belonging to the financial accounts were available quarterly from *Banque de France* from 1978 and, despite some difficulties coming directly from the source, until 2012. Stocks of financial accounts were available at the value of the beginning for each quarter. Therefore, in order to bring these to quarters[3] (as well as the stock of non-financial assets) we used the Denton 1971 technique. The rate of capacity utilization (from *INSEE*) is only available from 1976q1 to 2010q2.

Balance of payments data (shares of exports/imports by trade partner) were constructed from data obtained from *Eurostat* (volumes of exports to France), which were available annually for uneven periods, and from *OECD World Economic Outlook* database (for the price of exports), quarterly. In order to "fill the gaps" in the database we assumed a constant share before the first available observation equal to that year's observation. The same logic applied for unavailable series after a certain year for which they were no longer available.

A.1.5 Prices and interest rates

INSEE computes the price indexes for expenditure (personal consumption, private and public investment, exports and imports) following the method of the chain, that is, from weights revised every year but constant on each twelve-month link (*maillon*). The (Laspeyres-based) index for a given month is obtained in base 100 for December from the previous year (Piriou 1992).

Interest rates are represented by r when these are paid by the corresponding sector, and i when they are received by the corresponding sector. Thus, r_l^H is the interest rate paid by households on loans, and i_l^B is the interest rate charged by banks on loans. All are calculated as *apparent annualized interest rates*, that is, as the amount of interest paid/received divided by the previous period corresponding annual stock of debt instrument (bonds or loans) or interest-bearing instrument (deposits).

A.1.6 Investment price index

The quarterly growth rate of investment is here computed following two methods, depending on the account from which they are derived. The first (method 1 in the graph below, called p_K, which stems from the capital account) consists in dividing the revalu-

[3]So that the sum of the four quarters equals the stock at that given year.

ation effect of non-financial assets by the previous period stock of non-financial assets (what we called above the *implicit price index of national heritage*), which yields:

$$\frac{CapitalRevaluation}{CapitalStock_{-1}} = \frac{K_{-1}\Delta p_K}{p_{K-1}K_{-1}} = \frac{\Delta p_K}{p_{K-1}}$$

The second (method 2 in the graph, called p_i, stemming from the current account) consists of the annual growth rate of the price index obtained from dividing the value of investment by its volume.

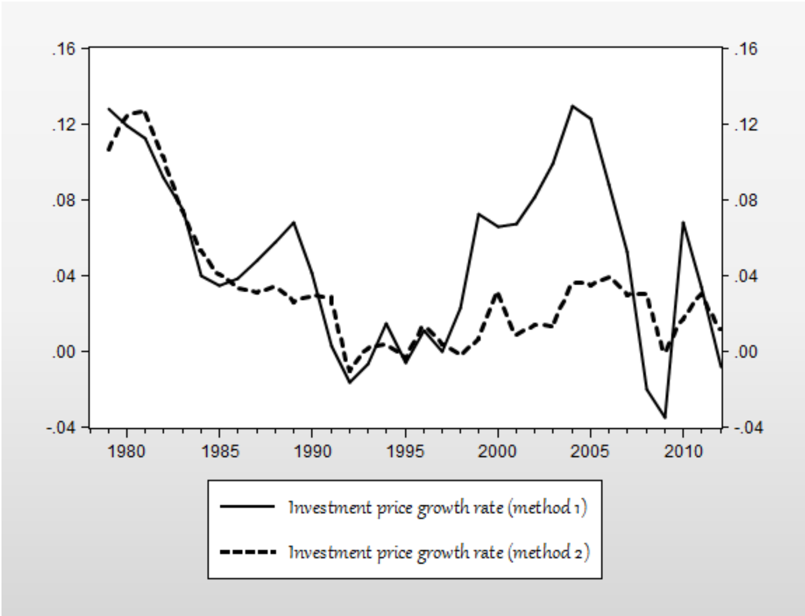

Figure A.1 – Price of total investment, growth rate.

As mentioned in the technical note of *INSEE* (2014; part IV INSEE 2013) and in Vanoli 2002, it is natural that the evolution of the two indexes differ[4].

It must be noted that there is a post-crisis investment price hike in 2010. This short-lived price-driven increase in wealth is well documented in Couleaud, Mauro, and Delamarre 2012, where it is argued that "[t]his rebound can be attributed to the sharp rise

[4]"Quelques éléments des comptes de patrimoine sont construits à prix constants puis valorisés élément par élément grâce à des indices de prix relatifs à chacun d'eux. Toutefois, pour d'autres éléments, et notamment pour les différents soldes qui apparaissent dans les comptes de patrimoine, aucun prix n'est disponible tel quel puisque ces éléments sont souvent le résultat de l'agrégation d'actifs ayant des prix différents. Ainsi, en l'absence de données à prix constants et afin de mener des analyses en volume pour ces soldes, il est possible de déflater les montants à prix courants (obtenus par différence des montants en valeur de différents actifs) grâce à un indice général des prix. On obtient alors des données en termes réels.

Cette évaluation de données en termes réels doit être totalement dissociée de l'évaluation des données à prix constants. Elle permet, néanmoins, pour les éléments pour lesquels les données à prix constants n'existent pas, de reconstituer des séries de données "réelles" permettant d'évaluer les variations de pouvoir d'achat des éléments concernés entre différentes périodes." Vanoli (2002, p. 37)

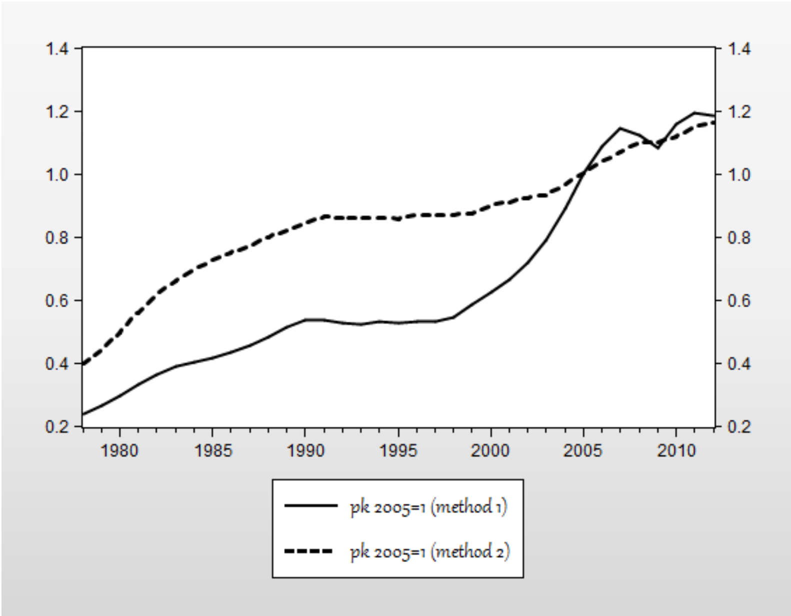

Figure A.2 – Price index of total investment (2005 = 1).

in land prices, which pushes up the value of property assets of all resident institutional sectors." p. 91.

A.1.7 Stock-flow consolidation

Note: we recommend the reader to follow this section along with the spreadsheets Variation Wealth 2009-2010 and Asset Liability Tables 2010 of the file Transactions Flows 2010.xls.

A novelty of our model, compared to other empirical structural models (for instance **Fair2005** for a model of the U.S.) is the fact that we embed stocks with flows explicitly. An important exception is the Levy Institute macroeconomic model. However, the difference between the latter and ours is that the Levy model blends households and firms into a single institutional sector, whereas ours studies both separately. Since our procedure seems to be the exception rather than the rule[5], we might as well make clear the concepts which lead to the consolidation from flows to stocks and vice versa.

For illustrative purposes, we proceed with the example of physical capital for the whole economy, but the procedure is obviously applicable and applied to each sector's asset and liability; financial (deposits, securities, credit and equity) and non-financial (physical capital).

Stock of capital: $p_K K$ p_K is the (implicit) price index of physical capital, and K is the

[5]"We have to wait until the end of the twentieth century for stocks to receive equal attention in international recommendations to that granted to flows. With few exceptions, however, the practice is itself still highly unbalanced." Vanoli 2002, p. 383, our translation.

volume of capital, which must be distinguished from the term *quantity*[6].

Flow of capital: $p_K \Delta K$ ΔK is the change in the stock of capital from period 1 to the next. That is, it consists of a change in the value of capital, stemming from a change in its volume only. *Fixed capital consumption* or depreciation[7] (FCC), or simply wear and tear, are considered separately.

Revaluation effect: $K_{-1}\Delta p_K$ Δp_K is the change in the price of capital. This effect consists of the change in value of capital, stemming from a change in its price only.

Other changes in volume: We note this equilibrating item OCV_K. According to Vanoli (op. cit. p. 395, our translation):

> The account "other changes in volume of assets" traces the changes in substance of heritage (*patrimoine*) of institutional sectors which do not result from the production activity or the primary revenue flows or from capital transfers or even from the variation of asset prices. The revaluation account aims *in fine* at highlighting the real holding gains and losses due to specific price variations differentials with respect to variations in the price level.

The value of the capital stock for the French economy (from firms, households and the government together) for a given period (a year) can be expressed as in Tables 4.4, 4.7, 4.10, 4.13 and 4.16:

$$p_K K = p_{K-1} K_{-1} + p_K \Delta K + K_{-1} \Delta p_K + OCV_K$$

A.1.8 Exclusions

Note: this is also based on INSEE 2013.

Excluded from balance sheet are human capital, natural heritage (air, flora, fauna...), public domain (rivers, territorial waters, lakes, highways, ports, airports,...), household durables (considered a flow), military goods, conditional non-financial assets, provisions made by companies and pension rights.

A.2 System of equations

Follow this section with chapter 4, particularly with subsection 4.2.1.

[6]"Stone consistently uses the term "quantity" which specialists traditionally employ for indexes, but the French translation of the SNC 68 replaces the term by "volume", since constant price measures take account of both the quantity variation and product quality..." Vanoli op. cit. p. 467, our translation.

[7]Depreciation (which is not the same as fiscal amortization or depreciation used in firms' accounting) represents the amount of fixed capital for a given period as a result of normal wear and tear and foreseeable obsolescence, including a provision for losses of fixed assets as a result of accidental damage insurable. It is calculated by *INSEE* for all fixed assets, except animals.

A.2.1 Households' equations

Households' uses-resources

$$VA_H = \alpha_h VA \tag{A.1}$$

$$W_{H_H} = w_h p_{va} VA_H \tag{A.2}$$

$$T_{2_H} = t_{2_h} p_{va} VA_H \tag{A.3}$$

$$\Pi_H = p_{va} VA_H - W_{H_H} - T_{2_H} \tag{A.4}$$

$$W_H = W_{paid} + W_R \tag{A.5}$$

$$INT_H^r = i_d^h (p_{d_a-1}^h D_{H-1}^A) \tag{A.6}$$

$$INT_H^p = r_l^h (p_{l_l-1}^h L_{H-1}^L) \tag{A.7}$$

$$DIV_H^r = \psi_1 (p_{e_a-1}^h E_{H-1}^A) \tag{A.8}$$

Closing line for social security benefits

$$SB_H = SB_F + SB_B + SB_G - SB_R \tag{A.9}$$

$$SC_H = \psi_2 W_H \tag{A.10}$$

$$T_{3_H} = t_{3_h}(\Pi_{H-4} + W_{H-4} + INT_{H-4} + DIV_{H-4} + SB_{H-4} - SC_{H-4}) \tag{A.11}$$

$$Y_H^d = \Pi_H + W_H + INT_H + DIV_H + SB_H - SC_H - T_{3_H} \tag{A.12}$$

$$ln(C) = f\left[ln\left(\frac{Y_H^d}{p_c}\right), ln\left(\frac{p_k^h K_H}{p_c}\right), ln\left(\frac{p_{e_a}^h E_H^A}{p_c}\right)\right] \tag{A.13}$$

$$p_c = f(p_y) \tag{A.14}$$

$$S_H = Y_H^d - p_c C \tag{A.15}$$

$$p_i^h = f(p_y) \tag{A.16}$$

$$I_H p_i^h = p_k^h \Delta K_H \tag{A.17}$$

$$FC_H = S_H - p_i^h I_H \tag{A.18}$$

Households' non-financial assets

$$p_k^h = f\left[\left(\frac{K_H}{pop}\right), (r_l^h - infl), u^{rate}\right] \tag{A.19}$$

$$ln\left(\frac{K_H}{pop}\right) = f\left[ln\left(\frac{Y_H^d/p_c}{pop}\right), ln\left(\frac{p_k^h}{p_c}\right), ln(u^{rate})\right] \tag{A.20}$$

$$FCC_H = \delta_k^h p_{k-1}^h K_{H-1} \tag{A.21}$$

$$\Delta K_H \times p_k^h = p_k^h K_H - p_{k-1}^h K_{H-1} + FCC_H - 4K_{H-1}\Delta p_k^h \tag{A.22}$$

Households' deposits held

$$D_H^A p_{d_a}^h = p_{d_a}^h D_{H_e}^A + \frac{p_{d_af}^h D_{H_f}^A}{x_r} \tag{A.23}$$

$$D_{H_e}^A p_{d_a}^h = p_{d_a-1}^h D_{H-1}^A + p_{d_a}^h \Delta D_H^A + rev_{d_a}^h - \theta_d^h p_{d_a}^h D_H^A \tag{A.24}$$

$$\frac{D_{H_f}^A p_{d_af}^h}{x_r} = \psi_4 p_c C - p_{d_a}^h D_{H_e}^A \tag{A.25}$$

$$\Delta D_H^A \times p_{d_a}^h = p_{d_a}^h \Delta D_{H_e}^A + p_{d_af}^h \Delta D_{H_f}^A \tag{A.26}$$

$$\Delta D_{H_e}^A \times p_{d_a}^h = p_{d_a}^h D_H^A - p_{d_a-1}^h D_{H-1}^A - rev_{d_a}^h - p_{d_af}^h \Delta D_{H_f}^A \tag{A.27}$$

$$\Delta D_{H_f}^A \times p_{d_af}^h = \Delta\left(\frac{p_{d_af}^h D_{H_f}^A}{x_r}\right) + rev_{d_af}^h \tag{A.28}$$

$$p_{d_a}^h = f(i_d^h) \tag{A.29}$$

$$rev_{d_a}^h = rev_{d_ae}^h + rev_{d_af}^h \tag{A.30}$$

$$rev_{d_af}^h = \left(\frac{p_{d_af-1}^h D_{H_f-1}^A}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.31}$$

$$rev^h_{d_a e} = 4D^A_{H-1}\Delta p^h_{d_a} - rev^h_{d_a f} \tag{A.32}$$

Households' credit issued

$$L^L_H p^h_{l_l} = p^h_{l_l} L^L_{H_e} + \frac{p^h_{l_l f} L^L_{H_f}}{x_r} \tag{A.33}$$

$$\left(\frac{L^L_{H_e} p^h_{l_l e} + (p^h_{l_l f} L^L_{H_f}/x_r)}{p^h_k K_H}\right) = f\left[ln\left(\frac{Y^d_H}{p^h_k K_H}\right), r^h_l, r^a_{e_h}\right] \tag{A.34}$$

$$\frac{L^L_{H_f} p^h_{l_l f}}{x_r} = \theta^h_l p^h_{l_l} L^L_H \tag{A.35}$$

$$\Delta L^L_H \times p^h_{l_l} = p^h_{l_l f}\Delta L^L_{H_f} + p^h_{l_l}\Delta L^L_{H_e} \tag{A.36}$$

$$\Delta L^L_{H_f} \times p^h_{l_l f} = \Delta\left(\frac{L^L_{H_f} p^h_{l_l f}}{x_r}\right) + rev^h_{l_l f} \tag{A.37}$$

$$\Delta L^L_{H_e} \times p^h_{l_l} = p^h_{l_l} L^L_H - p^h_{l_l -1} L^L_{H-1} - rev^h_{l_l} - \Delta p^h_{l_l f} L^L_{H_f} \tag{A.38}$$

$$p^h_{l_l} = f(r^h_l, infl) \tag{A.39}$$

$$rev^h_{l_l} = rev^h_{l_l e} + rev^h_{l_l f} \tag{A.40}$$

$$rev^h_{l_l f} = \left(\frac{p^h_{l_l f-1} L^L_{H_f -1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.41}$$

$$rev^h_{l_l e} = 4L^L_{H-1}\Delta p^h_{l_l} - rev^h_{l_l f} \tag{A.42}$$

Households' equities held and financial profitability

$$\frac{E^A_H}{Y} = f\left[r^a_{e_h}, \left(\frac{p^h_{l_l} L^L_H}{Y^h_d}\right), (r^l_h - infl)\right] \tag{A.43}$$

$$\frac{E^A_{H_f} p^h_{e_a f}}{x_r} = \theta^h_{e_a} p^h_{e_a} E^A_H \tag{A.44}$$

$$E^A_{H_e} p^h_{e_a} = p^h_{e_a} E^A_H - \frac{E^A_{H_f} p^h_{e_a f}}{x_r} \tag{A.45}$$

$$\Delta E_H^A \times p_{e_a}^h = p_{e_a}^h \Delta E_{H_e}^A + p_{e_af}^h \Delta E_{H_f}^A \tag{A.46}$$

$$\Delta E_{H_f}^A \times p_{e_af}^h = \Delta\left(\frac{p_{e_af}^h E_{H_f}^A}{x_r}\right) + rev_{e_af}^h \tag{A.47}$$

Closing column for households' capital account

$$\Delta E_{H_e}^A \times p_{e_a}^h = p_{l_l}^h \Delta L_H^L - p_{d_a}^h \Delta D_H^A - p_k^h \Delta K_H + S_H + Aj_H - p_{e_af}^h \Delta E_{H_f}^A \tag{A.48}$$

$$p_{e_a}^h = f(p_{e_l}^f) \tag{A.49}$$

$$rev_{e_a}^h = rev_{e_ae}^h + rev_{e_af}^h \tag{A.50}$$

$$rev_{e_af}^h = \left(\frac{p_{e_af-1}^h E_{H_f-1}^A}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.51}$$

$$rev_{e_ae}^h = 4E_{H-1}^A \Delta p_{e_a}^h - rev_{e_af}^h \tag{A.52}$$

$$r_{e_h}^a = \frac{\Delta p_{e_a}^h}{p_{e_a-1}^h} + \frac{DIV_H^r}{p_{e_a-1}^h E_{H-1}^A} \tag{A.53}$$

Households' adjustment term

$$Aj_H = a_h p_{va} VA_H \tag{A.54}$$

A.2.2 Firms' equations

Firms' uses-resources

$$VA_F = VA(1 - \alpha_h - \alpha_g) \tag{A.55}$$

Closing line for wages

$$W_F = W_{paid} - W_{H_H} - W_G \tag{A.56}$$

$$T_{2_F} = t_{2_f} p_{va} VA_F \tag{A.57}$$

$$\Pi_F = p_{va} VA_F - W_F - T_{2_F} \tag{A.58}$$

$$INT_F^p = r_l^f (p_{l_l-1}^f L_{F-1}^L - D_{F-1}^A) \tag{A.59}$$

Closing line for dividends

$$DIV_F^p = DIV_F^r + DIV_B^r + DIV_G^r + DIV_H^r + DIV_R^r - DIV_B^p - DIV_R^p \tag{A.60}$$

$$DIV_F^r = \phi_1(p^f_{e_a-1}E^A_{F-1}) \tag{A.61}$$

$$\Pi_F^a = \Pi_F - INT_F^p - DIV_F^p + DIV_F^r \tag{A.62}$$

$$T_{3_F} = t_{3_f}\Pi^a_{F-4} \tag{A.63}$$

$$SC_F = \phi_2 p_y Y \tag{A.64}$$

$$SB_F = \phi_3 p_y Y \tag{A.65}$$

$$S_F = \Pi_F^a - T_{3_F} + SC_F - SB_F \tag{A.66}$$

$$p_i^f = f(p_y) \tag{A.67}$$

$$I_F p_i^f = p_k^f \Delta K_F \tag{A.68}$$

$$FC_F = S_F - p_i^f I_F \tag{A.69}$$

Firms' non-financial assets and potential output

$$p_k^f = f(p_k^h, r_l^f) \tag{A.70}$$

$$K_F p_k^f = p_{k-1}^f K_{F-1} + p_k^f \Delta K_F - FCC_F + 4K_{F-1}\Delta p_k^f \tag{A.71}$$

$$FCC_F = \delta_k^f p_{k-1}^f K_{H-1} \tag{A.72}$$

Capital accumulation rate

$$car = f\left[gap, \left(\frac{S_F}{p_k^f K_{F-1}}\right), r^l_{e_f}, (r_l^f - infl)\right] \tag{A.73}$$

$$Y^p = k(K_H{-}1 + K_F{-}1 + K_G{-}1) \tag{A.74}$$

Firms' deposits held

$$D_F^A = \left(\frac{D_{F_f}^A}{x_r}\right) + D_{F_e}^A \tag{A.75}$$

$$\frac{D_{F_f}^A}{x_r} = \phi_4 p_y Y - D_{F_e}^A \tag{A.76}$$

$$D_{F_e}^A = D_{F-1}^A + \Delta D_F^A + rev_{d_a}^f - \theta_d^f D_F^A \tag{A.77}$$

$$\Delta D_F^A = \Delta D_{F_e}^A + \Delta D_{F_f}^A \tag{A.78}$$

$$\Delta D_{F_f}^A = \Delta\left(\frac{D_{F_f}^A}{x_r}\right) + rev_{d_a f}^f \tag{A.79}$$

$$\Delta D_{F_e}^A = D_F^A - D_{F-1}^A - rev_{d_a}^f - \Delta D_{F_f}^A \tag{A.80}$$

$$rev_{d_a}^f = rev_{d_a e}^f + rev_{d_a f}^f \tag{A.81}$$

$$rev_{d_a f}^f = \left(\frac{D_{F_f}^A}{x_r}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.82}$$

$$rev_{d_a e}^f = D_F^A - D_{F-1}^A - \Delta D_F^A - rev_{d_a f}^f \tag{A.83}$$

Firms' credit issued

$$\frac{L_F^L p_{l_l}^f}{p_k^f K_F} = f\left(r_{e_l}^f, (r_l^f - infl), \frac{S_F}{p_y Y}\right) \tag{A.84}$$

$$\frac{-L_{F_e}^L p_{l_l}^f + p_{l_l}^f L_F^L}{p_{l_l}^f L_F^L} = f(p_{e_l}^f) \tag{A.85}$$

$$\frac{L_{F_f}^L p_{l_l f}^f}{x_r} = p_{l_l-1}^f L_{F-1}^L + p_{l_l}^f \Delta L_F^L + rev_{l_l}^f - p_{l_l}^f L_{F_e}^L \tag{A.86}$$

$$\Delta L_F^L \times p_{l_l}^f = p_{l_l}^f \Delta L_{F_e}^L + p_{l_l f}^f \Delta L_{F_f}^L \tag{A.87}$$

$$\Delta L^L_{F_f} \times p^f_{l_l f} = \Delta\left(\frac{p^f_{l_l f} L^L_{F_f}}{x_r}\right) + rev^f_{l_l f} \tag{A.88}$$

$$\Delta L^L_{F_e} \times p^f_{l_l} = p^f_{l_l} L^L_F - p^f_{l_l -1} L^L_{F-1} - rev^f_{l_l} - p^f_{l_l f} \Delta L^L_{F_f} \tag{A.89}$$

$$p^f_{l_l} = f(r^f_l, infl) \tag{A.90}$$

$$rev^f_{l_l} = rev^f_{l_l e} + rev^f_{l_l f} \tag{A.91}$$

$$rev^f_{l_l f} = \left(\frac{p^f_{l_l f-1} L^L_{F_f -1}}{x_{r-1}}\right) \frac{\Delta ER}{ER_{-1}} \tag{A.92}$$

$$rev^f_{l_l e} = 4L^L_{F-1} \Delta p^f_{l_l} - rev^f_{l_l f} \tag{A.93}$$

Firms' equities held and financial profitability

$$E^A_F p^f_{e_a} = p^f_{e_a} E^A_{F_e} + \frac{p^f_{e_a f} E^A_{F_f}}{x_r} \tag{A.94}$$

$$\frac{-E^A_{F_e} p^f_{e_a} + p^f_{e_a} E^A_F}{p^f_{e_a} E^A_F} = f\left[\left(\frac{\Delta p^f_{e_a}}{p^f_{e_a -1}}\right) - \left(\frac{\Delta p^{US}_e}{p^{US}_{e-1}}\right)\right] \tag{A.95}$$

$$\frac{E^A_{F_f} p^f_{e_a f}}{x_r} = p^f_{e_a -1} E^A_{F-1} + p^f_{e_a} \Delta E^A_F + rev^f_{e_a} - p^f_{e_a} E^A_{F_e} \tag{A.96}$$

$$\Delta E^A_F \times p^f_{e_a} = p^f_{e_a} \Delta E^A_{F_e} + p^f_{e_a f} \Delta E^A_{F_f} \tag{A.97}$$

$$\Delta E^A_{F_f} \times p^f_{e_a f} = \Delta\left(\frac{p^f_{e_a f} E^A_{F_f}}{x_r}\right) + rev^f_{e_a f} \tag{A.98}$$

Closing column for firms' capital account

$$\Delta E^A_{F_e} \times p^f_{e_a} = p^f_{l_l} \Delta L^L_F + p^f_{e_l} \Delta E^L_F - \Delta D^A_F + Aj_F + FC_F - p^f_{e_a f} \Delta E^A_{F_f} \tag{A.99}$$

$$p^f_{e_a} = f(p^f_{e_l}) \tag{A.100}$$

$$rev^f_{e_a} = rev^f_{e_a e} + rev^f_{e_a f} \tag{A.101}$$

$$rev^f_{e_af} = \left(\frac{E^A_{F_f-1} p^f_{e_af-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.102}$$

$$rev^f_{e_ae} = 4E^A_{F-1}\Delta p^f_{e_a} - rev^f_{e_af} \tag{A.103}$$

$$r^a_{e_f} = \frac{\Delta p^f_{e_a}}{p^f_{e_a-1}} + \frac{DIV^r_F}{p^f_{e_a-1}E^A_{F-1}} \tag{A.104}$$

Firms' equities issued and financial profitability

$$\frac{E^L_F p^f_{e_l}}{p^f_k K_F + D^A_F + p^f_{e_a}E^A_F} = f\left(\frac{S_F}{p^f_k K_{F-1}}, (r^f_l - infl), r^f_{e_l}\right) \tag{A.105}$$

$$\Delta E^L_F \times p^f_{e_l} = p^f_{e_l}E^L_F - p^f_{e_l-1}E^L_{F-1} - 4E^L_{F-1}\Delta p^f_{e_l} \tag{A.106}$$

$$p^f_{e_l} = f(p^{US}_e, r^f_l) \tag{A.107}$$

$$r^l_{e_f} = \frac{\Delta p^f_{e_l}}{p^f_{e_l-1}} + \frac{DIV^p_F}{p^f_{e_l-1}E^L_{F-1}} \tag{A.108}$$

Firms' adjustment term

$$Aj_F = a_f p_{va} VA_F \tag{A.109}$$

A.2.3 General equations

$$Y = C + I + G + X - M \tag{A.110}$$

$$VAp_{va} = p_y Y - T_{1_G} - T_{1_R} \tag{A.111}$$

$$p_{va} = f(p_y) \tag{A.112}$$

$$ln(N) = f(ln(Y)) \tag{A.113}$$

$$N^S = n^S N \tag{A.114}$$

$$ln(AP) = f(ln(N), ln(TAP)) \tag{A.115}$$

$$u = 1 - \frac{N}{AP} \tag{A.116}$$

$$ln(p_y) = f\left[ln\left(\frac{wN}{Y}\right), gap, ln(p_m)\right] \tag{A.117}$$

$$ln\left(\frac{W_{paid}}{N_{sal}}\right) = f\left[ln(p_c), ln\left(\frac{Y}{N}\right), ln(u)\right] \tag{A.118}$$

$$ER = \frac{1}{x_r} \tag{A.119}$$

$$x_r = f\left[(r^r - i^r), \frac{Assets}{Liabilities}\right] \tag{A.120}$$

$$\Delta x_r^f = f(x_{r-1}^f - x_{r-1}^{f*}) \tag{A.121}$$

$$\Delta x_r^c = f(\Delta x_{r-p}^c) \tag{A.122}$$

$$x_{r*} = 0.5x_r^f + 0.5x_r^c \tag{A.123}$$

A.2.4 Government's equations

Government's uses-resources

$$VA_G = \alpha_g VA \tag{A.124}$$

$$G = \lambda_1 Y \tag{A.125}$$

$$p_g = f(p_y) \tag{A.126}$$

$$T_{1_G} = t_1 p_{va}(VA_F + VA_H + VA_G) \tag{A.127}$$

$$W_G = p_{va} VA_G - FCC_G \tag{A.128}$$

$$INT_G^p = r_{b_l}^g p_{b_l-1}^g B_{G-1}^L \tag{A.129}$$

$$DIV_G^r = \lambda_2 p_{e_a-1}^g E_{G-1}^A \tag{A.130}$$

Closing line for social security contributions

$$SC_G = SC_H - SC_F - SC_B - SC_R \tag{A.131}$$

$$SB_G = \lambda_3 p_y Y \tag{A.132}$$

Closing line for taxes on production

$$T_{2_G} = T_{1_G} + T_{1_R} + T_{2_H} + T_{2_F} - T_{2_R} \tag{A.133}$$

Closing line for income taxes

$$T_{3_G} = T_{3_H} + T_{3_F} + T_{3_B} + T_{3_R} \tag{A.134}$$

$$S_G = p_{va} VA_G - W_G + T_2 - INT_G^p + DIV_G^r + T_3 + SC_G - SB_G - p_g G \tag{A.135}$$

$$p_i^g = f(p_y) \tag{A.136}$$

$$I_G p_i^g = p_k^g \Delta K_G \tag{A.137}$$

$$FC_G = S_G - p_i^g I_G \tag{A.138}$$

Governments' non-financial assets

$$p_k^g = f(p_k^h, p_i^g, r_{b_l}^g) \tag{A.139}$$

$$K_G p_k^g = p_{k-1}^g K_{G-1} + p_k^g \Delta K_G - FCC_G + 4K_{G-1} \Delta p_k^g \tag{A.140}$$

$$FCC_G = \delta_k^g p_{k-1}^g K_{G-1} \tag{A.141}$$

$$\Delta K_G = \lambda_4 Y \tag{A.142}$$

Government's equities held

$$E_G^A p_{e_a}^g = p_{e_a}^g E_{G_e}^A + \frac{p_{e_af}^g E_{G_f}^A}{x_r} \tag{A.143}$$

$$\frac{E_{G_f}^A p_{e_af}^g}{x_r} = \theta_e^g p_{e_a}^g E_G^A \tag{A.144}$$

$$E_{G_e}^A p_{e_a}^g = \lambda_5 p_y Y - \frac{E_{G_f}^A p_{e_af}^g}{x_r} \tag{A.145}$$

$$\Delta E_G^A \times p_{e_a}^g = p_{e_a}^g \Delta E_{G_e}^A + p_{e_af}^g \Delta E_{G_f}^A \tag{A.146}$$

$$\Delta E^A_{G_f} \times p^g_{e_a f} = \Delta\left(\frac{E^A_{G_f} p^g_{e_a f}}{x_r}\right) + rev^g_{e_a f} \tag{A.147}$$

$$\Delta E^A_{G_e} \times p^g_{e_a} = p^g_{e_a} E^A_G - p^g_{e_a -1} E^A_{G-1} - rev^g_{e_a} - p^g_{e_a f} \Delta E^A_{G_f} \tag{A.148}$$

$$p^g_{e_a} = f(p^f_{e_l}) \tag{A.149}$$

$$rev^g_{e_a} = rev^g_{e_a e} + rev^g_{e_a f} \tag{A.150}$$

$$rev^g_{e_a f} = \left(\frac{E^A_{G_f -1} p^g_{e_a f -1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.151}$$

$$rev^g_{e_a e} = 4E^A_{G-1}\Delta p^g_{e_a} - rev^g_{e_a f} \tag{A.152}$$

Government's bonds issued

$$B^L_G p^g_{b_l} = p^g_{b_l} B^L_{G_e} + \frac{p^g_{b_l f} B^L_{G_f}}{x_r} \tag{A.153}$$

$$\frac{-B^L_{G_e} p^g_{b_l} + p^g_{b_l} B^L_G}{p^g_{b_l} B^L_G} = f[r^r - (i^r + \Delta x_{r*})] \tag{A.154}$$

$$\frac{B^L_{G_f} p^g_{b_l f}}{x_r} = p^g_{b_l -1} B^L_{G-1} + p^g_{b_l} \Delta B^L_G + rev^g_{b_l} - p^g_{b_l} B^L_{G_e} \tag{A.155}$$

$$\Delta B^L_G \times p^g_{b_l} = p^g_{b_l} \Delta B^L_{G_e} + p^g_{b_l f} \Delta B^L_{G_f} \tag{A.156}$$

$$\Delta B^L_{G_f} \times p^g_{b_l f} = \Delta\left(\frac{B^L_{G_f} p^g_{b_l f}}{x_r}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.157}$$

Closing column for government's capital account

$$\Delta B^L_{G_e} \times p^g_{b_l} = p^g_k \Delta K_G + p^g_{e_a} \Delta E^A_G - S_G - Aj_G - p^g_{b_l f} \Delta B^L_{G_f} \tag{A.158}$$

$$\Delta p^g_{b_l} = \frac{rev^g_{b_l}}{4B^L_{G-1}} \tag{A.159}$$

$$rev^g_{b_l} = rev^g_{b_l e} + rev^g_{b_l f} \tag{A.160}$$

$$rev^{g}_{b_l f} = \left(\frac{p^{g}_{b_l f-1} B^{L}_{G_f -1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.161}$$

$$rev^{g}_{b_l e} = p^{g}_{b_l} B^{L}_{G} - p^{g}_{b_l -1} B^{L}_{G-1} - p^{g}_{b_l} \Delta B^{L}_{G} - rev^{g}_{b_l f} \tag{A.162}$$

Government's adjustment line

$$Aj_G = a_g p_{va} VA_G \tag{A.163}$$

A.2.5 Banks' equations

Banks' uses-resources

$$INT^{p}_{B} = r^{b}(p^{b}_{d_l -1} D^{L}_{B-1} + p^{b}_{b_l -1} B^{L}_{B-1}) \tag{A.164}$$

$$INT^{r}_{B} = INT^{p}_{B} + INT^{p}_{F} + INT^{p}_{G} - INT_H - INT_R \tag{A.165}$$

$$DIV^{p}_{B} = \gamma_1 p^{b}_{e_l -1} E^{L}_{B-1} \tag{A.166}$$

$$DIV^{r}_{B} = \gamma_2 p^{b}_{e_a -1} E^{A}_{B-1} \tag{A.167}$$

$$T_{3_B} = t_{3_b}(INT^{r}_{B-4} + DIV^{r}_{B-4}) \tag{A.168}$$

$$SB_B = \gamma_3 p_y Y \tag{A.169}$$

$$SC_B = \gamma_4 p_y Y \tag{A.170}$$

$$FC_B = INT_B + DIV_B + SC_B - SB_B - T_{3_B} \tag{A.171}$$

Banks' deposit liabilities

$$D^{L}_{B} p^{b}_{d_l} = p^{b}_{d_l} D^{L}_{B_e} + \frac{p^{b}_{d_l f} D^{L}_{B_f}}{x_r} \tag{A.172}$$

$$D^{L}_{B_e} p^{b}_{d_l} = D^{A}_{F} + p^{h}_{d_a} D^{A}_{H} + p^{r}_{d_a} D^{A}_{R} - p^{r}_{d_l} D^{L}_{R} - \theta^{b}_{d_l} p^{b}_{d_l} D^{L}_{B} \tag{A.173}$$

$$\frac{D^{L}_{B_f} p^{b}_{d_l f}}{x_r} = p^{b}_{d_l} D^{L}_{B} - p^{b}_{d_l} D^{L}_{B_e} \tag{A.174}$$

$$\Delta D_B^L \times p_{d_l}^b = p_{d_l}^b \Delta D_{B_e}^L + p_{d_l f}^b \Delta D_{B_f}^L \tag{A.175}$$

$$\Delta D_{B_f}^L \times p_{d_l f}^b = \Delta\left(\frac{D_{B_f}^L p_{d_l f}^b}{x_r}\right) + rev_{d_l f}^b \tag{A.176}$$

$$\Delta D_{B_e}^L \times p_{d_l}^b = p_{d_l}^b D_B^L - p_{d_l-1}^b D_{B-1}^L - rev_{d_l}^b - p_{d_l f}^b \Delta D_{B_f}^L \tag{A.177}$$

$$p_{d_l}^b = f(r_b^b, infl) \tag{A.178}$$

$$rev_{d_l}^b = rev_{d_l e}^b + rev_{d_l f}^b \tag{A.179}$$

$$rev_{d_l f}^b = \left(\frac{D_{B_f-1}^L p_{d_l f-1}^b}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.180}$$

$$rev_{d_l e}^b = 4D_{B-1}^L \Delta p_{d_l}^b - rev_{d_l f}^b \tag{A.181}$$

Banks' securities held

$$B_B^A p_{b_a}^b = p_{b_a}^b B_{B_e}^A + \frac{p_{b_a f}^b B_{B_f}^A}{x_r} \tag{A.182}$$

$$\frac{-B_{B_e}^A p_{b_a}^b + p_{b_a}^b B_B^A}{p_{b_a}^b B_B^A} = f[r^r - (i^r + \Delta x_{r*})] \tag{A.183}$$

$$\frac{B_{B_f}^A p_{b_a f}^b}{x_r} = \gamma_5 p_y Y - p_{b_a}^b B_{B_e}^A \tag{A.184}$$

$$\Delta B_B^A \times p_{b_a}^b = p_{b_a}^b \Delta B_{B_e}^A + p_{b_a f}^b \Delta B_{B_f}^A \tag{A.185}$$

$$\Delta B_{B_f}^A \times p_{b_a f}^b = \Delta\left(\frac{p_{b_a f}^b B_{B_f}^A}{x_r}\right) + rev_{b_a f}^b \tag{A.186}$$

$$\Delta B_{B_e}^A \times p_{b_a}^b = p_{b_a}^b B_B^A - p_{b_a-1}^b B_{B-1}^A - rev_{b_a}^b - p_{b_a f}^b \Delta B_{B_f}^A \tag{A.187}$$

$$\Delta p_{b_a}^b = \frac{rev_{b_a}^b}{4B_{B-1}^A} \tag{A.188}$$

$$rev_{b_a}^b = rev_{b_a e}^b + rev_{b_a f}^b \tag{A.189}$$

$$rev^b_{b_af} = \left(\frac{p^b_{b_af-1}B^A_{B_f-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.190}$$

$$rev^b_{b_ae} = p^b_{b_a}B^A_B - p^b_{b_a-1}B^A_{B-1} - p^b_{b_a}\Delta B^A_B - rev^b_{b_af} \tag{A.191}$$

Banks' securities issued

$$B^L_B p^b_{b_l} = p^b_{b_l}B^L_{B_e} + \frac{p^b_{b_lf}B^L_{B_f}}{x_r} \tag{A.192}$$

Closing line for securities (stock form)

$$B^L_{B_e}p^b_{b_l} = p^b_{b_a}B^A_B + p^r_{b_a}B^A_R - p^g_{b_l}B^L_G - p^r_{b_l}B^L_R - \theta^b_{b_l}p^b_{b_l}B^L_B \tag{A.193}$$

$$\frac{B^L_{B_f}p^b_{b_lf}}{x_r} = p^b_{b_l-1}B^L_{B-1} + p^b_{b_l}\Delta B^L_B + rev^b_{b_l} - p^b_{b_l}B^L_{B_e} \tag{A.194}$$

$$\Delta B^L_B \times p^b_{b_l} = p^b_{b_l}\Delta B^L_{B_e} + p^b_{b_lf}\Delta B^L_{B_f} \tag{A.195}$$

$$\Delta B^L_{B_f} \times p^b_{b_lf} = \Delta\left(\frac{p^b_{b_lf}B^L_{B_f}}{x_r}\right) + rev^b_{b_lf} \tag{A.196}$$

$$\Delta B^L_{B_e} \times p^b_{b_l} = p^b_{b_l}B^L_B - p^b_{b_l-1}B^L_{B-1} - rev^b_{b_l} - p^b_{b_lf}\Delta B^L_{B_f} \tag{A.197}$$

$$\Delta p^b_{b_l} = \frac{rev^b_{b_l}}{4B^L_{B-1}} \tag{A.198}$$

$$rev^b_{b_l} = rev^b_{b_le} + rev^b_{b_lf} \tag{A.199}$$

$$rev^b_{b_le} = 4B^L_{B-1}\Delta p^b_{b_l} - rev^b_{b_lf} \tag{A.200}$$

$$rev^b_{b_lf} = \left(\frac{p^b_{b_lf-1}B^L_{B_f-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.201}$$

Banks' credit granted

$$L^A_B p^b_{l_a} = p^b_{l_a}L^A_{B_e} + \frac{p^b_{l_af}L^A_{B_f}}{x_r} \tag{A.202}$$

$$\frac{-L^A_{B_e} p^b_{l_a} + p^b_{l_a} L^A_B}{p^b_{l_a} L^A_B} = f[r^r - (i^r + \Delta x_{r*})] \tag{A.203}$$

Closing line for credit (stock form)

$$\frac{L^A_{B_f} p^b_{l_a f}}{x_r} = p^h_{l_l} L^L_H + p^f_{l_l} L^L_F + p^r_{l_l} L^L_R - p^r_{l_a} L^A_R - p^b_{l_a} L^A_{B_e} \tag{A.204}$$

$$\Delta L^A_B \times p^b_{l_a} = p^b_{l_a} \Delta L^A_{B_e} + p^b_{l_a f} \Delta L^A_{B_f} \tag{A.205}$$

$$\Delta L^A_{B_f} \times p^b_{l_a f} = \Delta \left(\frac{p^b_{l_a f} L^A_{B_f}}{x_r} \right) + rev^b_{l_a f} \tag{A.206}$$

$$\Delta L^A_{B_e} \times p^b_{l_a} = p^b_{l_a} L^A_B - p^b_{l_a -1} L^A_{B-1} - rev^b_{l_a} - p^b_{l_a f} \Delta L^A_{B_f} \tag{A.207}$$

$$p^b_{l_a} = f \left(\frac{p^f_{e_l}}{p^f_k} \right) \tag{A.208}$$

$$rev^b_{l_a} = rev^b_{l_a e} + rev^b_{l_a f} \tag{A.209}$$

$$rev^b_{l_a f} = \left(\frac{p^b_{l_a f -1} L^A_{B_f -1}}{x_{r-1}} \right) \frac{\Delta ER}{ER_{-1}} \tag{A.210}$$

$$rev^b_{l_a e} = 4 L^A_{B-1} \Delta p^b_{l_a} - rev^b_{l_a f} \tag{A.211}$$

Banks' equities held

$$E^A_B p^b_{e_a} = p^b_{e_a} E^A_{B_e} + \frac{p^b_{e_a f} E^A_{B_f}}{x_r} \tag{A.212}$$

$$\frac{-E^A_{B_e} p^b_{e_a} + p^b_{e_a} E^A_B}{p^b_{e_a} E^A_B} = f[r^r - (i^r + \Delta x_{r*})] \tag{A.213}$$

$$\frac{E^A_{B_f} p^b_{e_a f}}{x_r} = \gamma_6 p_y Y - p^b_{e_a} E^A_{B_e} \tag{A.214}$$

$$\Delta E^A_B \times p^b_{e_a} = p^b_{e_a} \Delta E^A_{B_e} + p^b_{e_a f} \Delta E^A_{B_f} \tag{A.215}$$

$$\Delta E^A_{B_f} \times p^b_{e_af} = \Delta\left(\frac{p^b_{e_af} E^A_{B_f}}{x_r}\right) + rev^b_{e_af} \tag{A.216}$$

$$\Delta E^A_{B_e} \times p^b_{e_a} = p^b_{e_a} E^A_B - p^b_{e_a-1} E^A_{B-1} - rev^b_{e_a} - p^b_{e_af} \Delta E^A_{B_f} \tag{A.217}$$

$$p^b_{e_a} = f(p^f_{e_l}) \tag{A.218}$$

$$rev^b_{e_a} = rev^b_{e_ae} + rev^b_{e_af} \tag{A.219}$$

$$rev^b_{e_af} = \left(\frac{p^b_{e_af-1} E^A_{B_f-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.220}$$

$$rev^b_{e_ae} = 4E^A_{B-1}\Delta p^b_{e_a} - rev^b_{e_af} \tag{A.221}$$

Banks' equities issued

$$E^L_B p^b_{e_l} = p^b_{e_l-1} E^L_{B-1} + p^b_{e_l}\Delta E^L_B + 4E^L_{B-1}\Delta p^b_{e_l} \tag{A.222}$$

Closing column for banks' capital account

$$\Delta E^L_B \times p^b_{e_l} = p^b_{b_a}\Delta B^A_B + p^b_{l_a}\Delta L^A_B + p^b_{e_a}\Delta E^A_B - p^b_{d_l}\Delta D^L_B - p^b_{b_l}\Delta B^L_B - FC_B - Aj_B \tag{A.223}$$

$$p^b_{e_l} = f(p^f_{e_l}) \tag{A.224}$$

Banks' adjustment line

$$Aj_B = a_b p_y Y \tag{A.225}$$

A.2.6 Current and capital accounts

Foreign trade equations

$$ln(X) = f\left[ln(Y^f), ln\left(\frac{p_x}{p_{x*}/x_r}\right)\right] \tag{A.226}$$

$$ln(p_x) = f\left[ln(p_y), ln\left(\frac{p_{x*}}{x_r}\right)\right] \tag{A.227}$$

$$ln(M) = f\left[ln(Y), ln\left(\frac{p_y}{p_m}\right)\right] \tag{A.228}$$

$$ln(p_m) = f\left[ln(p_y), ln\left(\frac{p_{m*}}{x_r}\right)\right] \quad (A.229)$$

Transactions with the rest of the world

$$T_{1_R} = t_{1_r} p_y Y \quad (A.230)$$

$$W_R = w_r p_y Y \quad (A.231)$$

$$T_{2_R} = t_{2_r} p_y Y \quad (A.232)$$

$$T_{3_R} = t_{3_r} p_y Y \quad (A.233)$$

$$INT_R^p = r^r(p^r_{d_l-1} D^L_{R-1} + p^r_{b_l-1} B^L_{R-1} + p^l_{l_r-1} L^L_{R-1}) \quad (A.234)$$

$$INT_R^r = (i^r + \Delta x_r)(p^r_{d_a-1} D^A_{R-1} + p^r_{b_a-1} B^A_{R-1} + p^r_{a_l-1} L^A_{R-1}) \quad (A.235)$$

$$DIV_R^p = \epsilon_1 p^r_{e_l-1} E^L_{R-1} \quad (A.236)$$

$$DIV_R^r = \epsilon_2 p^r_{e_a-1} E^A_{R-1} \quad (A.237)$$

$$SC_R = \epsilon_3 W_R \quad (A.238)$$

$$SB_R = \epsilon_4 p_y Y \quad (A.239)$$

Deposits held by the rest of the world, issued by French banks (i.e. reserves and SDRs)

$$D^A_R p^r_{d_a} = p^r_{d_a} D^A_{R_e} + \frac{p^r_{d_af} D^A_{R_f}}{x_r} \quad (A.240)$$

$$\frac{-D^A_{R_e} p^r_{d_a} + p^r_{d_a} D^A_R}{p^r_{d_a} D^A_R} = f[r^r - (i^r + \Delta x_{r*})] \quad (A.241)$$

$$\frac{p^r_{d_af} D^A_{R_f}}{x_r} = \epsilon_5 p_y Y - p^r_{d_a} D^A_{R_e} \quad (A.242)$$

$$\Delta D^A_R \times p^r_{d_a} = p^r_{d_a} \Delta D^A_{R_e} + p^r_{d_af} \Delta D^A_{R_f} \quad (A.243)$$

$$\Delta D^A_{R_f} \times p^r_{d_af} = \Delta\left(\frac{p^r_{d_af} D^A_{R_f}}{x_r}\right) + rev^r_{d_af} \tag{A.244}$$

$$\Delta D^A_{R_e} \times p^r_{d_a} = p^r_{d_a} D^A_R - p^r_{d_a-1} D^A_{R-1} - rev^r_{d_a} - p^r_{d_af} \Delta D^A_{R_f} \tag{A.245}$$

$$p^r_{d_a} = f[(i^r + \Delta x_r), infl] \tag{A.246}$$

$$rev^r_{d_a} = rev^r_{d_ae} + rev^r_{d_af} \tag{A.247}$$

$$rev^r_{d_af} = \left(\frac{p^r_{d_af-1} D^A_{R_f-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.248}$$

$$rev^r_{d_ae} = 4D^A_{R-1}\Delta p^r_{d_a} - rev^r_{d_af} \tag{A.249}$$

Deposits issued by the rest of the world, held by French banks

$$D^L_R p^r_{d_l} = p^r_{d_l} D^L_{R_e} + \frac{p^r_{d_lf} D^L_{R_f}}{x_r} \tag{A.250}$$

$$D^L_{R_e} p^r_{d_l} = p^r_{d_l-1} D^L_{R-1} + p^r_{d_l} \Delta D^L_R + rev^r_{d_l} - \theta^r_{d_l} p^r_{d_l} D^L_R \tag{A.251}$$

$$\frac{D^L_{R_f} p^r_{d_lf}}{x_r} = \epsilon_6 p_y Y - p^r_{d_l} D^L_{R_e} \tag{A.252}$$

$$\Delta D^L_R \times p^r_{d_l} = p^r_{d_l} \Delta D^L_{R_e} + p^r_{d_lf} \Delta D^L_{R_f} \tag{A.253}$$

$$\Delta D^L_{R_f} \times p^r_{d_lf} = \Delta\left(\frac{p^r_{d_lf} D^L_{R_f}}{x_r}\right) + rev^r_{d_lf} \tag{A.254}$$

$$\Delta D^L_{R_e} \times p^r_{d_l} = p^r_{d_l} D^L_R - p^r_{d_l-1} D^L_{R-1} - rev^r_{d_l} - p^r_{d_lf} \Delta D^L_{R_f} \tag{A.255}$$

$$p^r_{d_l} = f(r^r) \tag{A.256}$$

$$rev^r_{d_l} = rev^r_{d_le} + rev^r_{d_lf} \tag{A.257}$$

$$rev^r_{d_lf} = \left(\frac{p^r_{d_lf-1} D^L_{R_f-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.258}$$

$$rev^r_{d_l e} = 4D^L_{R-1}\Delta p^r_{d_l} - rev^r_{d_l f} \tag{A.259}$$

Securities held by the rest of the world, issued by French banks

$$B^A_R p^r_{b_a} = p^r_{b_a} B^A_{R_e} + \frac{p^r_{b_a f} B^A_{R_f}}{x_r} \tag{A.260}$$

$$\frac{-B^A_{R_e} p^r_{b_a} + p^r_{b_a} B^A_R}{p^r_{b_a} B^A_R} = f[r^r - (i^r + \Delta x_{r*})] \tag{A.261}$$

$$\frac{B^A_{R_f} p^r_{b_a f}}{x_r} = p^r_{b_a -1} B^A_{R-1} + p^r_{b_a}\Delta B^A_R + rev^r_{b_a} - p^r_{b_a} B^A_{R_e} \tag{A.262}$$

$$\Delta B^A_R \times p^r_{b_a} = p^r_{b_a}\Delta B^A_{R_e} + p^r_{b_a f}\Delta B^A_{R_f} \tag{A.263}$$

$$\Delta B^A_{R_f} \times p^r_{b_a f} = \Delta\left(\frac{p^r_{b_a f} B^A_{R_f}}{x_r}\right) + rev^r_{b_a f} \tag{A.264}$$

$$\Delta B^A_{R_e} \times p^r_{b_a} = \epsilon_a p_y Y - p^r_{b_a f}\Delta B^A_{R_f} \tag{A.265}$$

$$\Delta p^r_{b_a} = \frac{rev^r_{b_a}}{4B^A_{R-1}} \tag{A.266}$$

$$rev^r_{b_a} = rev^r_{b_a e} + rev^r_{b_a f} \tag{A.267}$$

$$rev^r_{b_a f} = \left(\frac{p^r_{b_a f-1} B^A_{R_f -1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.268}$$

$$rev^r_{b_a e} = p^r_{b_a} B^A_R - p^r_{b_a -1} B^A_{R-1} - p^r_{b_a}\Delta B^A_R - rev^r_{b_a f} \tag{A.269}$$

Securities issued by the rest of the world, held by French banks

$$B^L_R p^r_{b_l} = p^r_{b_l} B^L_{R_e} + \frac{p^r_{b_l f} B^L_{R_f}}{x_r} \tag{A.270}$$

$$\frac{B^L_{R_f} p^r_{b_l f}}{x_r} = p^r_{b_l -1} B^L_{R-1} + p^r_{b_l}\Delta B^L_R + rev^r_{b_l} - p^r_{b_l} B^L_{R_e} \tag{A.271}$$

$$B^L_{R_e} p^r_{b_l} = \epsilon_8 p_y Y - \theta^r_{b_l} p^r_{b_l} B^L_R \tag{A.272}$$

$$\Delta B_R^L \times p_{b_l}^r = p_{b_l}^r \Delta B_{R_e}^L + p_{b_l f}^r \Delta B_{R_f}^L \tag{A.273}$$

$$\Delta B_{R_f}^L \times p_{b_l f}^r = \Delta \left(\frac{p_{b_l f}^r B_{R_f}^L}{x_r} \right) + rev_{b_l f}^r \tag{A.274}$$

$$\Delta B_{R_e}^L \times p_{b_l}^r = p_{b_l}^r B_R^L - p_{b_l-1}^r B_{R-1}^L - rev_{b_l}^r - p_{b_l f}^r \Delta B_{R_f}^L \tag{A.275}$$

$$\Delta p_{b_l}^r = \frac{rev_{b_l}^r}{4B_{R-1}^L} \tag{A.276}$$

$$rev_{b_l}^r = rev_{b_l e}^r + rev_{b_l f}^r \tag{A.277}$$

$$rev_{b_l f}^r = \left(\frac{p_{b_l f-1}^r B_{R_f-1}^L}{x_{r-1}} \right) \frac{\Delta ER}{ER_{-1}} \tag{A.278}$$

$$rev_{b_l e}^r = p_{b_l}^r B_R^L - p_{b_l-1}^r B_{R-1}^L - p_{b_l}^r \Delta B_R^L - rev_{b_l f}^r \tag{A.279}$$

Credit held by the rest of the world, issued by French residents

$$L_R^A p_{l_a}^r = p_{l_a}^r L_{R_e}^A + \frac{p_{l_a f}^r L_{R_f}^A}{x_r} \tag{A.280}$$

$$L_{R_e}^A p_{l_a}^r = p_{l_a-1}^r L_{R-1}^A + p_{l_a}^r \Delta L_R^A + rev_{l_a}^r - \frac{p_{l_a f}^r L_{R_f}^A}{x_r} \tag{A.281}$$

$$\frac{L_{R_f}^A p_{l_a f}^r}{x_r} = \theta_{l_a}^r p_{l_a}^r L_R^A \tag{A.282}$$

$$\Delta L_R^A \times p_{l_a}^r = p_{l_a}^r \Delta L_{R_e}^A + p_{l_a f}^r \Delta L_{R_f}^A \tag{A.283}$$

$$\Delta L_{R_f}^A \times p_{l_a f}^r = \Delta \left(\frac{p_{l_a f}^r L_{R_f}^A}{x_r} \right) + rev_{l_a f}^r \tag{A.284}$$

$$\Delta L_{R_e}^A \times p_{l_a}^r = p_{l_a}^r L_R^A - p_{l_a-1}^r L_{R-1}^A - rev_{l_a}^r - p_{l_a f}^r \Delta L_{R_f}^A \tag{A.285}$$

$$p_{l_a}^r = f[(i + \Delta x_{r*}), infl] \tag{A.286}$$

$$rev_{l_a}^r = rev_{l_a e}^r + rev_{l_a f}^r \tag{A.287}$$

$$rev^r_{l_af} = \left(\frac{p^r_{l_af-1}L^A_{R_f-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.288}$$

$$rev^r_{l_ae} = 4L^A_{R-1}\Delta p^r_{l_a} - rev^r_{l_af} \tag{A.289}$$

Credit issued by the rest of the world, held by French banks

$$L^L_R p^r_{l_l} = p^r_{l_l}L^L_{R_e} + \frac{p^r_{l_lf}L^L_{R_f}}{x_r} \tag{A.290}$$

$$\frac{L^L_{R_f}p^r_{l_lf}}{x_r} = \theta^r_{l_l}p^r_{l_l}L^L_R \tag{A.291}$$

$$L^L_{R_e}p^r_{l_l} = p^r_{l_l-1}L^L_{R-1} + p^r_{l_l}\Delta L^L_R + rev^r_{l_a} - \frac{p^r_{l_lf}L^L_{R_f}}{x_r} \tag{A.292}$$

$$\Delta L^L_R \times p^r_{l_l} = p^r_{l_l}\Delta L^L_{R_e} + p^r_{l_lf}\Delta L^L_{R_f} \tag{A.293}$$

$$\Delta L^L_{R_e} \times p^r_{l_l} = p^r_{l_l}L^L_R - p^r_{l_l-1}L^L_{R-1} - rev^r_{l_l} - p^r_{l_lf}\Delta L^L_{R_f} \tag{A.294}$$

$$\Delta L^L_{R_f} \times p^r_{l_lf} = \Delta\left(\frac{L^L_{R_f}p^r_{l_lf}}{x_r}\right) + rev^r_{l_lf} \tag{A.295}$$

$$p^r_{l_l} = f(r^r, infl) \tag{A.296}$$

$$rev^r_{l_l} = rev^r_{l_le} + rev^r_{l_lf} \tag{A.297}$$

$$rev^r_{l_lf} = \left(\frac{L^L_{R_f-1}p^r_{l_lf-1}}{x_{r-1}}\right)\frac{\Delta ER}{ER_{-1}} \tag{A.298}$$

Equities held by the rest of the world, issued by French companies

$$E^A_R p^r_{e_a} = p^r_{e_a-1}E^A_{R-1} + p^r_{e_a}\Delta E^A_R + rev^r_{e_a} \tag{A.299}$$

Closing column for the rest of the world's capital account

$$\Delta E^A_R \times p^r_{e_a} = p^r_{d_l}\Delta D^L_R + p^r_{b_l}\Delta B^L_R + p^r_{l_l}\Delta L^L_R + p^r_{e_l}\Delta E^L_R - p^r_{d_a}\Delta D^A_R - p^r_{b_a}\Delta B^A_R - p^r_{l_a}\Delta L^A_R + FC_R + Aj_R \tag{A.300}$$

$$\Delta p^r_{e_a} = \frac{rev^r_{e_a}}{4E^A_{R-1}} \tag{A.301}$$

Equities issued by companies abroad, held by French residents

$$E^L_R p^r_{e_l} = p^f_{e_a} E^A_F + p^b_{e_a} E^A_B + p^g_{e_a} E^A_G + p^h_{e_a} E^A_H + p^r_{e_l} E^A_R - p^f_{e_l} E^L_F - p^b_{e_l} E^L_B \tag{A.302}$$

$$\Delta E^L_R \times p^r_{e_l} = p^r_{e_l} E^L_R - p^r_{e_l-1} E^L_{R-1} - rev^r_{e_l} \tag{A.303}$$

$$\Delta p^r_{e_l} = \frac{rev^r_{e_l}}{4E^L_{R-1}} \tag{A.304}$$

Adjustment line for the rest of the world

$$Aj_R = a_r p_y Y \tag{A.305}$$

System's closing variable and unwritten equation

$$FC_R = p_m M + INT^r_R + DIV^r_R + SC_R + SB_R - p_x X - W_R - T_{2_R} - INT^p_R - DIV^p_R - T_{3_R} \tag{A.306}$$

$$FC_R = -(FC_H + FC_F + FC_G + FC_B) \tag{A.307}$$

A.3 Nomenclature per term

The following list presents the symbols on the left, followed by the explanation of each term on the right. All price indexes equal 1 in 2005 (i.e. the average of the four quarters in that year equal unity). The order of appearance is alphabetical, starting with symbols.

The reader will notice that the list is 8 pages long. In order not to make the list longer and save some space, the description of the revaluation terms and OCVs are omitted. The inclusion of these terms would almost double the number of equations and pages. It will be noted, however, that their interpretation is straightforward, once the reader becomes familiar with the notation for stocks an flows. For instance, the revaluation term of (say) deposits held by firms in domestic currency is written $rev^e_{d_a f}$, whereas its corresponding OCV term would be written as $OCV^F_{D_A}$.

Note: this long list is useful in order to follow the system of equation described just above and in chapter 4. It is noteworthy to mention that the separation of financial instruments into domestic and foreign currency (here only stocks and flows) made the system way larger than it was originally planned. These terms are, however, necessary for the integral inclusion of the exchange rate.

α_h Share of households' value added out of total

α_g Share of government's value added out of total

δ_k^f Depreciation rate of firms' non-financial assets

δ_k^g Depreciation rate of government's non-financial assets

δ_k^h Depreciation rate of households' non-financial assets

ϵ_1 Share of dividends paid by the rest of the world out of the stock of equities it issues (annualized)

ϵ_2 Share of dividends received by the rest of the world out of the stock of equities it holds (annualized)

ϵ_3 Share of social security contributions received by the rest of the world out of wages

ϵ_4 Share of social security benefits received by the rest of the world out of *GDP*

ϵ_5 Share of stock of deposits held by the rest of the world out of *GDP* (values)

ϵ_6 Share of stock of deposit liabilities of the rest of the world out of *GDP* (values)

ϵ_8 Share of stock of securities issued by the rest of the world out of *GDP* (values)

γ_1 Share of dividends paid by banks out of the stock of equities they issue (annualized)

γ_2 Share of dividends received by banks out of the stock of equities they hold (annualized)

γ_3 Share of social security benefits paid by banks out of *GDP*

γ_4 Share of social security contributions received by banks out of *GDP*

γ_4 Share of stock of securities held by banks out of *GDP* (values)

γ_6 Share of stock of equities held by banks out of *GDP* (values)

λ_1 Share of government expenditure out of *GDP* (volumes)

λ_2 Share of dividends received by the government out of the stock of equities they hold (annualized)

λ_3 Share of social security benefits paid by the government out of *GDP*

λ_4 Share of public investment out of *GDP* (volumes)

λ_5 Share of stock of equities held by the government out of *GDP* (values)

Π_F Profits received by firms (value)

Π_F^a Profits after distribution received by firms (value)

Π_H Profits received by individual entrepreneurs (value)

ϕ_1 Share of dividends paid by firms out of the stock of equities they issue (annualized)

ϕ_2 Share of social security contributions received by firms out of *GDP*

ϕ_3 Share of social security benefits paid by firms out of *GDP*

ϕ_4 Share of deposits held by households out of *GDP* (values)

ψ_1 Share of dividends received by firms out of the stock of equities they hold (annualized)

ψ_2 Share of social security contributions paid by households out of their wages

ψ_4 Share of deposits held by households out of personal consumption expenditures (values)

ΔB_B^A Flow of securities held by banks (volume)

$\Delta B_{B_e}^A$ Flow of securities held by banks in domestic currency (volume)

$\Delta B_{B_f}^A$ Flow of securities held by banks in foreign currency (volume)

ΔB_R^A Flow of securities held by the rest of the world (volume)

$\Delta B^A_{R_e}$ Flow of securities held by the rest of the world in domestic currency (volume)
$\Delta B^A_{R_f}$ Flow of securities held by the rest of the world in foreign currency (volume)
ΔB^L_B Flow of securities issued by banks (volume)
$\Delta B^L_{B_e}$ Flow of securities issued by banks in domestic currency (volume)
$\Delta B^L_{B_f}$ Flow of securities issued by banks in foreign currency (volume)
ΔB^L_G Flow of bonds issued by the government (volume)
$\Delta B^L_{G_e}$ Flow of bonds issued by the government in domestic currency (volume)
$\Delta B^L_{G_f}$ Flow of bonds issued by the government in foreign currency (volume)
ΔB^L_R Flow of securities issued by the rest of the world (volume)
$\Delta B^L_{R_e}$ Flow of securities issued by the rest of the world in domestic currency (volume)
$\Delta B^L_{R_f}$ Flow of securities issued by the rest of the world in foreign currency (volume)
ΔD^A_F Flow of deposits held by firms (volume)
$\Delta D^A_{F_e}$ Flow of deposits held by firms in domestic currency (volume)
$\Delta D^A_{F_f}$ Flow of deposits held by firms in foreign currency (volume)
ΔD^A_H Flow of deposits held by households (volume)
$\Delta D^A_{H_e}$ Flow of deposits held by households in domestic currency (volume)
$\Delta D^A_{H_f}$ Flow of deposits held by households in foreign currency (volume)
ΔD^A_R Flow of deposits held by the rest of the world (volume)
$\Delta D^A_{R_e}$ Flow of deposits held by the rest of the world in domestic currency (volume)
$\Delta D^A_{R_f}$ Flow of deposits held by the rest of the world in foreign currency (volume)
ΔD^L_B Flow of deposit liabilities of banks (volume)
$\Delta D^L_{B_e}$ Flow of deposit liabilities of banks in domestic currency (volume)
$\Delta D^L_{B_f}$ Flow of deposit liabilities of banks in foreign currency (volume)
ΔD^L_R Flow of deposit liabilities of the rest of the world (volume)
$\Delta D^L_{R_e}$ Flow of deposit liabilities of the rest of the world in domestic currency (volume)
$\Delta D^L_{R_f}$ Flow of deposit liabilities of the rest of the world in foreign currency (volume)
ΔE^A_B Flow of equities held by banks (volume)
$\Delta E^A_{B_e}$ Flow of equities held by banks in domestic currency (volume)
$\Delta E^A_{B_f}$ Flow of equities held by banks in foreign currency (volume)
ΔE^A_F Flow of equities held by firms (volume)
$\Delta E^A_{F_e}$ Flow of equities held by firms in domestic currency (volume)
$\Delta E^A_{F_f}$ Flow of equities held by firms in foreign currency (volume)
ΔE^A_G Flow of equities held by the government (volume)
$\Delta E^A_{G_e}$ Flow of equities held by the government in domestic currency (volume)
$\Delta E^A_{G_f}$ Flow of equities held by the government in foreign currency (volume)
ΔE^A_H Flow of equities held by households (volume)

$\Delta E_{H_e}^A$ Flow of equities held by households in domestic currency (volume)
$\Delta E_{H_f}^A$ Flow of equities held by households in foreign currency (volume)
ΔE_B^L Flow of equities issued by banks (volume)
ΔE_F^L Flow of equities issued by firms (volume)
ΔK_F Flow of firms' non-financial assets (volume)
ΔK_G Flow of government's non-financial assets (volume)
ΔK_H Flow of households' non-financial assets (volume)
ΔL_B^A Flow of debt holdings of banks (volume)
$\Delta L_{B_e}^A$ Flow of debt holdings of banks in domestic currency (volume)
$\Delta L_{B_f}^A$ Flow of debt holdings of banks in foreign currency (volume)
ΔL_R^A Flow of debt holdings of the rest of the world (volume)
$\Delta L_{R_e}^A$ Flow of debt holdings of the rest of the world in domestic currency (volume)
$\Delta L_{R_f}^A$ Flow of debt holdings of the rest of the world in foreign currency (volume)
ΔL_F^L Flow of debt liabilities of firms (volume)
$\Delta L_{F_e}^L$ Flow of debt liabilities of firms in domestic currency (volume)
$\Delta L_{F_f}^L$ Flow of debt liabilities of firms in foreign currency (volume)
ΔL_H^L Flow of debt liabilities of households (volume)
$\Delta L_{H_e}^L$ Flow of debt liabilities of households in domestic currency (volume)
$\Delta L_{H_f}^L$ Flow of debt liabilities of households in foreign currency (volume)
ΔL_R^L Flow of debt liabilities of the rest of the world (volume)
$\Delta L_{R_e}^L$ Flow of debt liabilities of the rest of the world in domestic currency (volume)
$\Delta L_{R_f}^L$ Flow of debt liabilities of the rest of the world in foreign currency (volume)
Aj_B Adjustment term of banks
Aj_F Adjustment term of firms
Aj_G Adjustment term of the government
Aj_H Adjustment term of households
Aj_R Adjustment term of the rest of the world
AP Active population
B_B^A Stock of securities held by banks (volume)
$B_{B_e}^A$ Stock of securities held by banks in domestic currency (volume)
$B_{B_f}^A$ Stock of securities held by banks in foreign currency (volume)
B_R^A Stock of securities held by the rest of the world (volume)
$B_{R_e}^A$ Stock of securities held by the rest of the world in domestic currency (volume)
$B_{R_f}^A$ Stock of securities held by the rest of the world in foreign currency (volume)
B_B^L Stock of securities issued by banks (volume)
$B_{B_e}^L$ Stock of securities issued by banks in domestic currency (volume)
$B_{B_f}^L$ Stock of securities issued by banks in foreign currency (volume)
B_G^L Stock of bonds issued by the government (volume)

$B^L_{G_e}$ Stock of bonds issued by the government in domestic currency (volume)
$B^L_{G_f}$ Stock of bonds issued by the government in foreign currency (volume)
B^L_R Stock of securities issued by the rest of the world (volume)
$B^L_{R_e}$ Stock of securities issued by the rest of the world in domestic currency (volume)
$B^L_{R_f}$ Stock of securities issued by the rest of the world in foreign currency (volume)
C Consumption (volume)
D^A_F Stock of deposits held by firms (value)
$D^A_{F_e}$ Stock of deposits held by firms in domestic currency (value)
$D^A_{F_f}$ Stock of deposits held by firms in foreign currency (value)
D^A_H Stock of deposits held by households (volume)
$D^A_{H_e}$ Stock of deposits held by households in domestic currency (volume)
$D^A_{H_f}$ Stock of deposits held by households in foreign currency (volume)
D^A_R Stock of deposits held by the rest of the world (volume)
$D^A_{R_e}$ Stock of deposits held by the rest of the world in domestic currency (volume)
$D^A_{R_f}$ Stock of deposits held by the rest of the world in foreign currency (volume)
D^L_B Stock of deposit liabilities of banks (volume)
$D^L_{B_e}$ Stock of deposit liabilities of banks in domestic currency (volume)
$D^L_{B_f}$ Stock of deposit liabilities of banks in foreign currency (volume)
D^L_R Stock of deposit liabilities of the rest of the world (volume)
$D^L_{R_e}$ Stock of deposit liabilities of the rest of the world in domestic currency (volume)
$D^L_{R_f}$ Stock of deposit liabilities of the rest of the world in foreign currency (volume)
DIV^p_B Value of dividends paid by banks
DIV^p_F Value of dividends paid by firms
DIV^p_R Value of dividends paid by the rest of the world
DIV^r_B Value of dividends received by banks
DIV^r_F Value of dividends received by firms
DIV^r_G Value of dividends received by the government
DIV^r_H Value of dividends received by households
DIV^r_R Value of dividends received by the rest of the world
E^A_B Stock of equities held by banks (volume)
$E^A_{B_e}$ Stock of equities held by banks in domestic currency (volume)
$E^A_{B_f}$ Stock of equities held by banks in foreign currency (volume)
E^A_F Stock of equities held by firms (volume)
$E^A_{F_e}$ Stock of equities held by firms in domestic currency (volume)
$E^A_{F_f}$ Stock of equities held by firms in foreign currency (volume)
E^A_G Stock of equities held by the government (volume)
$E^A_{G_e}$ Stock of equities held by the government in domestic currency (volume)

$E^A_{G_f}$ Stock of equities held by the government in foreign currency (volume)
E^A_H Stock of equities held by households (volume)
$E^A_{H_e}$ Stock of equities held by households in domestic currency (volume)
$E^A_{H_f}$ Stock of equities held by households in foreign currency (volume)
E^A_R Stock of equities held by the rest of the world (volume)
E^L_F Stock of equities issued by firms (volume)
E^L_B Stock of equities issued by banks (volume)
E^L_R Stock of equities issued by the rest of the world (volume)
ER Exchange rate (under the price quotation system)
FC_B Financing capacity of banks
FC_F Financing capacity of firms
FC_F Financing capacity of the government
FC_H Financing capacity of households
FC_R Financing capacity of the rest of the world (French current account)
FCC_F Fixed capital consumption, or depreciation, of firms (value)
FCC_G Fixed capital consumption, or depreciation, of th government (value)
FCC_H Fixed capital consumption, or depreciation, of households (value)
G Public consumption expenditure (volume)
I_H Households' investment (volume)
I_F Firms' investment, national accounts (volume)
I_G Public investment (volume)
i^h_d Interest rate on deposits received by households
i^r Interest rate received by the rest of the world
$infl$ Inflation rate
INT^p_B Value of interests paid by banks
INT^p_G Value of interests paid by the government
INT^p_H Value of interests paid by households
INT^p_F Value of interests paid by firms
INT^p_R Value of interests paid by the rest of the world
INT^r_B Value of interests received by banks
INT^r_H Value of interests received by households
INT^r_R Value of interests received by the rest of the world
K_F Stock of non-financial assets of firms (volume)
K_G Stock of non-financial assets of the government (volume)
K_H Stock of non-financial assets of households (volume)
L^A_B Stock of loans granted by banks (volume)
$L^A_{B_e}$ Stock of loans granted by banks in domestic currency (volume)
$L^A_{B_f}$ Stock of loans granted by banks in foreign currency (volume)
L^A_R Stock of loans granted by the rest of the world (volume)
$L^A_{R_e}$ Stock of loans granted by the rest of the world in domestic currency (volume)
$L^A_{R_f}$ Stock of loans granted by the rest of the world in foreign currency (volume)

L_F^L Stock of loans contracted by firms (volume)
$L_{F_e}^L$ Stock of loans contracted by firms in domestic currency (volume)
$L_{F_f}^L$ Stock of loans contracted by firms in foreign currency (volume)
L_H^L Stock of loans contracted by households (volume)
$L_{H_e}^L$ Stock of loans contracted by households in domestic currency (volume)
$L_{H_f}^L$ Stock of loans contracted by households in foreign currency (volume)
L_R^L Stock of loans contracted by the rest of the world (volume)
$L_{R_e}^L$ Stock of loans contracted by the rest of the world in domestic currency (volume)
$L_{R_f}^L$ Stock of loans contracted by the rest of the world in foreign currency (volume)
M Imports (volume)
N Employment
N^S Salaried employees
n^s Share of salaried employees out of total
p_c Consumer price index
$p_{b_a}^b$ Price of securities held by banks
$p_{b_a}^r$ Price of securities held by the rest of the world
$p_{b_l}^b$ Price of securities issued by banks
$p_{b_l}^g$ Price of bonds issued by the government
$p_{b_l}^r$ Price of bonds issued by the rest of the world
$p_{d_a}^h$ Price of deposits held by households
$p_{d_a}^r$ Price of deposits held by the rest of the world
$p_{d_l}^b$ Price of deposit liabilities of banks
$p_{d_l}^r$ Price of deposit liabilities of the rest of the world
$p_{e_a}^b$ Price of equities held by banks
$p_{e_a}^f$ Price of equities held by firms
$p_{e_a}^g$ Price of equities held by the government
$p_{e_a}^h$ Price of equities held by households
$p_{e_a}^r$ Price of equities held by the rest of the world
$p_{e_l}^b$ Price of equities issued by banks
$p_{e_l}^f$ Price of equities issued by firms
$p_{e_l}^r$ Price of equities issued by the rest of the world
p_g Price of public consumption expenditure
p_i^h Households' investment price index
p_i^f Firms' investment price index
p_i^g Public investment price index
p_k^f Price of non-financial assets of firms
p_k^g Price of non-financial assets of the government
p_k^h Price of non-financial assets of households

$p_{l_a}^{b}$ Price of debt holdings of banks
$p_{l_a}^{r}$ Price of debt holdings of the rest of the world
$p_{l_l}^{f}$ Price of debt liabilities of firms
$p_{l_l}^{h}$ Price of debt liabilities of households
$p_{l_l}^{r}$ Price of debt liabilities of the rest of the world
p_m Price of French imports
p_{m*} Price of imports of competitors
p_{va} Price of value added
p_x Price of French exports
p_{x*} Price of exports of competitors
p_y *GDP* deflator, alternatively general price level
r_b^b Interest rate on securities paid by banks
r_b^g Interest rate on bonds paid by the government
r_l^f Interest rate on loans paid by firms
r_l^h Interest rate on loans paid by households
r^r Interest rate paid by the rest of the world
$r_{e_a}^f$ Rate of financial profitability of equities held by firms
$r_{e_a}^h$ Rate of financial profitability of equities held by households
$r_{e_l}^f$ Rate of financial profitability of equities issued by firms
S_F Firms' savings
S_G Government balance
S_H Households' savings
SB_B Social security benefits paid by banks
SB_F Social security benefits paid by firms
SB_G Social security benefits paid by the government
SB_H Social security benefits received by households
SB_R Social security benefits received by the rest of the world
SC_B Social security contributions received by banks
SC_F Social security contributions received by firms
SC_G Social security contributions received by the government
SC_H Social security contributions paid by households
SC_R Social security contributions received by the rest of the world
t_{1_G} Tax rate on VAT
t_{1_R} Tax rate on VAT paid by the rest of the world
t_{2_F} Tax rate paid by firms on their production
t_{2_H} Tax rate paid by individual entrepreneurs on their production
t_{2_R} Tax rate paid by the rest of the world on their production
T_{1_G} Value added tax paid by concerned French residents
T_{1_R} Value added tax paid by the rest of the world
T_{2_F} Taxes on production paid by firms
T_{2_G} Taxes on production received by the government

T_{2_H} Taxes on production paid by households
T_{2_R} Taxes on production paid by the rest of the world
t_{3_B} Income tax rate paid by banks
t_{3_F} Income tax rate paid by firms
t_{3_H} Income tax rate paid by households
t_{3_R} Income tax rate paid by the rest of the world
T_{3_B} Corporate income taxes, paid by banks
T_{3_F} Corporate income taxes, paid by firms
T_{3_G} Income taxes collected by the government
T_{3_H} Income taxes paid by households
T_{3_R} Income taxes paid by the rest of the world
TAP Total active population (includes inactive individuals)
u Unemployment rate
VA Total value added
VA_F Firms' value added
VA_H Households' value added
VA_G Public non-market production
w Wage per worker
W_F Wages paid by firms
W_G Wages paid by the government
W_H Wages received by households
W_{H_H} Wages paid by individual entrepreneurs
W_{paid} Wages paid by firms, individual entrepreneurs and the government
W_R Wages received by the rest of the world
X Exports (volume)
x_r Exchange rate (under the volume quotation system)
x_{r*} Expected exchange rate (under the volume quotation system)
Y GDP (volume)
Y_H^d Households' disposable income
Y^p Potential production of firms

A.4 Estimates

A.4.1 Households

Consumption

Variable	*Parameter*	*t-stat*
$ln\left(\frac{Y_H^d}{pc}\right)$	0.83	4.58
$ln\left(\frac{p_k^h K_H}{pc}\right)$	0.07	2.64
$ln\left(\frac{p_{e_a}^h E_H^A}{pc}\right)$	0.12	7.78
Trend	-0.002	-2.39
Constant term	0.06	-

Table A.1 – Vector Error Correction Estimates for $ln(C)$; 3 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(C_{-2})$	0.17	0.00
$\Delta ln(C_{-4})$	0.16	0.00
$\Delta ln\left(\frac{Y_{H-1}^d}{pc_{-1}}\right)$	0.19	0.00
$\Delta ln\left(\frac{Y_{H-4}^d}{pc_{-4}}\right)$	-0.08	0.03
$\Delta ln\left(\frac{p_k^h K_H}{pc}\right)$	0.11	0.00
$\Delta ln\left(\frac{p_{e_a-2}^h E_{H-2}^A}{pc_{-2}}\right)$	-0.015	0.00
$\Delta ln\left(\frac{p_{e_a-3}^h E_{H-3}^A}{pc_{-3}}\right)$	0.021	0.00
Constant term	0.007	0.00
vc_{-1}^C	-0.008	0.22

Table A.2 – Error correction mechanism for $\Delta ln(C)$.

Consumer price index

Variable	*Parameter*	*t-stat*
p_y	0.94	79.89
Constant term	0.07	5.40

Table A.3 – Vector Error Correction Estimates for p_c; 2 lags.

Variable	*Parameter*	*p-value*
Δp_{c-1}	0.88	0.00
Δp_y	0.07	0.02
vc_{-1}^{pc}	-0.015	0.00

Table A.4 – Error correction mechanism for Δp_c.

Demand for housing

Variable	*Parameter*	*t-stat*
$ln\left(\frac{Y_H^d/p_c}{pop}\right)$	0.00	-
$ln\left(\frac{p_k^h}{p_c}\right)$	-0.22	-1.00
$r_l^h - infl$	-7.87	-1.52
$ln(u)$	-0.31	-1.27
Constant term	-4.95	-3.83

Table A.5 – Vector Error Correction Estimates for $ln\left(\frac{K_H}{pop}\right)$; 5 lags.

Variable	*Parameter*	*p-value*
$\Delta ln\left(\frac{K_{H-1}}{pop_{-1}}\right)$	2.06	0.00
$\Delta ln\left(\frac{K_{H-2}}{pop_{-2}}\right)$	-1.70	0.00
$\Delta ln\left(\frac{K_{H-3}}{pop_{-3}}\right)$	0.60	0.00
$\Delta ln\left(\frac{Y_H^d/p_c}{pop}\right)$	0.06	0.02
$\Delta ln\left(\frac{p_{k-4}^h}{p_{c-4}}\right)$	-0.02	0.01
vc_{-1}^{KH}	-0.0002	0.54

Table A.6 – Error correction mechanism for $\Delta ln\left(\frac{K_H}{pop}\right)$.

Housing price

Variable	*Parameter*	*t-stat*
$\left(\frac{Y_H^d}{p_c}\right)$	0.00	-
$\left(\frac{K_H}{pop}\right)$	0.00	-
$r_l^h - infl$	-24.32	-7.68
u	-1.58	-0.71
Constant term	1.16	4.54

Table A.7 – Vector Error Correction Estimates for p_k^h; 5 lags.

Variable	*Parameter*	*p-value*
Δp_{k-1}^h	2.32	0.00
Δp_{k-2}^h	-1.56	0.00
Δp_{k-4}^h	0.23	0.00
$\Delta\left(\frac{K_H}{pop}\right)$	0.60	0.00
Δu_{-2}	-0.006	0.75
vc_{-1}^{pkh}	-0.0004	0.03

Table A.8 – Error correction mechanism for Δp_k^h.

Households' investment price

Variable	*Parameter*	*p-value*
Δp^h_{i-1}	0.86	0.00
Δp_y	0.09	0.00

Table A.9 – Error correction mechanism for Δp^h_i.

Households' deposit price

Variable	*Parameter*	*p-value*
$\Delta p^h_{d_a-1}$	0.43	0.00
$\Delta p^h_{d_a-2}$	0.45	0.00
Δi^h_d	-1.01	0.00
Δi^h_{d-1}	0.91	0.00

Table A.10 – Error correction mechanism for $\Delta p^h_{d_a}$.

Households' demand for debt

Variable	*Parameter*	*t-stat*
$ln\left(\frac{Y^d_H}{p^h_k K_H}\right)$	0.09	3.81
$r^h_l - infl$	-15.69	-8.28
$r^h_{e_a}$	2.63	2.90
Trend	-0.002	-2.99
Constant term	0.27	-

Table A.11 – Vector Error Correction Estimates for $\left(\frac{L^L_{H_e} p^h_{l_l} + p^h_{l_l f} L^L_{H_f}}{p^h_k K_H}\right) = lev_H$; 4 lags.

Variable	*Parameter*	*p-value*
Δlev_{H-1}	2.05	0.00
Δlev_{H-2}	-1.67	0.00
Δlev_{H-3}	0.53	0.00
$\Delta ln\left(\frac{Y^d_{H-1}}{p^h_{k-1}K_{H-1}}\right)$	0.024	0.02
$\Delta ln\left(\frac{Y^d_{H-2}}{p^h_{k-2}K_{H-2}}\right)$	-0.025	0.14
$\Delta ln\left(\frac{Y^d_{H-3}}{p^h_{k-3}K_{H-3}}\right)$	0.007	0.43
$\Delta(r^h_{l-3} - infl_{-3})$	-0.006	0.76
$\Delta r^h_{e_a}$	-0.03	0.00
$\Delta r^h_{e_a-3}$	-0.004	0.71

Table A.12 – Error correction mechanism for Δlev_H.

Price of loans contracted by households

Variable	*Parameter*	*t-stat*
r^h_l	-3.21	-6.51
$infl$	5.37	5.62
Constant term	1.02	242.79

Table A.13 – Vector Error Correction Estimates for $p^h_{l_l}$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta p^h_{l_l-1}$	0.98	0.00
$\Delta p^h_{l_l-3}$	-0.24	0.00
Δr^h_{l-1}	-0.03	0.28
$\Delta infl$	0.16	0.00
$\Delta infl_{-1}$	-0.14	0.00
$\Delta infl_{-2}$	0.03	0.19
vc^{pllh}_{-1}	-0.0003	0.83

Table A.14 – Error correction mechanism for $\Delta p^h_{l_l}$.

Financial accumulation of households

Variable	Parameter	t-stat
$r^h_{e_a}$	-8.11	-1.99
$ln\left(\frac{p^h_{l_l} L^L_H}{Y^d_H}\right)$	1.24	12.39
$r^h_l - infl$	-6.95	-1.24
Constant term	-0.46	-0.95

Table A.15 – Vector Error Correction Estimates for $ln\left(\frac{E^A_H}{Y}\right)$; 5 lags.

Variable	Parameter	p-value
$\Delta ln\left(\frac{E^A_{H-1}}{Y_{-1}}\right)$	0.88	0.00
$\Delta ln\left(\frac{E^A_{H-3}}{Y_{-3}}\right)$	-0.06	0.17
$\Delta r^h_{e_a-2}$	0.26	0.46
$\Delta ln\left(\frac{p^h_{l_l} L^L_H}{Y^d_H}\right)$	0.14	0.01
$\Delta(r^h_{l-1} - infl_{-1})$	-0.84	0.24
vc^{EAH}_{-1}	-0.02	0.09

Table A.16 – Error correction mechanism for $\Delta ln\left(\frac{E^A_H}{Y}\right)$.

Price of equities held by households

Variable	Parameter	t-stat
$p^f_{e_l}$	0.69	11.33
Constant term	0.34	6.83

Table A.17 – Vector Error Correction Estimates for $p^h_{e_a}$; 1 lag.

Variable	*Parameter*	*p-value*
$\Delta p^h_{e_a-1}$	0.86	0.00
$\Delta p^f_{e_l}$	0.35	0.00
$\Delta p^f_{e_l-1}$	-0.31	0.00
vc^{peah}_{-1}	-0.004	0.00

Table A.18 – Error correction mechanism for $\Delta p^h_{e_a}$.

A.4.2 Firms

Capital accumulation rate of firms

Variable	*Parameter*	*t-stat*
gap	0.16	2.38
$\frac{S_F}{p^f_k K_{F-1}}$	0.39	11.71
$r^f_{e_l}$	-0.11	-1.67
$r^f_l - infl$	-0.98	-5.98

Table A.19 – Vector Error Correction Estimates for $car = \frac{\Delta K_F p^f_k - FCC_F}{p^f_k K_{F-1}}$; 2 lags.

Variable	*Parameter*	*p-value*
Δcar_{-1}	0.63	0.00
Δgap	0.09	0.00
$\Delta\left(\frac{S_F}{p^f_k K_{F-1}}\right)$	0.12	0.00
$\Delta r^f_{e_l}$	-0.05	0.00
$\Delta(r^f_l - infl)$	-0.13	0.01
vc^{car}_{-1}	-0.06	0.00

Table A.20 – Error correction mechanism for Δcar.

Price of firms' non-financial assets

Variable	*Parameter*	*p-value*
Δp^f_{k-1}	2.38	0.00
Δp^f_{k-2}	-1.89	0.00
Δp^f_{k-3}	0.52	0.00
Δp^h_{k}	0.62	0.00
Δp^h_{k-1}	-1.45	0.00
Δp^h_{k-2}	1.13	0.00
Δp^h_{k-3}	-0.29	0.00
Δp^f_{i-3}	0.001	0.00
$\Delta(r^f_l - infl)$	-0.022	0.00
$\Delta(r^f_{l-1} - infl_{-1})$	0.020	0.00
$\Delta(r^f_{l-3} - infl_{-3})$	-0.007	0.05

Table A.21 – Error correction mechanism for Δp^f_k.

Price of firms' investment

Variable	*Parameter*	*t-stat*
p_y	0.98	49.56

Table A.22 – Vector Error Correction Estimates for p^f_i; 2 lags.

Variable	*Parameter*	*p-value*
Δp^f_{i-1}	0.67	0.00
Δp_y	0.28	0.00
vc^{pif}_{-1}	-0.002	0.41

Table A.23 – Error correction mechanism for Δp^f_i.

Firms' own funds

Variable	*Parameter*	*t-stat*
$ln\left(\frac{S_F}{p_k^f K_{F-1}}\right)$	0.00	-
$(r_l^f - infl)$	277.74	7.02
$r_{e_l}^f$	53.13	3.07

Table A.24 – Vector Error Correction Estimates for $own = \frac{E_F^L p_{e_l}^f}{p_k^f K_F + D_F^A + p_{e_a}^f E_F^A}$; 4 lags.

Variable	*Parameter*	*p-value*
Δown_{-1}	2.56	0.00
Δown_{-2}	-2.31	0.00
Δown_{-3}	0.73	0.00
$\Delta ln\left(\frac{S_{F-3}}{p_{k-3}^f K_{F-4}}\right)$	0.005	0.68
$\Delta(r_{l-1}^f - infl_{-1})$	0.38	0.17
$\Delta r_{e_l-2}^f$	-0.08	0.14
Δvc_{-1}^{own}	-0.00002	0.86

Table A.25 – Error correction mechanism for Δown.

Price of equities issued by firms

Variable	*Parameter*	*p-value*
$\Delta\left(\frac{p^f_{e_l-1}}{p^f_{k-1}}\right)$	0.67	0.00
$\Delta\left(\frac{S_F}{p^f_k K_{F-1}}\right)$	3.16	0.00
Δr^f_{l-2}	-5.21	0.02
Δu_{-2}	-0.36	0.55
$\Delta infl_{-1}$	-0.36	0.63
Constant term	-0.002	0.05

Table A.26 – Error correction mechanism for $\Delta\left(\frac{p^f_{e_l}}{p^f_k}\right)$.

Firms' debt

Variable	*Parameter*	*t-stat*
$r^f_{e_l}$	96.43	6.00
r^f_l	-115.82	-4.39
$\frac{S_F}{p_y Y}$	54.46	4.82
$\frac{\Delta pk_{ratio}}{pk_{ratio-1}}$	-37.02	-2.38
Trend	-0.002	-0.91
Constant term	-5.84	-

Table A.27 – Vector Error Correction Estimates for $L_F = \frac{L^L_F p^f_{l_l}}{p^f_k K_F}$, $pk_{ratio} = \frac{p^f_k}{p_y}$; 6 lags.

Variable	*Parameter*	*p-value*
ΔL_{F-1}	1.86	0.00
ΔL_{F-2}	-0.87	0.00
$\Delta r^f_{e_l}$	0.005	0.19
$\Delta(r^f_{l-1} - infl_{-1})$	-0.012	0.69
$\Delta\left(\frac{S_{F-3}}{p_{y-3} Y_{-3}}\right)$	0.03	0.23
vc^{LF}_{-1}	-0.00004	0.33

Table A.28 – Error correction mechanism for ΔL_F.

Price of loans contracted by firms

Variable	*Parameter*	*t-stat*
r_l^f	-352.69	-3.93

Table A.29 – Vector Error Correction Estimates for $p_{l_l}^f$; 3 lags.

Variable	*Parameter*	*p-value*
$\Delta p_{l_l-1}^f$	1.05	0.00
$\Delta p_{l_l-2}^f$	-0.25	0.00
Δp_y	0.17	0.00

Table A.30 – Error correction mechanism for $\Delta p_{l_l}^f$.

Price of equities held by firms

Variable	*Parameter*	*t-stat*
$p_{e_l}^f$	0.95	66.41

Table A.31 – Vector Error Correction Estimates for $p_{e_a}^f$; 1 lag.

Variable	*Parameter*	*p-value*
$\Delta p_{e_a-1}^f$	1.08	0.00
$\Delta p_{e_a-2}^f$	-0.33	0.00
$\Delta p_{e_l}^f$	0.76	0.00
$\Delta p_{e_l-1}^f$	-0.82	0.00
$\Delta p_{e_l-2}^f$	0.26	0.00
vc_{-1}^{pelf}	-0.006	0.12

Table A.32 – Error correction mechanism for $\Delta p_{e_a}^f$.

Loans contracted by firms in foreign currency

Variable	*Parameter*	*t-stat*
$p^f_{e_l}$	0.12	4.61
Constant term	-0.002	-

Table A.33 – Vector Error Correction Estimates for $L_f = \frac{-L^L_{F_e} p^f_{l_l} + p^f_{l_l} L^L_F}{p^f_{l_l} L^L_F}$; 5 lags.

Variable	*Parameter*	*p-value*
ΔL_{f-1}	0.68	0.00
ΔL_{f-2}	0.19	0.06
ΔL_{f-4}	-0.19	0.00
$\Delta p^f_{e_l}$	0.01	0.07
vc^{LLFfc}_{-1}	-0.009	0.22

Table A.34 – Error correction mechanism for ΔL_f.

Equities held by firms in foreign currency

$$E_f = \frac{-E^A_{F_e} p^f_{e_a} + p^f_{e_a} E^A_F}{p^f_{e_a} E^A_F}$$

$$e_{diff} = \left(\frac{\Delta p^f_{e_a}}{p^f_{e_a-1}} \right) - \left(\frac{\Delta p^{US}_e}{p^{US}_{e-1}} \right)$$

Variable	*Parameter*	*p-value*
ΔE_{f-1}	0.59	0.00
ΔE_{f-2}	0.22	0.00
Δe_{diff}	0.04	0.24

Table A.35 – Error correction mechanism for ΔE_f.

A.4.3 General equations

Employment

Variable	*Parameter*	*p-value*
Constant term	-2.06	0.00
Trend	-0.003	0.00
Struct. change dummy (1988q1-2008q1)	-0.06	0.00
d1988q1	0.03	0.02
d2008q2	-0.04	0.00
d2008q3	-0.04	0.00

Table A.36 – *OLS* Estimates for $ln\left(\frac{N}{Y}\right)$.

Variable	*Parameter*	*p-value*
$\Delta ln(N_{-1})$	1.70	0.00
$\Delta ln(N_{-2})$	-0.79	0.00
$\Delta ln(Y)$	0.04	0.00
vc^{N}_{-1}	-0.0004	0.65

Table A.37 – Error correction mechanism for $\Delta ln(N)$.

Active population

Variable	*Parameter*	*t-stat*
$ln(N)$	0.42	5.22
$ln(TAP)$	0.55	6.99

Table A.38 – Vector Error Correction Estimates for $ln(AP)$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(AP_{-1})$	1.51	0.00
$\Delta ln(AP_{-2})$	-0.78	0.00
$\Delta ln(AP_{-3})$	0.11	0.00
$\Delta ln(N)$	0.046	0.02
$\Delta ln(N-1)$	-0.070	0.00
$\Delta ln(N-3)$	0.025	0.00
$\Delta ln(TAP_{-1})$	0.09	0.00
$\Delta ln(TAP_{-2})$	-0.06	0.00
vc_{-1}^{AP}	-0.002	0.03

Table A.39 – Error correction mechanism for $\Delta ln(AP)$.

Wage per worker

Variable	*Parameter*	*t-stat*
$ln(p_c)$	0.91	2.39
$ln\left(\frac{Y}{N}\right)$	0.70	1.23
$ln(u)$	-1.28	-6.34

Table A.40 – Vector Error Correction Estimates for $ln\left(\frac{W_{paid}}{N^{sal}}\right)$; 2 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(p_c)$	0.47	0.00
$\Delta ln(p_{c-1})$	0.39	0.00
$\Delta ln\left(\frac{Y}{N}\right)$	0.12	0.01
u	- 0.0001	0.72
vc_{-1}^{wages}	-0.003	0.00

Table A.41 – Error correction mechanism for $\Delta ln\left(\frac{W_{paid}}{N^{sal}}\right)$.

General price level

Variable	*Parameter*	*t-stat*
$ln\left(\frac{wN}{Y}\right)$	0.82	20.03
$ln(gap)$	0.91	2.64
$ln(p_m)$	0.29	7.76

Table A.42 – Vector Error Correction Estimates for $ln(p_y)$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(p_{y-2})$	0.49	0.00
$\Delta ln\left(\frac{wN}{Y}\right)$	0.29	0.00
$\Delta ln(gap)$	0.23	0.00
$\Delta ln(p_{m-1})$	0.05	0.00
vc_{-1}^{py}	-0.03	0.00

Table A.43 – Error correction mechanism for $\Delta ln(p_y)$.

Price of value added

Variable	*Parameter*	*t-stat*
p_y	0.93	46.46
Constant term	0.07	-

Table A.44 – Vector Error Correction Estimates for p_{va}; 2 lags.

Variable	*Parameter*	*p-value*
Δp_{va-1}	0.88	0.00
Δp_y	1.14	0.00
Δp_{y-1}	-1.01	0.00
vc_{-1}^{pva}	-0.0001	0.95

Table A.45 – Error correction mechanism for Δp_{va}.

Exchange rate

Variable	*Parameter*	*t-stat*
$r^r - i^r$	58.72	2.24
$\left(\frac{Assets}{Liabilities}\right)$	1.47	4.34
Constant term	-0.49	-

Table A.46 – Vector Error Correction Estimates for x_r; 2 lags.

Variable	*Parameter*	*p-value*
Δx_{r-1}	1.19	0.00
Δx_{r-2}	-0.26	0.00
$\Delta(r^r - i^r)$	0.99	0.00
$\Delta(r^r_{-1} - i^r_{-1})$	-0.19	0.01
$\Delta\left(\frac{Assets}{Liabilities}\right)$	0.0015	0.23
vc^{xr}_{-1}	-0.001	0.00

Table A.47 – Error correction mechanism for Δx_r.

Variable	*Parameter*	*p-value*
$AR(1)$	-0.51	0.00
$AR(2)$	0.38	0.00
$MA(1)$	0.77	0.00

Table A.48 – Error correction mechanism for Δx^c_r.

Variable	*Parameter*	*p-value*
$(x_r - x^{f*}_r)$	-0.59	0.00

Table A.49 – Error correction mechanism for Δx^f_r.

A.4.4 Government

Price of public investment

Variable	*Parameter*	*t-stat*
p_y	1.65	9.16
Constant term	-0.78	4.00

Table A.50 – Vector Error Correction Estimates for p_i^g; 3 lags.

Variable	*Parameter*	*p-value*
Δp_{i-1}^g	1.46	0.00
Δp_{i-2}^g	-0.60	0.00
Δp_y	0.11	0.06
vc_{-1}^{pig}	-0.001	0.35

Table A.51 – Error correction mechanism for Δp_i^g.

Price of public current expenditure

Variable	*Parameter*	*p-value*
Δp_{g-1}	0.93	0.00
Δp_y	0.32	0.00
Δp_{y-1}	-0.26	0.00

Table A.52 – Error correction mechanism for Δp_i^g.

Price of public non-financial assets

Variable	*Parameter*	*p-value*
Δp^g_{k-1}	2.16	0.00
Δp^g_{k-2}	-1.78	0.00
Δp^g_{k-3}	0.61	0.00
Δp^h_k	0.71	0.00
Δp^h_{k-1}	-1.49	0.00
Δp^h_{k-2}	1.71	0.00
Δp^h_{k-3}	-0.38	0.00
Δp^g_{i-1}	-0.006	0.05
Δp^g_{i-2}	0.011	0.06
Δp^g_{i-3}	-0.005	0.18
Δr^g_{b-2}	-0.03	0.00

Table A.53 – Error correction mechanism for Δp^g_k.

Price of public non-financial assets

Variable	*Parameter*	*t-stat*
$p^f_{e_l}$	0.60	9.54
Constant term	0.46	9.62

Table A.54 – Vector Error Correction Estimates for $p^g_{e_a}$; 1 lag.

Variable	*Parameter*	*p-value*
$\Delta p^g_{e_a-1}$	0.65	0.00
$\Delta p^f_{e_l}$	0.46	0.00
$\Delta p^f_{e_l-1}$	-0.29	0.00
vc^{peag}_{-1}	-0.03	0.00

Table A.55 – Error correction mechanism for $\Delta p^g_{e_a}$.

Bonds issued by the government in foreign currency

Variable	*Parameter*	*t-stat*
$r^r - (i^r + \Delta x_r)$	28.28	2.56

Table A.56 – Vector Error Correction Estimates for $BLG_{fc} = \frac{-B^L_{G_e} p^g_{b_l} + p^g_{b_l} B^L_G}{p^g_{b_l} B^L_G}$; 4 lags.

Variable	*Parameter*	*p-value*
ΔBLG_{fc-1}	0.16	0.06
ΔBLG_{fc-2}	0.42	0.00
ΔBLG_{fc-3}	0.08	0.35
$\Delta[r^r - (i^r + \Delta x_r)]$	0.41	0.00
vc^{BLGfc}_{-1}	-0.002	0.39

Table A.57 – Error correction mechanism for ΔBLG_{fc}.

A.4.5 Banks

Price of equities held by banks

Variable	*Parameter*	*t-stat*
$p^f_{e_l}$	0.80	19.52
Trend	0.0002	0.48
Constant term	0.12	-

Table A.58 – Vector Error Correction Estimates for $p^b_{e_a}$; 2 lags.

Variable	*Parameter*	*p-value*
$\Delta p^b_{e_a-1}$	0.83	0.00
$\Delta p^f_{e_l}$	0.59	0.00
$\Delta p^f_{e_l-1}$	-0.48	0.00
vc^{peab}_{-1}	-0.006	0.28

Table A.59 – Error correction mechanism for $\Delta p^b_{e_a}$.

Price of equities issued by banks

Variable	*Parameter*	*t-stat*
$p^{f}_{e_l}$	0.27	2.76
Constant term	0.71	9.50

Table A.60 – Vector Error Correction Estimates for $p^{b}_{e_l}$; 2 lags.

Variable	*Parameter*	*p-value*
$\Delta p^{b}_{e_l-1}$	0.87	0.00
$\Delta p^{f}_{e_l}$	0.24	0.00
$\Delta p^{f}_{e_l-1}$	-0.22	0.00
vc^{pelb}_{-1}	-0.005	0.00

Table A.61 – Error correction mechanism for $\Delta p^{b}_{e_l}$.

Price of deposit liabilities of banks

Variable	*Parameter*	*t-stat*
r^{b}_{b}	-13.78	1.27
$infl$	228.83	5.08

Table A.62 – Vector Error Correction Estimates for $p^{b}_{d_l}$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta p^{b}_{d_l-1}$	0.27	0.00
$\Delta p^{b}_{d_l-2}$	0.34	0.00
Δr^{b}_{b-2}	-0.18	0.26
$\Delta infl_{-1}$	0.60	0.00
vc^{pdlb}_{-1}	-0.005	0.00

Table A.63 – Error correction mechanism for $\Delta p^{b}_{d_l}$.

Price of banks' credit holdings

Variable	*Parameter*	*t-stat*
$p^f_{e_l}$	0.37	0.73
Constant term	0.37	0.73

Table A.64 – Vector Error Correction Estimates for $p^b_{l_a}$; 2 lags.

Variable	*Parameter*	*p-value*
$\Delta p^b_{l_a-1}$	0.64	0.00
$\Delta\left(\frac{p^f_{e_l}}{p^f_k}\right)$	0.012	0.00
$\Delta\left(\frac{p^f_{e_l-1}}{p^f_{k-1}}\right)$	-0.011	0.00
$\Delta\left(\frac{p^f_{e_l-2}}{p^f_{k-2}}\right)$	0.004	0.00
vc^{plab}_{-1}	-0.0003	0.00

Table A.65 – Error correction mechanism for $\Delta p^b_{l_a}$.

Banks' securities held in foreign currency

$$BAB_{fc} = \left(\frac{-B^A_{B_e} p^b_{b_a} + p^b_{b_a} B^A_B}{p^b_{b_a} B^A_B}\right)$$

Variable	*Parameter*	*p-value*
ΔBAB_{fc-1}	0.28	0.00
ΔBAB_{fc-2}	0.22	0.00
ΔBAB_{fc-3}	0.15	0.07
$\Delta[r^r - (i^r + \Delta x_r)]$	-0.42	0.48
$\Delta[r^r_{-2} - (i^r_{-2} + \Delta x_{r-2})]$	0.71	0.21

Table A.66 – Error correction mechanism for ΔBAB_{fc}.

Loans made by banks in foreign currency

$$LAB_{fc} = \left(\frac{-L^A_{B_e} p^b_{l_a} + p^b_{l_a} L^A_B}{p^b_{l_a} L^A_B} \right)$$

Variable	*Parameter*	*p-value*
ΔLAB_{fc-1}	0.59	0.00
ΔLAB_{fc-2}	0.33	0.00
ΔLAB_{fc-3}	-0.09	0.13
$\Delta[r^r_{-2} - (i^r_{-2} + \Delta x_{r-2})]$	0.08	0.13

Table A.67 – Error correction mechanism for ΔLAB_{fc}.

Equities held by banks in foreign currency

$$EAB_{fc} = \left(\frac{-E^A_{B_e} p^b_{e_a} + p^b_{e_a} E^A_B}{p^b_{e_a} E^A_B} \right)$$

Variable	*Parameter*	*p-value*
ΔEAB_{fc-1}	0.48	0.00
ΔEAB_{fc-2}	0.25	0.00
ΔEAB_{fc-3}	0.11	0.23
$\Delta[r^r_{-3} - (i^r_{-3} + \Delta x_{r-3})]$	0.89	0.00

Table A.68 – Error correction mechanism for ΔEAB_{fc}.

A.4.6 Rest of the world

Exports

Variable	*Parameter*	*t-stat*
$ln(Y^f)$	1.98	21.86
$ln\left(\frac{p_x x_r}{p_{x*}}\right)$	0.93	10.48

Table A.69 – Vector Error Correction Estimates for $ln(X)$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(X_{-1})$	0.28	0.00
$\Delta ln(Y^f)$	0.41	0.00
$\Delta ln\left(\frac{p_{x-3}x_{r-3}}{p_{x*-3}}\right)$	-0.67	0.03
vc_{-1}^{X}	-0.03	0.37

Table A.70 – Error correction mechanism for $\Delta ln(X)$.

Price of exports

Variable	*Parameter*	*t-stat*
$ln(p_y)$	0.54	4.83
$ln\left(\frac{p_{x*}}{x_r}\right)$	0.44	3.91

Table A.71 – Vector Error Correction Estimates for $ln(p_x)$; 2 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(p_{x-1})$	0.42	0.00
$\Delta ln(p_y)$	0.66	0.00
$\Delta ln\left(\frac{p_{x*-3}}{x_{r-3}}\right)$	0.014	0.21
vc_{-1}^{px}	-0.008	0.04

Table A.72 – Error correction mechanism for $\Delta ln(p_x)$.

Imports

Variable	*Parameter*	*t-stat*
$ln\left(\frac{p_y}{p_m}\right)$	1.29	8.88
$ln(Y)$	1.91	14.32

Table A.73 – Vector Error Correction Estimates for $ln(M)$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(M)$	0.13	0.00
$\Delta ln\left(\frac{p_y}{p_m}\right)$	0.07	0.06
$\Delta ln(Y)$	2.72	0.00
vc^M_{-1}	-0.004	0.30

Table A.74 – Error correction mechanism for $\Delta ln(M)$.

Import prices

Variable	*Parameter*	*t-stat*
$ln(p_m)$	0.57	3.28
$ln\left(\frac{p_m}{x_r}\right)$	0.39	2.24

Table A.75 – Vector Error Correction Estimates for $ln(p_m)$; 3 lags.

Variable	*Parameter*	*p-value*
$\Delta ln(p_{m-1})$	0.30	0.00
$\Delta ln(p_{y-1})$	0.87	0.00
$\Delta ln\left(\frac{p_{m-1}}{x_{r-1}}\right)$	0.15	0.04
vc^{pm}_{-1}	-0.06	0.00

Table A.76 – Error correction mechanism for $\Delta ln(p_m)$.

Prices of deposits held by the rest of the world

Variable	*Parameter*	*p-value*
$\Delta p^r_{d_a-1}$	0.86	0.00
$\Delta(i^r_{-1} + \Delta x_{r*-1})$	-0.15	0.49
$\Delta infl_{-1}$	1.85	0.00
$\Delta infl_{-3}$	-0.91	0.00

Table A.77 – Error correction mechanism for $\Delta p^r_{d_a}$.

Deposits held by the rest of the world in foreign currency

$$DAR_{fc} = \frac{-D^A_{R_e} p^r_{d_a} + p^r_{d_a} D^A_R}{p^r_{d_a} D^A_R}$$

Variable	*Parameter*	*p-value*
ΔDAR_{fc-1}	0.48	0.00
ΔDAR_{fc-2}	0.37	0.00
ΔDAR_{fc-3}	-0.19	0.00
$\Delta[r^r_{-2} - (i^r_{-2} + \Delta x_{r*-2})]$	0.49	0.02

Table A.78 – Error correction mechanism for ΔDAR_{fc}.

Prices of deposit liabilities of the rest of the world

Variable	*Parameter*	*t-stat*
r^r	-89.89	1.03
$infl$	412.49	-4.14

Table A.79 – Vector Error Correction Estimates for $p^r_{d_l}$; 3 lags.

Variable	*Parameter*	*p-value*
$\Delta p^r_{d_l-1}$	1.24	0.00
$\Delta p^r_{d_l-2}$	-0.40	0.00
Δr^r_{-1}	-2.02	0.00
vc^{pdlr}_{-1}	-0.0003	0.00

Table A.80 – Error correction mechanism for $\Delta p^r_{d_l}$.

Securities held by the rest of the world in foreign currency

$$BAR_{fc} = \left(\frac{-B^A_{R_e} p^r_{b_a} + p^r_{b_a} B^A_R}{p^r_{b_a} B^A_R} \right)$$

Variable	*Parameter*	*p-value*
ΔBAR_{fc-1}	0.69	0.00
ΔBAR_{fc-3}	0.11	0.13
$\Delta[r^r_{-1} - (i^r_{-1} + \Delta x_{r*-1})]$	-0.09	0.55
$\Delta[r^r_{-3} - (i^r_{-3} + \Delta x_{r*-3})]$	0.14	0.32

Table A.81 – Error correction mechanism for ΔBAR_{fc}.

Price of loans made by the rest of the world to France

Variable	*Parameter*	*t-stat*
$i^r + \Delta x_{r*}$	-68.56	-5.29
$infl$	14.53	3.28
Trend	-0.006	-4.63
Constant term	2.93	-

Table A.82 – Vector Error Correction Estimates for $p^r_{l_a}$; 4 lags.

Variable	*Parameter*	*p-value*
$\Delta p^r_{l_a-1}$	1.15	0.00
$\Delta p^r_{l_a-3}$	-0.32	0.00
$\Delta[i^r_{-1} + \Delta x_{r*-1}]$	-0.18	0.03
$\Delta infl_{-1}$	0.27	0.06
vc^{plar}_{-1}	-0.002	0.00

Table A.83 – Error correction mechanism for $\Delta p^r_{l_a}$.

Price of loans contracted by the rest of the world from France

Variable	*Parameter*	*t-stat*
r^r	-148.08	-4.22
$infl$	32.47	4.61
Trend	-0.006	-3.09
Constant term	3.38	-

Table A.84 – Vector Error Correction Estimates for $p^r_{l_l}$; 2 lags.

Variable	*Parameter*	*p-value*
$\Delta p^r_{l_l-1}$	0.78	0.00
Δr^r	-3.83	0.00
$\Delta infl$	1.01	0.00
vc^{pllr}_{-1}	-0.0002	0.81

Table A.85 – Error correction mechanism for $\Delta p^r_{l_l}$.

A.5 Misspecification tests

Dep. var.	*Equation*	*Skewness*	*Kurtosis*	*Jarque-Bera*	*Hetero.*
C	A.1	0.4983	0.7426	0.7217	0.0754
p_c	A.3	0.5753	0.3974	0.5661	0.5284
K_H	A.5	0.8763	0.0156	0.1054	0.9922
p_k^h	A.7	0.8443	0.2305	0.5411	0.7292
L_H^L	A.11	0.3791	0.2043	0.2556	0.6095
$p_{l_l}^h$	A.13	0.3222	0.0012	0.0036	0.3087
E_H^A	A.15	0.9390	0.6411	0.9130	0.0422
$p_{e_a}^h$	A.17	0.4493	0.3054	0.4097	0.0001
ΔK_F	A.19	0.1293	0.1628	0.0884	0.9759
p_i^f	A.22	0.4063	0.5674	0.5688	0.8781
E_F^L	A.24	0.3105	0.1811	0.1998	0.0933
L_F^L	A.27	0.5489	0.0000	0.0000	0.9783
$p_{l_l}^f$	A.29	0.0684	0.0351	0.0169	0.9997
$p_{e_a}^f$	A.31	0.4409	0.0000	0.0000	0.0752
$L_{F_f}^L$	A.33	0.7981	0.0218	0.0879	0.0091
AP	A.38	0.9752	0.3248	0.7194	0.5442
W_{paid}	A.40	0.0705	0.0596	0.0235	0.9675
p_y	A.42	0.4937	0.0608	0.1338	0.5327
p_{va}	A.44	0.3864	0.7332	0.6406	0.4853
x_r	A.46	0.6558	0.1910	0.3835	0.1217
p_i^g	A.50	0.6826	0.7174	0.8393	0.9049
$p_{e_a}^g$	A.54	0.9522	0.2866	0.6273	0.7398
$B_{G_f}^L$	A.56	0.3393	0.6829	0.5705	0.2457
$p_{e_a}^b$	A.58	0.5193	0.7296	0.7466	0.4998
$p_{e_l}^b$	A.60	0.7265	0.0000	0.0000	0.6153
$p_{d_l}^b$	A.62	0.2388	0.0260	0.0360	0.0008
$p_{l_a}^b$	A.64	0.0660	0.1213	0.0467	0.9791
X	A.69	0.9471	0.9959	0.9986	0.9112
p_x	A.71	0.2346	0.0069	0.0117	0.9999
M	A.73	0.6821	0.3831	0.6018	0.0344
p_m	A.75	0.3341	0.0021	0.0060	0.6270
$p_{d_l}^r$	A.79	0.2775	0.9049	0.6203	0.0199
$p_{l_a}^r$	A.82	0.0254	0.3430	0.0490	0.9362
$p_{l_l}^r$	A.84	0.0073	0.3624	0.0187	0.8527

Table A.86 – *VECM* Residual Normality Tests and Heteroskedasticity, no cross-terms (p-values).

Dep. var.	*Equation*	*Normality*	*Hetero. (BPG)*	*Breusch-Godfrey*
C	A.2	0.5930	0.4499	0.8156
p_c	A.4	0.1310	0.6008	0.9952
K_H	A.6	0.0000	0.0011	0.6902
p_k^h	A.8	0.0000	0.6259	0.9999
p_i^h	A.9	0.0000	0.7245	0.9933
$p_{d_a}^h$	A.10	0.0000	0.9138	0.9999
L_H^L	A.12	0.3431	0.5669	0.9512
$p_{l_l}^h$	A.14	0.0528	0.0091	0.9729
E_H^A	A.16	0.0000	0.0245	0.9999
$p_{e_a}^h$	A.18	0.1844	0.4806	0.9990
ΔK_F	A.20	0.9208	0.6575	0.8627
p_k^f	A.21	0.9209	0.2861	0.9626
p_i^f	A.23	0.0539	0.0509	0.9943
E_F^L	A.25	0.0000	0.4293	0.9984
$p_{e_l}^f$	A.26	0.9378	0.7819	0.9294
L_F^L	A.28	0.0000	0.7671	0.9999
$p_{l_l}^f$	A.30	0.0000	0.4493	0.9999
$p_{e_a}^f$	A.32	0.3058	0.9567	0.9997
$L_{F_f}^L$	A.34	0.0000	0.0025	0.0785
$E_{F_f}^A$	A.35	0.0000	0.1989	0.2933
N	A.36	0.1241	0.0000	0.0011
ΔN	A.37	0.4045	0.0838	0.2877
AP	A.39	0.0000	0.0012	0.0105
W_{paid}	A.41	0.2613	0.4167	0.9891
p_y	A.43	0.0000	0.2885	0.9999
p_{va}	A.45	0.4570	0.2418	0.9171
x_r	A.47	0.9031	0.1018	0.9756
x_r^c	A.48	0.5674	0.7224	0.9817
x_r^f	A.49	0.2207	0.0000	0.7837

Table A.87 – *ECM*s Normality, Heteroskedasticity and Breusch-Pagan tests (p-values).

Dep. var.	*Equation*	*Normality*	*Hetero. (BPG)*	*Breusch-Godfrey*
p_i^g	A.51	0.0000	0.5855	0.9999
p_g	A.52	0.0357	0.0318	0.9979
p_k^g	A.53	0.0000	0.3187	0.0861
$p_{e_a}^g$	A.55	0.2583	0.8981	0.9792
$B_{G_f}^L$	A.57	0.8404	0.1670	0.9775
$p_{e_a}^b$	A.59	0.3997	0.4855	0.8354
$p_{e_l}^b$	A.61	0.0654	0.1499	0.9549
$p_{d_l}^b$	A.63	0.0000	0.0585	0.5957
$p_{l_a}^b$	A.65	0.8913	0.1581	0.9200
$B_{B_f}^A$	A.66	0.0674	0.0071	0.9783
$L_{B_f}^A$	A.67	0.0000	0.0248	0.9893
$E_{B_f}^A$	A.68	0.0000	0.0000	0.6685
X	A.70	0.0000	0.0031	0.9991
p_x	A.72	0.0000	0.9154	0.5469
M	A.74	0.7554	0.6728	0.9223
p_m	A.76	0.0000	0.2084	0.5761
$p_{d_a}^r$	A.77	0.0000	0.0001	0.9999
$D_{R_f}^A$	A.78	0.0051	0.0352	0.9994
$p_{d_l}^r$	A.80	0.0000	0.5724	0.9866
$B_{R_f}^A$	A.81	0.0000	0.9187	0.9999
$p_{l_a}^r$	A.83	0.8675	0.7202	0.9014
$p_{l_l}^r$	A.85	0.3959	0.8423	0.9910

Table A.88 – *ECM*s Normality, Heteroskedasticity and Breusch-Pagan tests (p-values), continued.