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Abstract

This thesis touches upon important aspects that involve the past, present and future of unconventional monetary policies (UMPs): their historical background and conceptual debate; the experience of UMPs in advanced economies, with the Euro area case; the effects of UMPs in emerging economies, and their links with corporate debt; the process of UMPs exit and the future of monetary policy frameworks. First, by reporting several historical experiences of the Bank of England, Federal Reserve System and Bank of Japan, we have observed that policies which after the 2008 crisis were considered to be “unconventional” had already been adopted in various occasions before. Second, on the conceptual debate, we analyzed UMPs framework (objectives, measures, transmission channels, and effects), with more detailed attention on nominal negative interest rates, measure which had not been implemented before 2008. Third, on UMPs experience in the Euro area, we observed that UMPs were capable of avoiding a major financial collapse after 2008, and managed partial improvements in macroeconomic indicators. In particular, sovereign yields have presented distinct responses according to each asset purchase program announced/implemented. However, UMPs were not able alone to solve all economic problems in the Euro area, which deserve the support of additional policies (fiscal, industrial, institutional, financial regulation/supervision) to ensure a sustained growth path in the medium/long term. Fourth, on UMPs effects in emerging economies, we have observed the important role of accommodative measures of the main advanced economies central banks, together with other global factors, to explain the rise of corporate debt. Its economic policy implications are related to the need for enhancement in financial regulation, macro and microprudential instruments to increase the resilience of the financial system against crises. Finally, the current process of UMPs exit is asynchronous, and gradual sequencing and proper communication will be required to avoid major disruptions in international financial markets. Future monetary policy frameworks may take lessons from past and recent experiences and incorporate some UMPs in their toolkits, in order to increase the effectiveness of monetary policies and reduce financial stability concerns, once the challenges posed by financial markets are increasingly higher.

Keywords: Unconventional Monetary Policies, Negative Interest Rates, Euro Area, Emerging Economies, Corporate Debt, Financial Stability.

Résumé

Cette thèse aborde des aspects importants qui impliquent le passé, le présent et l'avenir des politiques monétaires non conventionnelles (PMNC): son contexte historique et les débats conceptuels qui l'accompagnent; l'expérience des PMNC dans les économies avancées, avec le cas de la Zone Euro; les effets des PMNC dans les économies émergentes et ses liens avec la dette privée des entreprises; le processus de sortie des PMNC et l'avenir des cadres de politique monétaire. Premièrement, en rapportant plusieurs expériences historiques de la Banque d'Angleterre, de la Réserve Fédérale américaine et de la Banque du Japon, nous mettons en évidence que des politiques qui, après la crise de 2008, étaient considérées comme «non conventionnelles» avaient en fait déjà été adoptées à diverses occasions dans l'histoire. Deuxièmement, au niveau des débats conceptuels, nous analysons le cadre (objectifs, mesures, canaux de transmission, effets) des PMNC, en portant une attention plus détaillée aux taux d'intérêt nominaux négatifs, mesure qui n'a pas été appliquée avant 2008. Troisièmement, au regard de l'expérience des PMNC dans la zone euro, nous avons constaté que ces dernières étaient capables d'éviter un effondrement financier majeur après 2008 et d'apporter des améliorations partielles des indicateurs macroéconomiques. En particulier, les rendements souverains ont présenté des réponses différentes selon chaque programme d'achat d'actifs annoncé / mis en œuvre. Néanmoins, les PMNC n'ont pas été capables de résoudre toutes seules les problèmes économiques de la zone euro, qui méritent le soutien de politiques supplémentaires (fiscales, industrielles, institutionnelles, de réglementation / supervision financières) pour assurer une trajectoire de croissance soutenue à moyen / long terme. Quatrièmement, en ce qui concerne les effets des PMNC dans les économies émergentes, nous avons observé le rôle important joué par les mesures d'assouplissement monétaire des principales banques centrales des économies avancées, associées à d'autres facteurs mondiaux, pour expliquer la hausse de la dette des entreprises. Ses implications pour la politique économique sont liées à la nécessité de renforcer la réglementation financière et les instruments macro et microprudentiels afin d'augmenter la résilience du système financier contre les crises. Enfin, le processus actuel de sortie des PMNC est asynchrone. Un séquençage progressif et une communication appropriée seront nécessaires pour éviter des perturbations majeures des marchés financiers internationaux. Les futurs cadres de politique monétaire pourraient tirer des leçons des expériences du passé et récentes et incorporer certaines PMNC dans leur boîte à outils pour augmenter l'efficacité des politiques monétaires et réduire des préoccupations liées à stabilité financière, une fois que les défis posés par les marchés financiers sont devenus de plus en plus importants.

Mots clés: Politiques Monétaires non Conventionnelles, Taux d'Intérêt Négatifs, Zone Euro, Économies Émergentes, Dette des Entreprises, Stabilité Financière.

Resumo

Esta tese aborda aspectos importantes que envolvem o passado, presente e futuro das políticas monetárias não convencionais (PMNCs): seu histórico e debate conceitual; a experiência das PMNCs nas economias avançadas, com o caso da Área do Euro; os efeitos das PMNCs nas economias emergentes e suas relações com a dívida corporativa; o processo de saída das PMNCs e o futuro dos arcabouços de política monetária. Primeiro, relatando várias experiências históricas do Banco da Inglaterra, do Federal Reserve System e do Banco do Japão, observamos que as políticas que, após a crise de 2008, eram consideradas “não convencionais” já haviam sido adotadas em várias ocasiões anteriores. Em segundo lugar, no debate conceitual, analisamos o arcabouço das PMNCs (objetivos, medidas, canais de transmissão e efeitos), com atenção mais detalhada sobre as taxas de juros nominais negativas, medida que não havia sido implementada antes de 2008. Em terceiro lugar, na experiência das PMNCs na Área do Euro, observamos que as PMNCs foram capazes de evitar um grande colapso financeiro após 2008 e resultaram em melhorias parciais nos indicadores macroeconômicos. Em particular, os rendimentos soberanos apresentaram respostas distintas de acordo com cada programa de compra de ativos anunciado / implementado. No entanto, as PMNCs não foram capazes de resolver sozinhas todos os problemas econômicos da Área do Euro, que merecem o apoio de políticas adicionais (fiscal, industrial, institucional, regulação/supervisão financeira) para assegurar uma trajetória de crescimento sustentado no médio/longo prazo. Quarto, sobre os efeitos das PMNCs nas economias emergentes, observamos o importante papel das medidas de acomodação monetária dos principais bancos centrais de economias avançadas, juntamente com outros fatores globais, para explicar o aumento da dívida corporativa. Suas implicações de política econômica estão relacionadas à necessidade de aprimoramento na regulação financeira, instrumentos macro e microprudenciais para aumentar a resiliência do sistema financeiro contra crises. Finalmente, o atual processo de saída das PMNCs é assíncrono, e um sequenciamento gradual e uma comunicação apropriada serão necessários para evitar grandes distúrbios nos mercados financeiros internacionais. Os futuros arcabouços de política monetária podem tirar lições de experiências passadas e recentes e incorporar algumas PMNCs nos seus instrumentos, a fim de aumentar a eficácia das políticas monetárias e reduzir os riscos de estabilidade financeira, uma vez que os desafios impostos pelos mercados financeiros são cada vez mais elevados.

Palavras-chave: Políticas Monetárias Não Convencionais, Taxas de Juros Negativas, Área do Euro, Economias Emergentes, Dívida Corporativa, Estabilidade Financeira.

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List of Abbreviations

ABS Asset-Backed Security

ABSPP Asset-Backed Securities Purchase Program

AEs Advanced Economies

APF Asset Purchase Facility

APP Asset Purchase Program

BIS Bank for International Settlements

BLS Bank Lending Survey

BOE Bank of England

BOJ Bank of Japan

BoP Balance of Payments

bps basis points

CAPM Capital Asset Pricing Model

CBDC Central Bank Digital Currency

CBO Congressional Budget Office

CBOE Chicago Board Option Exchange

CBPP Covered Bond Purchase Program

CBPS Corporate Bond Purchase Scheme

CEO Chief Executive Officer

CME Comprehensive Monetary Easing

CNB Czech National Bank

CPI Consumer Price Index

CPMI Committee on Payments and Market Infrastructures

CSPP Corporate Sector Purchase Program

DFR Deposit Facility Rate

DSGE Dynamic Stochastic General Equilibrium

EBA European Banking Authority

E-bonds European Bonds

ECB European Central Bank

ECJ European Court of Justice

EDIS European Deposit Insurance Scheme

EFSF European Financial Stability Facility

EFSM European Financial Stabilization Mechanism

EIB European Investment Bank

EIOPA European Insurance and Occupational Pensions Authority

EMEA Emerging Europe, Middle East and Africa

EMEs Emerging Economies

EONIA Euro Overnight Index Average

ESBies European Safe Bonds

ESM European Stability Mechanism

ESMA European Securities and Markets Authority

ESRB European Systemic Risk Board

ETFs Exchange-Traded Funds

EU European Union

EURIBOR European Interbank Offered Rate

FDIC Federal Deposit Insurance Committee

Fed Federal Reserve System

FG Forward Guidance

FGLS Feasible Generalized Least Squares

FLS Funding for Lending Scheme

FOMC Federal Open Market Committee

FRFA Fixed Rate Full Allotment

FTPL Fiscal Theory of Price Level

GCC German Constitutional Court

GDP Gross Domestic Product

G-SIBs Global Systemically Important Banks

HICP Harmonised Index of Consumer Prices

HQLA High-Quality Liquid Assets

IFS International Financial Statistics

IIF Institute of International Finance

IMF International Monetary Fund

IOER Interest on Excess Reserves

IT Inflation Targeting

JGBs Japanese Government Bonds

J-REITS Japanese Real Estate Investment Trusts

LCI Labor Cost Index

LOLR Lender of Last Resort

LSAP Large Scale Asset Purchase Program

LT Liquidity Trap

LTROs Long-Term Refinancing Operations

MBS Mortgage-Backed Securities

MEP Maturity Extension Program

MLF Marginal Lending Facility

MRO Main Refinancing Operations

MSCI Morgan Stanley Capital International

NCBs National Central Banks

NCM New Consensus Macroeconomics

NEER Nominal Effective Exchange Rate

NIRPs Negative Interest Rate Policies

NPL Non-Performing Loans

OECD Organisation for Economic Co-operation and Development

OIS Overnight Index Swap

OLS Ordinary Least Squares

OMT Outright Monetary Transactions

PCE Personal Consumption Expenditure

PCSE Panel-Corrected Standard Errors

pp percentage point

PSPP Public Sector Purchase Program

QE Quantitative Easing

QoQ Quarter over Quarter

QQME Quantitative and Qualitative Monetary Easing

QTM Quantity Theory of Money

RDD Regression Discontinuity Design

REER Real Effective Exchange Rate

ROA Return on Assets

RRP Reverse Repurchase Agreement Facility

S&P Standard and Poor's

SAFE Survey on the Access to Finance of Enterprises in the Euro area

SAPI Sustained Adjustment in the Path of Inflation

SMEs Small and Medium-Sized Enterprises

SMP Securities Markets Programme

SNB Swiss National Bank

SOMA System Open Market Account

SRM Single Resolution Mechanism

SSM Single Supervisory Mechanism

SSR Shadow Short Rate

SUR Seemingly Unrelated Regression

TAF Term Auction Facility

TALF Term Asset-Backed Securities Loan Facility

TFP Total Factor Productivity

TLTROs Targeted Long-Term Refinancing Operations

UK United Kingdom

UMPs Unconventional Monetary Policies

U.S. United States

USA United States of America

VaR Value at Risk

VAR Vector Autoregressive

WAM Weighted Average Maturity

YCC Yield Curve Control

YoY Year over Year

ZIRP Zero Interest Rate Policy

ZLB Zero Lower Bound

Chapter 1. Introduction

1.1. Objectives

Unconventional Monetary Policies (UMPs) are usually known as the set of extraordinary measures implemented by central banks after the 2008 crisis, which differed from the pre-2008 standard instrument of short-term interest rate determination. The subject of UMPs is very diverse, and related to a great variety of topics. Therefore, our intention in the thesis is to focus on four important points linked to this subject, which allow us to put into a broader perspective the past, present, and future of UMPs. After this introduction in chapter 1, the main research questions to be addressed in each of the chapters are described in the sequence.

Chapter 2 - Unconventional Monetary Policies: Historical Background and Conceptual Debate

In which historical experiences the measures known today as unconventional monetary policies have been previously adopted? In UMPs conceptual debate, what were their main objectives, measures, transmission channels, and effects? In particular, what was the role of nominal negative interest rates? New alternatives for monetary policies and targets are also under discussion, what are their pros and cons?

Chapter 3 - Unconventional Monetary Policies in Advanced Economies: The Euro area Experience

How was the evolution of unconventional monetary policies implemented by the European Central Bank since 2008? What were UMPs impacts on Euro area's main macroeconomic indicators in the period? In particular, what were the responses of Euro area's sovereign and private yield curves with asset purchase programs announced/implemented?

What other policies could help to achieve UMPs intended objectives, and improve the economic outcomes in the Euro area?

Chapter 4 - Effects of Unconventional Monetary Policies in Emerging Economies: Links with Corporate Debt and Policy Implications

How are the profile and the determinants of corporate debt expansion in emerging economies? In particular, what is the role of global factors, including UMPs in the process? What are the challenges for emerging markets' related to the rise of corporate debt, in firms and country level? Due to those challenges, what policies could improve emerging economies resilience and enhance their instruments against financial crises?

Chapter 5 - Unconventional Monetary Policies Exit and Future Monetary Policy Frameworks

How is evolving the process of exit from unconventional monetary policies? What are UMPs exit benefits, challenges, and spillovers to other economies? As for future monetary policy frameworks, can we expect complete removal of unconventional policies, with a return to pre-2008 standards ("normalization"), or the incorporation of some unconventional policies as new tools in future frameworks ("new normal")?

In the general conclusions in chapter 6, we present a summary of the main ideas and results presented in previous chapters. With them, we intend to have an overall assessment of UMPs implementation in past and recent experiences, their consequences for countries of origin and international spillovers in other advanced and emerging economies, and prospects for future monetary policy frameworks.

1.2. Structure

The thesis is composed of a total of six chapters. Besides the introduction in chapter 1 and the general conclusions in chapter 6, each one of the other chapters focuses on an important point related to the past, present and future of UMPs: Historical background and

conceptual debate (chapter 2); Advanced Economies: the Euro area experience (chapter 3); Emerging Economies: links with corporate debt and economic policy implications (chapter 4); UMPs exit and future monetary policy frameworks (chapter 5).

Chapter 2 starts with a historical perspective of UMPs and then discusses several conceptual aspects related to UMPs. First, there is a description of the historical background of unconventional monetary policies, mentioning experiences which they were implemented before 2008 (i.e., UK 1825, USA 1932, UK and USA 1940s and 1950s, USA 1961, Japan 1999 and 2000s). In the sequence, we address important conceptual aspects of UMPs, discussing these policies' main objectives, transmission channels, measures adopted (liquidity provision operations, private and public asset purchase programs, forward guidance, yield curve control, negative interest rates), with a more detailed analysis on nominal negative interest rates, measure which had not been implemented before 2008. Moreover, we present some of the main UMPs implementation results available in the literature, with the effects of these policies on important financial and macroeconomic indicators (i.e., bond yields, inflation, output) of the main jurisdictions they were implemented (U.S., UK, Japan, Euro area), as well as the spillovers to other economies, especially emerging countries. Furthermore, we address the question of the role of inflation targeting regimes in the current scenario, and the discussion surrounding the possibility of adopting alternative targets (nominal GDP/price level) and policies (monetary finance), as well as enlarging central banks' mandates (incorporating employment, wages, inequality and environmental objectives).

Chapter 3 is dedicated to discussing the implementation of unconventional monetary policies in a key advanced economy, the Euro area. We inspect the main characteristics of the unconventional programs implemented by the European Central Bank (ECB) after the 2008 financial crisis, analyzing to what extent they had an impact on Euro area's main macroeconomic indicators in the period. In particular, we analyze Euro area's sovereign and

private yield curves responses with each asset purchase program announced/implemented from 2009 onwards. Hence, we intend to verify the evolution of the implementation of ECB programs' framework, with the institution trying to improve more recent programs based on shortcomings observed in initial measures. Since we observe that UMPs were not able alone to solve all economic problems in the Euro area, we suggest additional policies (fiscal, industrial, institutional, financial regulation/supervision) to ensure a sustained growth path in the medium/long term.

Chapter 4 aims to explore one important effect of unconventional monetary policies in emerging economies (EMEs), focusing on corporate debt expansion after the 2008 crisis. First, we present the features of emerging market corporate debt expansion after 2008, with particular importance for the growth of leverage, net foreign exchange exposure, and later deterioration in firms' debt repayment capacity. Next, we do a panel regression to identify the main changes in the determinants of emerging market corporate debt expansion before and after the 2008 crisis. Among these determinants, the growing importance of global factors (in which unconventional monetary policies are included), when compared to domestic microeconomic and macroeconomic factors. Taking into account the challenges raised by the expansion of corporate debt in emerging countries at the firm and national level, we discuss economic policy implications to emerging economies, with particular importance for the enhancement in financial regulation, macro and microprudential tools as instruments to increase the resilience of the financial system against crises.

In chapter 5, the discussion is centered on UMPs exit, and how will be shaped future monetary policy frameworks. First, we discuss several issues related to UMPs exit: lessons from past experiences of exit from monetary accommodation and current experiences; challenges, sequencing, and central banks' balance sheets sizes; spillovers and coordination. Furthermore, on how will be shaped future monetary policy frameworks, we analyze to which

extent policies previously classified as “unconventional” will be removed, or maintained (and considered as new tools available in monetary policy frameworks). In other terms, if there is going to be a “normalization” of monetary policies to pre-2008 crisis standards, or if it will be adopted a “new normal” for future monetary policy frameworks.

In chapter 6, we present the thesis’ general conclusions, with a summary of the main findings of each chapter. They bring us important insights into the past, present, and future of unconventional monetary policies.

As for the methodological procedure, in each chapter, we cite the main authors that discuss the points raised during the text, then present other authors that reinforce or oppose their points. At a later moment, we make a critical assessment of the points raised by the authors cited, analyzing the literature and sometimes presenting our own views on the topics discussed during the text.

1.3. Main Contributions

Some of the main contributions of the thesis to the literature on unconventional monetary policies are described in the sequence.

In chapter 2, on unconventional monetary policy historical background and conceptual debate, we explore in more detail nominal negative interest rate policies (NIRPs), one of the few UMPs which were not adopted in large scale before the 2008 crisis. Regarding NIRPs theoretical analysis, despite the arguments supporting their implementation originally came from mainstream authors (Monetarists and some New Keynesians), their adverse effects have been clearly pointed out not only by heterodox authors (Post-Keynesians) but also by other authors coming from the mainstream (group of New Keynesians and Neo-Fisherians), recognizing the flaws of views such as exogenous money and Quantitative Theory of Money. In practical terms, the analysis available in the literature is that, while negative interest rate positive effects were usually small and progressively faded out, various other negative effects

may appear over time, in the balance sheet of domestic agents and foreign economies affected by their spillovers. So instead of negative interest rates, we recognize that an active fiscal policy could be the first-best alternative of expansionary measures. Nevertheless, we understand that the implementation of an active fiscal policy may not be possible in jurisdictions implementing negative interest rates for legal/political constraints. Therefore, we argue in favor of other actions not commonly mentioned in the literature for this purpose: *countercyclical macroprudential measures followed by targeted liquidity operations and initiatives to improve debt restructuring/insolvency frameworks*. The adoption of such actions in a combined way would act in two fronts: i) Enhance credit supply conditions for productive purposes, reducing banks' balance sheets constraints and creating incentives to lend for the real economy; ii) Increase credit demand for productive purposes, by helping to repair consumers and entrepreneurs' balance sheets and promoting a positive effect in their state of confidence, which fostered an expansion in credit demand for consumption and investment. We believe such policy mix would bring a favorable contribution to promote a more sustained economic growth in countries that adopted negative interest rates, and lower financial stability concerns for domestic agents and foreign economies eventually affected by negative interest rate spillovers.

In chapter 3, which describes unconventional monetary policies in advanced economies with the Euro area experience, we analyze Euro area's sovereign and private yield curves' levels and differentials with ECB's main asset purchase programs announced/implemented from 2009 onwards. In each group of programs, by observing the outcomes in announcement and implementation dates, we compare the similarities and differences of results in core/periphery countries, and infer the importance of distinct UMP transmission channels to achieve those outcomes. Our analysis is based on a one-day window around each program announcement/implementation, considering that each program announcement/

implementation was the main event that influenced yield changes on its respective day. Other articles in the literature of Euro area bond yields with the event study approach so far have not involved the totality of features our analysis presents (all ECB asset purchase programs between 2009 and 2016, comparison of effects in announcement/ implementation dates and in core/periphery countries, as well as distinct monetary policy transmission channels). Our main results are as follows. Regarding sovereign bond programs, unlike other programs, the Public Sector Purchase Program (PSPP) initial announcement and implementation led to lower yields across almost all countries (except for Greece, that was not eligible). Furthermore, the PSPP led to more intense yield drops in *periphery* countries (mainly in the *announcement* date, implying a stronger role for the signaling channel of unconventional monetary policy), whereas in *core* countries yield drops were smaller, but more significant in the *implementation* date, implying a stronger role for the portfolio rebalancing channel of unconventional monetary policy. Those facts implied a reduction in the cost of borrowing of almost all governments, and reduced sovereign yield spreads between periphery and core countries, which were one of the main problems during the Euro area crisis. We also underline the importance of the way central banks communicate their announcements, and how they achieve better results when they do it more properly, improving the effects of their guidance over markets (e.g., UMPs signaling channel). This fact was observed on sovereign bond programs “verbal intervention” announcements, as well as in private bond programs, with the Corporate Sector Purchase Program (CSPP) experience.

In chapter 4, we discuss the effects of unconventional monetary policies on emerging economies, focusing on the increase in corporate debt. Our contributions to the literature in this chapter are to investigate the determinants of EMEs corporate debt expansion by using a dataset which goes from 2000 Q1 up to a recent period (2016 Q4), with subsamples before and after the 2008 crisis, so we identify the main changes in the factors that explain EMEs

corporate debt expansion before and after this event. Most importantly, we identify a factor not previously used in the literature with that purpose: the *interaction between higher commodity prices and more appreciated exchange rates*. Our findings suggest that the exchange rate has been one of the most important determinants that explain the increase in EMEs companies' debt through the period 2000-2016, and also in the period before the 2008 crisis. But after 2008, beyond some country-level factors (exchange rate, national GDP growth, firms' higher liquidity levels), other factors that have global origins (more accommodative monetary policy in USA, lower financial market volatility, global GDP growth, higher commodity prices and its interaction with the exchange rate appreciation) have become increasingly important to explain emerging market corporate debt expansion.

Finally, in chapter 5 we analyze UMPs exit and future monetary policy frameworks. We participate to the literature by arguing that central banks should not merely promote a complete return to pre-2008 standards ("normalization"), but need to take advantage of the experience with past episodes and the 2008 crisis response, in order to improve their future monetary policy and financial stability frameworks ("new normal"). Based on this, measures implemented in the post-2008 crisis would have three possible destinations in the new framework: i) Be discarded, due to their predominantly negative effects; ii) Not be regularly implemented, but be kept as a tool if needed to achieve central banks' objectives, especially under situations of crises; iii) Be incorporated as a regular measure of the monetary policy/financial stability framework. For instance, in the case of the Euro area, we would have the following examples: i) Exclude the SMP, once the sterilized bond purchases during its course did not solve the financial fragmentation in periphery countries, sometimes increasing periphery country sovereign yields; ii) Do not implement TLTRO II on a regular basis, but keep TLTRO II as an alternative facility to improve liquidity conditions, and foster targeting credit to the real economy if needed; iii) Keep forward guidance as a permanent tool to clarify

central bank's reaction function and improve communication, and macroprudential measures to expand the resilience of the financial system. In the case of small advanced open economies and emerging countries, central bank balance sheet policies (e.g., yield curve management, with monetary authorities selling/buying government bonds previously available/ placed after on their balance sheets to cope with excessive inflows/outflows and foreign exchange appreciation/depreciation) could be added to other actions already applied to face destabilizing pressures or excessive volatility in asset and foreign exchange markets (e.g., macroprudential measures, capital flow management initiatives, foreign exchange interventions). In this sense, monetary and financial stability authorities in advanced and emerging economies will need to be increasingly evolving institutions, in a continuously adaptive and innovative process, in order to face the challenges posed by financial markets that are each day more dynamic, innovative, complex, interconnected and globalized.

Chapter 2. Unconventional Monetary Policies: Historical Background and Conceptual Debate

2.1. Introduction

This chapter intends to analyze the implementation of unconventional monetary policies (UMPs) by the world's major central banks, starting with a historical perspective, and then discussing several conceptual aspects related to UMPs. After this introduction, section 2.2 describes the historical background of UMPs, mentioning experiences which they were implemented before 2008 in the United Kingdom, USA, and Japan. Section 2.3 addresses important conceptual aspects of UMPs, discussing these policies' main objectives, measures adopted (credit policies, quasi-debt management policies, forward guidance, exchange rate ceiling, negative interest rates), main transmission channels, as well as positive and negative views of different authors related to these measures. Section 2.4 presents some of the main UMPs implementation results available in the literature. The positive and negative effects of these policies on the most relevant financial and macroeconomic indicators of the main areas where they were implemented (USA, UK, Japan, Euro area) are mentioned, as well as the spillovers to other economies, especially emerging countries. Section 2.5 addresses the question of the role of inflation targeting regimes in the post-2008 scenario, and the discussion surrounding the possibility of adopting alternative targets (nominal GDP, price level) and policies (monetary finance), as well as enlarging central banks' mandates (incorporating employment, wages, inequality and environmental objectives). Section 2.6 closes the chapter with its main conclusions.

2.2. Historical Background

Although the expression “unconventional monetary policy” gained notoriety to name the set of extraordinary measures implemented by central banks after the 2008 crisis, this does not mean those policies are completely new or have never been practiced before. In fact, what

is called “conventional monetary policy” today - central banks controlling short-term policy rates, and keeping them at positive levels, in order to influence broad financial and macroeconomic conditions (Borio and Zabai, 2016) - has become a common practice since the 1990s. So we had several occasions in the history of central banks when they used instruments that differed from short-term interest rate control (or tried to steer them indirectly, through the injection of reserves into the banking system). Hence, we will highlight in the sequence some periods in the past when instruments that are now being called “unconventional” (e.g., expanded liquidity provision facilities, asset purchase programs, yield curve control measures) have already been used by major central banks, and explain the context of their implementation.

2.2.1. BOE as lender of last resort in 1825

The 1825 banking crisis in London is considered to be one of the first systemic financial crises in modern history. According to authors such as Smith (2009) and Morgan and Narron (2015), this crisis did not have a single event as a trigger. In fact, it had several factors behind it: i) Expansionary monetary policy fueled an increase in asset prices and a stock market boom; ii) Stimulus in demand for financing infrastructure projects - including in newly independent South American countries - fostered an increase in debt issuance; iii) New financial instruments blurred the distinction between sound projects and speculative/fraudulent “investments”; iv) Lack of discipline by banks and market oversight by authorities helped to spread risky activities. All of them precipitated into an environment of “panic” and contagion, with a bubble burst and a bank run. Surprisingly, the Bank of England did not react to those problems initially, later receiving strong criticisms from authors such as Bagehot (1873). Bagehot argued that in those occasions, the central bank had a crucial role in stopping the panic with three major rules. First, supplying all liquidity needed by financial institutions. Second, supplying

this liquidity at high interest rates¹. Third, supplying liquidity against good quality collateral. Only after the failure of some large banks in London, the Bank of England indeed assumed this lender of last resort (LOLR) role². It performed an extensive credit provision against different types of collateral, purchased public bills and used other tools, in order to put a floor on asset prices and avoid a liquidity freeze. So, after some delay, the BOE ended up using many mechanisms it had on its hands at that time to backstop the banking system. The institution managed indeed to contain the panic, although the stock market downturn and the recession lasted into 1826.

In a comparison between the LOLR rules prescribed by Bagehot after the 1825 crisis, and the actions taken by central banks right after the 2008 crisis, one can say that numerous authors (e.g., Meltzer, 2009; Taylor, 2009; Hogan *et al.*, 2015) argue that central banks have deviated from Bagehot's rules³ in the 2008 episode. For instance, Hellwig (2014) claims that, instead of lending freely to solvent banks, against good collateral, and at high rates, central banks right after 2008 lent freely, to banks of doubtful solvency, at mixed-quality collateral and low rates. In fact, central banks enacted tools to extend liquidity to a wide variety of agents beyond banks (i.e., non-bank financial institutions, firms, and households), acting as market makers of last resort (Mehrling, 2011; Le Maux and Scialom, 2013).

However, analyzing several historical experiences of financial crises in the 19th and 20th century, other authors such as Mishkin and White (2016) argue that central banks “unprecedented actions” such as the ones taken right after 2008 (deviations from Bagehot's rules) are the norm, and not the exception. This would be the case because by following

¹ According to specialists on Bagehot's writings such as Bignon *et al.* (2012), the objective to offer liquidity at high interest rates would be to avoid free-riding on central bank liquidity (discouraging borrowers who do not need it at that moment), and create incentives to keep interbank market functioning. Moreover, it would avoid moral hazard and protect central bank balance sheet from losses.

² Although Bagehot's (1873) rules for a central bank as lender of last resort were quite influential, the concept of LOLR had already appeared in the literature several years before, with Baring (1797) and Thornton (1802).

³ Still, there are other authors who dissent from this view, arguing that measures that were taken right after 2008 crisis (apart from some adaptations to modern financial systems) broadly stuck to Bagehot's rules, such as Madigan (2009), Bernanke (2012) and Domanski *et al.* (2014).

Bagehot's rules reactive (*ex-post*) approach, central banks would provide remedial relief for solvent banks, but not impede the financial shock to spread to other financial institutions and the real economy. Hence, central banks often preferred a preventive (*ex-ante*) approach, trying to avoid failures of large institutions and buffer the economy from crises shocks. However, this approach could foster moral hazard problems, since it can incentivize financial institutions to engage in excessive risk-taking, eventually leading to another financial crisis. Thus, the authors argue that a successful preventive approach, which reconciles price stability and financial stability, should not only focus if central banks can follow instrument rules strictly. Instead, this approach should open the way for central banks to pursue target or contingent rules⁴ that give monetary authorities more room for maneuver under such interventions, with transparency but limited discretion, so that monetary authorities can retain their credibility and mitigate moral hazard.

2.2.2. Fed asset purchase program in 1932

After the New York stock exchange crash in 1929, the period that followed it until 1933 is known as "Great Contraction", due to the huge losses faced by financial markets and the real economy. The Fed was faced with a tradeoff on that occasion, as argued by Eichengreen (2008). On the one hand, there was a call to pursue an expansionary monetary policy in order to try to provide some stimulus to the economy. On the other hand, the Fed had to keep a relatively tight monetary policy stance, in order to avoid further capital outflows, which were undermining the convertibility of the dollar in the gold standard. Faced with this dilemma, the Fed opted to try to safeguard dollar convertibility, by keeping a relatively tight monetary policy stance (contraction of the monetary base, and decline of nominal interest rates lower than of inflation, implying an increase in real interest rates). Even if Fed discount rates were lowered,

⁴ According to Mishkin and White (2016), central banks may set three different types of rules: i) instrument, more defined and easily verifiable (e.g short-term interest rate); ii) target, more flexible and less easily verifiable, with a focus on the medium term (e.g., inflation); iii) contingent, discretionary and temporary, to face extraordinary conditions (e.g., extensive liquidity provision operations).

banks were not using the discount window, for two reasons: i) For reputational effects, to avoid that depositors interpreted it as a sign of weakness and withdrew their funds; ii) Banks were unable to borrow from it because they lacked eligible collateral. This “inaction” by the Fed after the 1929 crash (neither serving as a lender of last resort à la Bagehot, nor using its tools to prevent deflation or the collapse of real economic activity) was considered one of the major policy flaws at that time, as mentioned by authors such as Friedman and Schwarz (1963) and Bernanke (2000).

One exception of Fed inactivity during the Great Contraction was a brief period from April to August 1932. In this occasion, under pressure from the Congress, the Fed engaged in the purchase of US\$ 1 billion in Treasuries, according to authors such as Anderson (2010). This was a sizeable open market program at that time, once it represented 2% of GDP. According to Bordo and Sinha (2016), this program had significant effects in reducing Treasuries yields: short-term bills -90 basis points (bps); medium-term notes -114 bps; long-term bonds -48 bps. It also temporarily reversed the decline in money supply and led to a quick revival in industrial production and real output. This effectiveness would be explained by the high segmentation in bond markets that prevailed at that time (non-bank agents had difficulty in accessing public bond markets, concentrated in few banks). This fact allowed that central bank purchases indeed increased Treasury prices and lowered their yields, providing a positive stimulus for output.

Nevertheless, the Fed opted to end this asset purchase program just five months after its implementation, for several reasons. Bordo (2014) argues the Fed feared that the expansionary policy reinvigorated stock market speculation, created inflationary pressures and threatened gold convertibility. Epstein and Ferguson (1984) point to an additional reason: the banking sector did not want that asset purchases continued pushing interest rates lower, a fact that could reduce further their profitability, which was already weak. That is why Epstein and Ferguson (1984) argue that facing conflicting objectives – protecting the soundness of a specific sector

(financial) and overseeing the protection of other business/ real economy - the Fed ended up opting for the former.

It is interesting to observe that the asset purchase experience in 1932 and the first quantitative easing program implemented by the Fed in 2008 (Large Scale Asset Purchase Program - LSAP 1) had various similarities. Bordo and Sinha (2016) affirm that both programs had the following common elements: i) Were measures to boost economic activity, in the middle of a severe economic downturn; ii) Were large scale operations, with unprecedented amounts; iii) Were not planned to continue for an indefinite time period. Nevertheless, they also point to important institutional differences between the implementation of the two programs: (i) A fixed exchange rate regime based on the gold standard in 1932, instead of a flexible exchange rate in 2008; (ii) The announcement of the program's size and time extension during the LSAP 1 episode, which have not occurred in 1932; (c) The use of other unconventional tools in 2008-2009 (including lending facilities and asset purchases from non-financial agents), instead of the single focus in public bonds in 1932. Beyond the similarities and differences between the two experiences, those authors argue that, as bond market segmentation was higher in 1932, and the program showed significant positive effects in the short period it was implemented, the "Great Contraction" could have ended earlier if the program had been prolonged for more time, and accompanied by other tools that reinforced it (e.g., a better communication of Fed's reaction function to the market, and a bolder set of additional fiscal and regulatory measures by the government⁵).

⁵ The "Great Contraction" just ended in March 1933, when the new elected President Roosevelt declared a one-week nationwide banking holiday and closed insolvent banks. Later, he enacted a series of important fiscal, exchange rate, and regulatory measures that allowed the USA to emerge from the recession, as described by Meltzer (2003). More specifically on the financial sector, it concentrated authority within Fed's Board of Governors, expanded the institution's ability to lend on the basis of any sound collateral, and authorized it to lend to non-financial firms in a crisis. Furthermore, there was the introduction of a federal deposit insurance scheme by the Federal Deposit Insurance Committee (FDIC); the mandatory separation of commercial and investment banking (Glass-Steagall Act); the regulation of deposit interest rates (regulation "Q" of Glass-Steagall Act); and stricter limits on market entry. All those reforms were intended to improve Fed's ability to respond to crises, while turning the banking system less vulnerable to instability episodes.

2.2.3. Yield caps on sovereign bonds by the BOE/Fed in the 1940s/1950s

With World War II, the expansion of government budget deficits and debts exerted upward pressure on long-term interest rates of major economies. Due to these concerns, central banks in the United Kingdom and the United States implemented a cap on long-term sovereign bond yields, in order to curb the cost of government financing and stabilize government bond markets.

In the United Kingdom, the large expansion of government debt led the Treasury to commission a National Debt Enquiry in 1945. The Enquiry report recommended that the government should establish a term structure of yields on government securities, and allow the maturity structure of government's debt to be determined by investors. The policy then implemented came to be known as "ultra-cheap money", as described by Allen (2012). According to this author, this policy was implemented with the Treasury refusing to issue government securities at yields higher than those which the government deemed acceptable. For long-term gilts, it was adopted a cap of 2.5%, with the Treasury and the Bank of England conducting gilt purchases in order to try to keep this cap. Conversely, the Treasury had to reduce the debt maturity profile, by increasing significantly the issuance of short-term bills to ensure its financing. Concerns with the rapid growth of credit and inflation led the Treasury/BOE to abandon the 2.5% cap in 1947, although net gilt purchases continued until 1948.

In the United States, Fed policy to control the rise of government bond yields began before, in 1942, as described by Meltzer (2003). The Fed imposed a cap not only for long-term bonds (2.5%) but also for three-month bills (0.375%), incurring in large bond purchases to try to keep those caps. The cap on short-term bills was gradually raised to around 1% and finally abandoned in 1948, but the cap on long-term bonds was kept in 2.5% until 1951.

Those policies actually managed to control the rise of long-term government bond yields. However, some agents at that time posed strong criticisms to it, as mentioned by Shirai (2018): i) Market excessive reliance on central banks' actions could not develop proper trading volumes/pricing mechanisms by its own; ii) Central banks' purchases were increasing inflationary pressures on the economy, which were already on an upward trend after World War II; iii) Central banks' policies became subordinated to governments' debt management framework, instead of pursuing central banks' objectives (e.g., control inflation). All these criticisms led to the removal of the sovereign bond yield caps previously implemented.

In the UK, after the removal of the cap, the objective of monetary policy in the 1950s shifted towards trying to manage a balanced growth of aggregate demand and supply, and hence contain excessive credit growth, inflation and keep the exchange rate parity, as argued by Allen (2012). However, debt management policies and lending controls were still seen as an important part of the monetary framework, as mentioned in the Radcliff Committee Report in 1959. Therefore, there was some coordination between the Treasury and the Bank of England, with government funding operations trying to support monetary policy efforts to control credit. For instance, the Treasury carried out operations to sell gilts and absorb short-term bills⁶, thus reducing banks' liquidity and adding to the efforts of containing credit growth.

In the USA, the removal of the yield cap happened in March 1951, when the Treasury-Federal Reserve Accord was signed. This accord not only removed the 2.5% cap but also paved the way to strengthen the Fed's operational independence, as mentioned by Meltzer (2003). Fed's independence was confirmed in 1953, when the Fed stated that the goal of monetary policy was to achieve price stability. Furthermore, it announced the implementation of the "Bills Only" policy, limiting the target of its open market operations to Treasury Bills. This

⁶ Until 1971, the BOE requested UK banks to keep a minimum ratio of 30% in cash and liquid assets, as a percentage of their total assets. For this purpose, short-term Treasury bills counted as liquid assets, but gilts did not.

policy was based on the idea that both short-term and long-term interest rates should be determined by market forces⁷. By then, Treasury Bills were large in terms of the amounts outstanding and transaction volumes. By limiting its scope to Treasury Bills, the Fed intended to influence reserve amounts held by commercial banks, attenuating the direct effects of open market operations on the entire term structure of interest rates.

2.2.4. Fed “Operation Twist” in 1961

In the aftermath of the Korean War in 1960, the USA was found in a difficult economic situation, both in external (dollar/gold outflows) and domestic (output downturn) terms. In this context, the priorities of incumbent President Kennedy were to improve the country’s balance of payments and recover economic activity.

Under these circumstances, in 1961⁸ the Fed conducted a program that was coined “Operation Twist”. The purpose of this program was to reduce capital outflows by keeping short-term interest rates high and to promote stimulus to the domestic economy by lowering long-term interest rates. In order to do so, the Fed sold short-term bills, in an amount of US\$ 7.4 billion, and purchased long-term bonds in an amount of US\$ 8.8 billion (1.7% of GDP), according to Ehlers (2012). It also counted on the support of the Treasury to reduce the maturities of the securities issued, with this institution focusing primarily on short-term bills.

There were mixed views on the effectiveness of this program. In theory, Operation Twist was expected to be effective if the markets for long-term and short-term bonds were segmented and the two classes of bonds were not perfect substitutes, as claimed by the “market segmentation theory” and/ the “preferred habitat hypothesis”. Conversely, from the viewpoint

⁷ In this sense, it differed from central banks’ steering short-term interest rates, which came to be the main policy tool used by monetary authorities since the 1990s.

⁸ Fed’s “Operation Twist” was announced in February 1961 and ended officially in 1965. However, its operations were basically carried out in 1961, with very little activity in remaining years, until it was terminated officially in 1965, according to Ehlers (2012).

of the “expectations theory of the term structure”⁹, long-term bonds and short-term bonds were highly substitutable, which would turn Operation Twist ineffective.

Among several evaluations of the program that were conducted on that occasion, one of the most influent was published by Modigliani and Sutch (1966). Even if these authors supported the “preferred habitat hypothesis”, the analysis performed by them showed that the reduction of spreads between long-term and short-term debt was minimal, and not statistically significant¹⁰. According to Amamiya (2017), this study ended up supporting a view that gradually spread after that occasion: “central banks can control short-term interest rates, but not long-term interest rates”¹¹.

After the 2008 crisis, this view lost some support, in the sense that even mainstream economists, who continue arguing against a direct control of long-term interest rates by central banks, now recognize sometimes it is desirable to let long-term interest rates be indirectly “guided” by central banks through UMPs, so as to achieve their price stability objectives. For instance, a new “Operation Twist” was implemented by the Fed from September 2011 until December 2012. This time, the Fed did not count on the explicit support of the Treasury shortening the maturity of its issuances like in 1961. Instead, the Fed used open market operations, selling short-term Treasuries (less than 3 years), and buying US\$ 667 billion in

⁹ See further details on the “market segmentation theory”, “preferred habitat hypothesis” and “expectations theory of the term structure” in the discussion related to transmission channels of monetary policy in section 2.3.

¹⁰ A reassessment of Modigliani and Sutch (1966) study was made more recently by Swanson (2011). This author pointed out that Modigliani and Sutch used low frequency (quarterly) data on their time series, which may have led them to face endogeneity problems and obtain biased results. Using high frequency data in an event study, Swanson found that the 1961 Operation Twist had statistically significant results, which could seem moderate in size (reduction of around 15 bps in long-term interest rates), but could be equivalent to a non-negligible easing policy (i.e., a 100 bps cut in the Federal Funds rate target).

¹¹ This view was built within the Monetarist and New Keynesian frameworks, which believe that interest rates tend to converge to the “neutral” or “natural” interest rate in the long term. According to this view, the neutral rate is the interest rate that is consistent with output at its potential level, and inflation at its target. This natural rate would vary over time according to several factors: structural, which determine its long-run trend (e.g., potential growth, demographics, market structures) and transitory, which may temporarily deviate them from long-term values (i.e., macroeconomic shocks). These factors would be outside the control of monetary authorities. Therefore, Monetarist and New Keynesian authors argued against the control of long-term interest rates by central banks, which according to them could cause problems such as distortions in financial markets and inflationary bias.

medium/long-term bonds (from 6 to 30 years). The intention was to induce a reduction in long-term yields, without the need to expand its balance sheet like in previous LSAP programs. According to Ehlers (2012), the effect of 2011-2012 Operation Twist in long-term yields was temporary and somehow offset by new issuances of long-term bonds by the Treasury. However, the reduction in the overall maturity of the outstanding debt held outside Fed's balance sheet (from 7.7 to 5.5 years during the program implementation) may have lowered term premia and created a stimulative effect on the real economy.

2.2.5. The Japan Experience in the late 1990s and 2000s

2.2.5.1. Zero Interest Rate Policy and Forward Guidance (1999-2000)

At the beginning of 1999, Japan registered deflation in its two main measures of underlying inflation: core (CPI excluding food) and core-core (CPI excluding food and energy) indexes. Before falling into deflation, Japan experienced in the early 1990s the collapse of a bubble in real estate and stock market prices, subsequently followed by a financial crisis in the second half of the 1990s. In the view of authors such as Koo (2011), this crisis was a typical case of a *balance sheet recession*: instead of maximizing profits, Japanese private sector as an aggregate tried to minimize debts/deleverage at the same time¹², pushing down asset prices and the economic output.

However, this deflation was not a fast and acute deflationary episode, like the ones experienced after the collapse of bubbles in other countries. Rather, it was a prolonged mild deflation, which lasted for most of the 2000s decade, and could be explained by several factors. According to Shirai (2018), the deflation was a result of a chronic demand shortage and a sluggish output growth experienced since the beginning of the 1990s. The potential growth rate itself was on a long declining trend, which according to this author was mainly attributable to a

¹² This argument is based on the concept of fallacy of composition (rational individual decision to minimize debt has a negative outcome on the aggregate), and has a similar logic to the paradox of thrift, which had been already described since Keynes (1936).

slowdown in capital stock accumulation and total factor productivity (TFP) growth. Unfavorable demographic dynamics (aging population) also played a role in the reduction of potential growth¹³. Moreover, exchange rate developments, with a significant appreciation of the yen against the dollar during several periods of the 1990s and the 2000s contributed to the deflation. Overall, all those events have led households to save more because of growing concerns about the future, discouraged firms from engaging actively in business fixed investment and innovative activities, and prompted financial institutions to undertake risk-averse investment strategies, explaining the prolonged environment of mild deflation and economic stagnation.

At the beginning of 1999, the BOJ did not have enough information to evaluate if the deflation registered was the beginning of a fast/acute deflationary episode or a prolonged mild deflation. However, the institution decided to act, by introducing a nominal Zero Interest Rate Policy (ZIRP) in February 1999. The BOJ initially guided the uncollateralized overnight call rate to move around 0.15% and subsequently induced a further decline towards 0%. This was done by providing large amounts of short-term funds against collateral pooled by financial institutions. In April 1999, the BOJ Governor Masaru Hayami provided a kind of guidance to the zero interest rate policy. However, he did not do it by a formal Public Statement on Monetary Policy. Instead, at the press conference immediately after the April 1999 Monetary Policy Meeting, he informally expressed his view that the BOJ would maintain its zero interest rate policy “*until deflationary concerns were dispelled*”. It was seen as open-ended forward guidance, trying to signal a more accommodative monetary stance. Nonetheless, this move received several criticisms at that time, according to Shirai (2018). First, for the vagueness of the definition of deflation (not clear which inflation index or other indicators would be

¹³ The adverse demographic effects on productivity started to be tackled by specific policies since Prime Minister Abe took office in 2013. He introduced policies to encourage labor market participation by over 65-year-olds and housewives.

considered in BOJ's evaluations). Second, for allowing a wide range of interpretations about the date the policy could be ceased.

In fact, ZIRP was implemented for 18 months, until August 2000, when the policy rate was lifted to 0.25%. In order to justify its exit decision, the BOJ provided in the meeting's Statement of Monetary Policy the following arguments: i) The downward pressure on prices coming from weak demand had receded; ii) The policy ceasing meant an adjustment to the degree of monetary easing in line with the improvement observed in the economy; iii) The policy rate would still be extremely low, and hence could support further economic recovery; iv) The termination of the policy would raise the public confidence that the economy was recovering and enhance markets' dynamism.

However, this perception that the Japanese economy had improved was not broad-based¹⁴. Although output and trade indicators (i.e., industrial production and exports) presented some improvement, inflation indexes (CPI and core CPI) remained negative. On the following months, the Japanese economy showed signs that it had been negatively affected by the dot-com bubble burst in the USA in that period, with exports and output dropping sharply in early 2001, while inflation remained negative. Hence, BOJ's decision to increase the policy rate was reversed six months later¹⁵. In February 2001, the increase in the policy rate ceased, and it was lowered from 0.25% to 0.15% (with effect from March 2001).

2.2.5.2. Quantitative Easing (2001-2006)

In this more adverse scenario, in March 2001 the BOJ adopted a new monetary easing framework, that later came to be known as Quantitative Easing (QE). This new framework was composed of three essential elements, as explained in BOJ's Statement of Monetary Policy at

¹⁴ For instance, the view of the Ministry of Finance and of the Cabinet Office was that it was premature to terminate the Zero Interest Rate Policy, given the economic and financial situation at that time. In the August 2000 BOJ meeting, their representatives filed a request to postpone the exit decision until the next Monetary Policy Meeting, but this request was dismissed by the majority of BOJ Board members.

¹⁵ Because of the presence of deflation during the lifting of the decision and the subsequent reversal of the policy, many analysts at the time shared the view that BOJ's decision to discontinue ZIRP was inappropriate and had negatively affected its credibility.

the occasion. First, there was a shift from nominal interest rate targeting (uncollateralized overnight call rate) to reserve targeting (commercial banks' current account balances at the BOJ, which roughly corresponded to the sum of required and excess reserves). The reserve target amount was raised nine times: from an initial 5 trillion yen to around 30–35 trillion yen in January 2004, a level that was maintained until the end of QE policy in March 2006. In order to achieve this reserve target, the BOJ provided short-term funds (maturities of 1 year or less), expanding excess reserves. Second, with the policy announcement, the BOJ provided a formal commitment to maintaining the QE policy until the core CPI registered “stably zero percent on a year-on-year increase”. This commitment was clarified further in October 2003 by the introduction of two QE exit conditions: (i) The most recently published core CPI registered zero percent or above, and this level needed to be maintained for several months; (ii) The projected core CPI would be no lower than zero percent. This was *state-contingent forward* guidance, based on the actual and expected performance of the core CPI, thus more explicit than in the earlier ZIRP commitment. Third, it was decided to increase government bond purchases if it was found necessary to facilitate meeting the reserve target.

Observing the economic developments after the implementation of QE, authors as Shirai (2018) point that, after reaching a trough in January 2002, Japan's economy was finally able to enter a moderate recovery phase. The main engines of this recovery were exports and domestic manufacturing activities associated with them, supported by favorable global growth and depreciation of yen's effective exchange rate. Yen's depreciation, especially against the euro and the U.S. dollar, occurred due to interest rate differentials and risk-taking behavior of investors, which engaged in carry trade activities (selling yen and buying foreign currencies without hedge). Regarding the core CPI index, after remaining in slightly negative territory in the early 2000s, it finally turned positive in late 2005, followed by higher levels from early 2006 onwards.

Taking into account these developments, at the March 2006 BOJ meeting, the institution concluded that the conditions laid out in its previous commitments had been fulfilled. More specifically, the Board presented the following reasons: (i) Positive core CPI from end-2005 until January 2006 (the latest data available then); (ii) Projections of further improvements in GDP growth; (iii) Expected wage increases and tighter labor market conditions, partly as a result of growing economic activity; (iv) Rising inflation expectations of firms and households, also boosted by yen's depreciation and an increase in international commodity prices. By then, BOJ's estimates were that core CPI would stay within the range of 0% to 1% in fiscal year 2006, and slightly below 1% in fiscal year 2007.

Therefore, the BOJ proposed to end the QE policy at the March 2006 meeting. Instead of the outstanding balance of current accounts at the BOJ, the uncollateralized overnight call rate would be reintroduced as the main monetary policy instrument, with a level set at zero percent. Furthermore, at this policy meeting, the BOJ introduced a longer-run inflation outlook, named "*understanding of medium-to-long-term price stability*". This understanding was not an official inflation target, but a level of the CPI inflation recognized as price stability by the BOJ Board. This long-run outlook was initially implemented in the range of 0% and 2%, with a median of 1%, and it could be revised on an annual basis. The BOJ acknowledged that this long-run outlook was below the average inflation targets in other advanced economies (2%). However, it preferred to take into account Japan's experience of very low inflation during the last decades, considering that the inflation range at which agents would perceive prices to be stable would also be low.

After March 2006, the BOJ voted in favor of two interest rate hikes: in July 2006 (from 0% to 0.25%) and in February 2007 (from 0.25% to 0.5%). This policy rate was maintained until October 2008.

The decision to exit the QE policy in March 2006 was controversial, as it was the decision to lift the Zero Interest Rate Policy in August 2000¹⁶. The criticism gained strength in the middle of 2006, after the release of a revision in CPI data¹⁷. According to the Japanese Statistics Bureau, this revision resulted in an average decline of 0.5% from January to July 2006. So the actual number for the core CPI in January 2006 was -0.1%. This meant that one of BOJ's exit conditions - the most recently published core CPI is zero percent or higher for several months - was not satisfied. Furthermore, year-on-year changes in the core-core CPI remained negative during 2005 and 2006. Nevertheless, BOJ's long-term inflation expectations projections remained positive and more or less at around 1%, revealing some upward bias in the institution's inflation expectations forecasts. For those reasons, authors as Shirai (2018) argue that many analysts at that time considered BOJ's decision to abandon QE in March 2006 premature, having the opinion that the institution was rushing too fast to withdraw its monetary stimulus.

Other analysts were more skeptical about BOJ's accommodative policies at that time. For instance, Koo (2011) considered that, once Japan had faced a prolonged balance sheet recession, it was found in a liquidity trap with a deflationary nature¹⁸. Hence, in such context indebted agents do not spend, but try to pay off debts; banks do not lend, due to the lack of demand from new borrowers; consumption and investment are postponed and do not recover by themselves. In those situations, expansionary monetary policies are inefficient, and what

¹⁶ In March 2006, the Ministry of Finance and the Cabinet Office also opposed the QE exit. Unlike the August 2000 meeting, this time their representatives did not file a formal request for the BOJ Board proposal to be postponed until the next monetary policy meeting. Instead, they expressed their strong dissatisfaction regarding BOJ's Board proposal orally, and asked for more cooperation from the part of BOJ with the government, in their efforts to overcome deflation. These statements did not change the course of BOJ's Board decision to exit the QE policy.

¹⁷ Revisions in CPI data in Japan are done every five years, adjusting the base year and updating the weights of the consumer price index basket.

¹⁸ A broader discussion on the concepts of "liquidity trap" and "debt deflation" is done in appendix 2.1 at the end of this chapter.

would be really needed was a proactive fiscal policy¹⁹. In Koo (2011) view, the collapse was not worse because of two mitigating elements. First, despite government efforts to cut fiscal deficit on some occasions (i.e., 1997 and 2001, following IMF and OECD recommendations), this deficit actually increased, with a parallel increase of government borrowing. In fact, this increase in fiscal deficit allowed some periods of temporary revival in economic output, which avoided a larger recession. Second, the government provided capital injections in the banking sector twice after 1997 to avoid a more broad-based financial crisis. This is in accordance with the view that, under balance sheet recessions, only liquidity injections do not solve insolvency problems in financial institutions, which have a deeper nature.

2.3. Unconventional Monetary Policy - Conceptual Issues

In this section, the main conceptual aspects related to unconventional monetary policies will be discussed, especially their objectives, transmission channels, and main measures.

Before the 2008 crisis, advanced economies' central banks operated in a relatively predictable and stable environment. Since the 1990s, central banks' reaction function was usually defined by an interest rate instrument rule according to Taylor (1993), in which deviations from the inflation target and/or potential output were corrected through changes in short-term nominal interest rates²⁰. Favorable arbitrage conditions meant that short-term nominal interest rates were transmitted to the whole spectrum of the yield curve (including long-term maturities) and to other asset classes.

However, unlike the conventional view shaped throughout the period mid-1980s until 2007 that large recessions would be unlikely events of short length, authors like Williams (2014) argue that major recessions are not rare events of slow recovery, especially when

¹⁹ According to Koo (2011), this should be done by a medium-term (5/10 year) commitment by the government to increase expenditure (not to cut taxes, which could lead to demand leakages due to debt repayment and increase in saving). As a result, the increase in public sector spending could compensate for the decrease in private sector spending while balance sheets were repaired, avoiding the economy to collapse.

²⁰ According to the Taylor rule, nominal interest rates would equal the sum of real interest rates, inflation expectations, and deviations of inflation from its target, and output from its potential level.

followed by financial and banking crises. According to the author, this conventional view would have been built on previous works that considered data only from the USA after World War II. However, considering a larger sample of countries over a longer time period, Williams (2014) showed that large recessions are more common than previously thought, and given their severe effects, they last for a longer period²¹. Thus, the 2008 crisis challenged the conventional view of the predominance of “stability” in at least three aspects. First, the liquidity scarcity has led several markets to be paralyzed. Second, the disruption of arbitrage conditions undermined the transmission of monetary policy to bond yields and other asset prices. Third, the severity of the recession pushed nominal interest rates to near zero/negative levels.

In this context, the implementation of UMPs would aim to promote macroeconomic stabilization through two broad objectives, according to IMF (2013a): (i) restoration of the proper functioning of financial markets and their intermediation mechanisms; (ii) introduction of additional monetary stimulus, since conventional accommodative mechanisms were close to their limit. Those objectives would also have a particular sequencing: focus on the first one right after the initial and acute part of the crisis in 2008, later shifting to the second one, as financial intermediation conditions began to be restored.

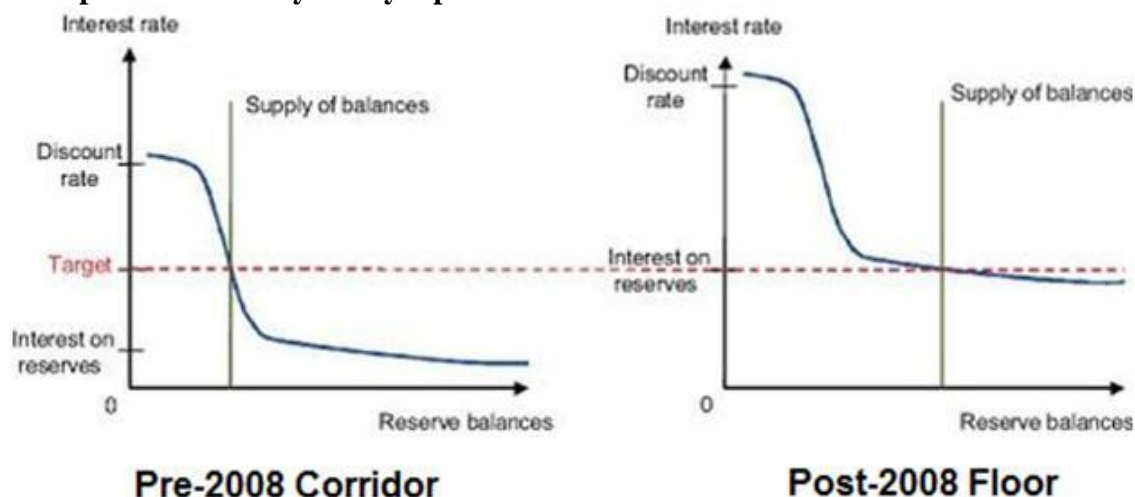
In order to achieve those objectives, central banks in advanced economies had to adjust their monetary policy operational frameworks, and also implemented a wide variety of unconventional measures.

On the adjustment of central banks’ monetary policy operational frameworks, there was a change in the amount/design of liquidity provision mechanisms, and in interest rates used by monetary authorities as a reference to steer short-term interbank market rates, as mentioned by

²¹ From a sample of 17 countries in the period 1871-2012, Williams (2014) shows that the observed fall in U.S. GDP in 2009 (-3.7%) has a chance to occur in the same magnitude in 5.2% of the time (or once every 19 years). Moreover, a lasting shock of at least two years occurs in 4.4% of the time (or once every 23 years). These numbers point to a much greater probability than when only post World War II USA data is considered: 1 every 430 years for a crisis of similar magnitude, or 1 every 570 years for a shock lasting at least at least two years.

authors such as Keister (2012). The main differences between the pre-2008 and post-2008 operational frameworks can be visualized in graph 2-1.

Graph 2-1 Monetary Policy Operational Frameworks Before and After 2008



Source: Keister (2012)

Monetary policy operational framework between the 1990s and 2008 – without excess reserves – was known as the “corridor” system. The benchmark interest rate for regular liquidity operations was the target (main refinancing) rate, at the middle of the corridor, with the discount (marginal) rate for overnight operations at the top of the corridor, and the interest on excess reserves - IOER (deposit) at the bottom of the corridor. Money market rates were steered to the target rate at the middle of the corridor, by estimating banking system’s liquidity needs from reserve requirements and autonomous factors (e.g., banknotes), and then satisfying these liquidity needs exactly. The monetary policy operational framework after 2008 – with excess reserves – was switched to the “floor” system. The main interest rate for policy purposes became the interest on reserves (deposit) rate, at the bottom of the corridor, which determines the amount central banks pay on excess reserves. With saturated demand for reserves, interbank market rates usually stand closer to deposit rates²² (banks borrow/lend at

²² In some occasions, interbank market rates can be traded below interest on excess reserves. This event may occur if a significant number of non-bank financial institutions (which are not eligible to earn interest on reserves) are willing to lend in the market at lower rates. It happened in USA, which has a very deep non-bank financial market, composed of large institutions such as money market funds and government-sponsored

levels close to the one they can receive if they leave their excess reserves on central banks' balance sheets).

On the types of unconventional measures, we find in the literature several forms to classify those measures. We describe in the sequence the taxonomy proposed by Borio and Zabai (2016), which we find that encompasses in a more comprehensive manner this large variety of measures. According to these authors, central banks unconventional measures can be classified into two different groups. The first group would be *interest rate policies*, through which central banks set nominal interest rates, or steer expectations about their future path, in order to influence financial conditions. On this first group, we could include measures such as setting nominal interest rates on excess reserves at a negative level and forward guidance on interest rates. The second group would be *balance sheet policies*, whereby the central bank adjusts its current balance sheet size/composition, or steer expectations about its future balance sheet size/composition, in order to influence financial conditions, beyond the effect generated by interest rates. This second group would encompass a diverse set of measures: i) Credit policies, focusing on private debt/ securities (e.g., private asset purchases, liquidity provision operations, adjustment in the requirements for central bank operations, in terms of maturities/collateral/counterparties); ii) Quasi²³-debt management policies (i.e., public bond purchases, government bonds' yield curve control); iii) Bank reserves policies (operations that target the size of central bank balance sheet); iv) Forward guidance on balance sheet policies (communication about the expected size/composition of central banks' balance sheet); v) Exchange rate policy (interventions in foreign exchange markets).

All those measures count on several *transmission channels* of monetary policy. Before the 2008 crisis, several authors had already described the so-called “conventional” monetary

agencies. The creation by the Fed of a liquidity facility for non-bank financial institutions (the Reverse Repurchase Agreement Facility-RRP) in September 2013 served as a floor to those deviations from interbank market rates to interest on excess reserves. See further details of RRP in section 5.6.

²³ The word “quasi” is to distinguish central banks' open market operations from public debt direct management policies performed by Treasury departments, as explained by Borio and Zabai (2016).

policy transmission channels: i) Interest rates (Mishkin, 1996); ii) Asset prices, including equities, house/land, and their association with wealth effects (Mishkin, 1996); iii) Expectations, based on the expectations theory of the term structure, in the tradition of Fisher (1930), Hicks (1939) and Lutz (1940); iv) Exchange rates (Taylor, 1995); v) Credit, including bank lending and firms/households balance sheets (Bernanke and Gertler, 1995)²⁴;

Unconventional monetary measures would also operate through these “conventional” channels, and some other additional channels. The two main UMP transmission channels would be signaling and portfolio rebalancing. Table 2-1 summarizes their main features.

Table 2-1 UMPs Main Transmissions Channels

Feature	Signaling	Portfolio Rebalancing	
		Scarcity/Local Supply	Duration
Underlying Theory of Finance	Expectation theory of the term structure Management of expectations	Market segmentation, with preferred habitat agents and limited arbitrage	Market segmentation, with preferred habitat and risk-averse arbitrageurs' agents
Expected Impact	Flattening of the whole yield curve, usually more intense in expected future short rates	Quantity: ↓ term premium of assets in the same maturity	Maturity: ↓ term premium in the whole yield curve, in particular, long-term assets

Source: Author own elaboration, based on classification available in IMF (2013a) and Altavilla *et al.* (2015).

The first channel would be called “signaling” (Krishnamurthy and Vissing-Jorgensen, 2011; Christensen and Rudebusch, 2012; Bauer and Rudebusch, 2014). Its theoretical underpinning is on the expectations theory of the term structure, in the tradition of Fisher (1930), Hicks (1939) and Lutz (1940), and further developed by the management of expectations mechanism described by Woodford (2003)²⁵. The expectations theory of the term structure leads to the prediction that the long-term interest rate is an average of current and expected future short rates, and relies on assumptions such as efficient market hypothesis

²⁴ Although these monetary policy transmission channels are deemed as “conventional”, some of them are subject to strong criticisms, for relying on problematic theoretical hypotheses. For instance, the credit channel (in particular, the bank lending component) is supported by erroneous loanable funds theory and Quantity Theory of Money logics (larger bank reserves do not necessarily lead to more credit, spending or inflation), as argued by Fiebiger and Lavoie (2018). A similar criticism is valid when this bank lending channel is used to explain UMPs transmission mechanisms, as mentioned by Lavoie and Fiebiger (2018), who support their argument on the endogenous money theory (discussed further in subsection 2.3.5.2).

²⁵ According to the “management of expectations” mechanism highlighted by Woodford (2003), the effectiveness of monetary policy increases with the ability of central banks to influence market expectations about the future path of nominal interest rates, and not merely their current levels.

(Fama, 1970) and perfect asset substitutability. The signaling channel goes beyond the conventional expectations channel, with the communication coming from the central bank that the set of UMPs being implemented implies a commitment of maintaining an accommodative stance for an extended time period. So its expected impact is a flattening of the whole yield curve, usually more intense in future short rates (once the central bank commitment is more certain to last in the short-term), but also effective in lowering future long rates.

The second channel is known as “portfolio balance” or “portfolio rebalancing” (Bernanke, 2010; Gagnon *et al.*, 2011; Joyce *et al.*, 2011). Its theoretical underpinning is on the market segmentation theory developed by authors such as Tobin (1958, 1969). With market segmentation, assets are not perfect substitutes in market trading. So when the central bank purchases an asset in the market (i.e., sovereign bond), it raises the price of that asset, hence reducing its term premium and its yield. This yield reduction has spillover to other assets, with investors being incentivized to rebalance their portfolio towards riskier asset classes (e.g., corporate bonds, loans to households/firms).

The portfolio rebalancing channel operates through two mechanisms. The first one is named “scarcity” (following Krishnamurthy and Vissing-Jorgensen, 2013) or “local supply” (following D’Amico and King, 2012). Beyond the assumption of market segmentation, the scarcity mechanism assumes the assumptions of preferred habitat (agents prefer to retain assets of a specific maturity, as described by Modigliani and Sutch, 1966) and limited arbitrage (occasions when asset prices diverge from fundamentals, restricting arbitrage opportunities, as argued by Shleifer and Vishny, 1997). The main action of the central bank in the scarcity mechanism is on quantities. As the central bank is a large buyer in the market, the price of the specific assets being purchased rise, and yields of these securities fall. Moreover, with the “local supply” effect, yields fall not only in the specific asset being purchased by the central bank, but also fall in other assets within the same maturity, although the size of the fall

is not as big as in the specific asset purchased by the central bank. Hence, this mechanism fosters investors to rebalance their portfolios towards riskier asset classes within the same maturity range.

The second mechanism is called “duration” (Vayanos and Villa, 2009; Greenwood and Vayanos, 2014). The main theoretical assumptions underlying this mechanism are market segmentation, and to consider the existence of two types of agents: preferred habitat (prefer to hold assets in specific maturity) and risk-averse arbitrageurs (invest across different maturities, subject to certain risk-bearing capacity). In this mechanism, the main action of the central bank is on maturities. Central banks buy assets on a large scale, reducing term premium and duration risk²⁶. Hence yields drop not only on the specific maturity bought by the central bank (assuming preferred habitat agents) but in all maturities, especially in the long-term (assuming risk-averse arbitrageurs’ agents). Thus, this mechanism fosters investors to rebalance their portfolios towards riskier assets, especially to ones with longer maturities.

Other channels are also mentioned in the literature and would be more relevant for specific situations or jurisdictions. For instance, the “liquidity channel” (Gagnon *et al.*, 2011; Joyce *et al.*, 2011) would be relevant in situations of acute financial stress. By providing liquidity and purchasing assets, the central bank would serve as a buffer to agents, making it less costly for investors to sell assets at those situations. Hence, this channel would be temporary and limited to the implementation timeframe of the central bank measure.

Analyzing UMPs international transmission channels, authors such as Neely (2015) show evidence that signaling and portfolio rebalancing would also be relevant channels to explain UMPs spillovers from origin countries to foreign jurisdictions. Moreover, other additional UMPs international transmission channels have been identified by Fratzscher *et al.* (2016): sovereign credit risk (reduction in sovereign CDS spreads), bank credit risk (reduction

²⁶ “Duration risk” is the sensibility of an asset price to changes in interest rates, as described by Hicks (1939). In this sense, it is a proxy for asset price volatility. It is usually higher for assets with a longer maturity.

in global banks CDS spreads), confidence (reduction in option implied volatilities, which contain information on risk aversion and uncertainty in financial markets).

In the case of the Euro area and its particular framework as a monetary union, additional channels for UMP transmission have been identified. For instance, studying programs implemented in the more acute phase of the Euro area crisis (2008-2012), Krishnamurthy *et al.* (2018) also mention the following channels: reduction in default risk (solvency), reduction in market segmentation (liquidity risk), reduction in redenomination risk (possible return to more depreciated national currency, instead of the euro). Assessing asset purchase programs implemented after deflation threats in 2014 in the Euro area, authors such Breckenfelder *et al.* (2016) and Gambetti and Musso (2017) mention the existence of the inflation re-anchoring channel, which would be equivalent to the signaling channel, but with a more specific commitment by the central bank to re-anchor inflation expectations in the medium-term.

Our objective in this section is not to present a complete list of all possible transmission channels which appear in the literature, since some of them rely on other policies (i.e., “fiscal channel”)²⁷ or problematic theoretical assumptions (e.g., “credit reallocation channel”, further discussed in subsection 3.4.2). Instead, our focus is to show that UMPs have diverse transmission mechanisms and to describe the main channels which they occur.

Therefore, in a very broad perspective, unconventional monetary policies main objectives, measures, transmission channels, and effects could be summarized as presented in table 2-2 in the sequence.

²⁷ The existence of so-called “fiscal channel” has been mentioned by authors as Bernanke *et al.* (2004), Ugai (2007) and Fiedler *et al.* (2016). According to these authors, lower sovereign yields promoted by unconventional measures would lower the cost of government debt service, reducing its budget constraint and increasing the space to pursue an expansionary fiscal policy if the government decides to do so. However, we understand that this channel is not independent (i.e., an accommodative monetary measure by itself like other channels), since it requires coordination with the government to pursue an expansionary fiscal policy, which does not necessarily occur.

Table 2-2 UMPs Main Objectives, Measures, Transmissions Channels and Effects

Objectives	Measures	Transmission Channels	Effects
I. Restore proper functioning of financial markets and intermediation mechanisms	<ul style="list-style-type: none"> • Liquidity provision operations • Private asset purchases 	<ul style="list-style-type: none"> • Credit • Asset price • Portfolio rebalancing • Liquidity 	Avoided complete crash in financial markets
II. Provide additional monetary stimulus (inflation expectations/output) while conventional channels are limited	<ul style="list-style-type: none"> • Public bond purchases • Yield curve control • Forward guidance • NIRPs 	<ul style="list-style-type: none"> • Interest rate • Asset price • Expectations • Exchange Rate • Credit • Portfolio rebalancing • Signaling 	Effects diverse according to place and program

Note: The transmission channels in bold letters are related to unconventional measures, while the ones which are not in bold are also available in conventional monetary policies. Source: Author own elaboration, based on the classification of objectives, measures, and effects available in IMF (2013a), and main transmission channels mentioned in this section.

In the following part of section 2.3, we will describe in more detail the unconventional monetary measures mentioned in table 2-2, while in section 2.4 we will discuss in more detail UMPs effects.

2.3.1. Credit policies

Among credit policies, some of the main measures taken were liquidity provision operations and private asset purchases.

Concerning *Liquidity Provision Operations*, they aimed to prevent market freezing with the confidence collapse shortly after 2008, and the possibility of bank runs/herd movements. As a result, central banks, once limited to providing liquidity to a more restricted set of agents (i.e., banks with a temporary shortage of resources), have expanded their role as lenders of last resort. There were liquidity lending operations for banks, governments, non-bank financial institutions and specific markets (e.g., derivatives, asset-backed securities, commercial papers). Liquidity was offered not only to more agents but also in larger amounts and longer maturities. Main central banks offered long-term liquidity lines with unlimited amounts and more flexible collateral rules (e.g., Fed - Term Auction Facility - TAF; ECB - Long Term Refinancing Operations - LTROs). Central banks have also taken on the role of market makers of last resort,

acting to reduce large asset price swings in markets with greater volatility (Mehrling, 2011; Le Maux and Scialom, 2013). Examples of this activity were currency swap lines created among main global central banks (Broz, 2015; Carré and Le Maux, 2017), providing funding for financial institutions in need to finance foreign currency denominated assets (especially dollars), and programs focusing on specific markets (e.g., ABS markets in the USA, with Fed's Term Asset-Backed Securities Loan Facility - TALF). There was also the creation of programs offering liquidity and funding to banks in order to encourage them to grant loans for the real economy. These included BOE Funding for Lending Scheme (FLS) and ECB Targeted Long Term Refinancing Operations (TLTROs).

Regarding *private asset purchases* by central banks, their main purposes were: i) Support asset prices to prevent abrupt falls; ii) Reduce financial costs and restrictions, seeking to normalize intermediation. Several central banks engaged in private asset purchase programs. The Fed purchased real estate assets (Mortgage Backed Securities - MBS and securities of federal agencies Fannie Mae and Freddie Mac). The BOJ acquired commercial papers, corporate bonds, stocks (through Exchange-Traded Funds- ETFs) and Japanese Real Estate Investment Trusts (J-REITS). The ECB bought covered bonds (Covered Bond Purchase Program - CBPP) and ABS (Asset-Backed Securities Purchase Program - ABSPP) from financial institutions, as well as corporate bonds (Corporate Sector Purchase Program - CSPP). The BOE also bought corporate securities (Corporate Bond Purchase Scheme - CBPS) under its third Asset Purchase Program.

2.3.2. Quasi-Debt Management Policies

Among quasi-debt management policies, some of the main measures taken were public asset purchases and yield curve controls.

2.3.2.1. Public Asset Purchases

Concerning government bond purchases, reductions of nominal long-term interest rates would operate through UMP transmission channels mentioned above, mainly signaling and portfolio rebalancing. Examples of public and private asset purchase programs by major central banks (Fed, BOE, BOJ, ECB) can be found in Table 2-3 in the sequence, which mentions the name of the program, length, type of asset and amount purchased.

Table 2-3 Post 2008 Major Central Bank Asset Purchase Programs

Name	Length	Asset Type	Amount
Fed			US\$ Bi
LSAP 1	Nov/08 - Nov/09	Treasuries, MBS/agency bonds	300 (Tr), 175 (Ag), 1250 (MBS)
LSAP 2	Nov/10 - Jun/11	Treasuries	600 (Tr)
MEP (Operation Twist)	Sep 11/ - Dec/12	Buy long-term Treasuries Sell short-term Treasuries	667 (Tr)
LSAP 3	Sep/12 - Oct/14	Treasuries /MBS	1750 (Tr & MBS)
BOE			£ Bi
APP 1	Mar/09 - Nov/09	Long-term Gilts	200
APP 2	Oct/11 - Jul/12	Long-term Gilts	175
APP 3	Aug/16- Jun/17	Long-term Gilts corporate bonds	60 (Gilts) & 10 (Corporate Bonds)
BOJ			¥ Tri
CME	Oct/10 - Mar/13	Public (JGBs) and private securities (corporate bonds, commercial papers, ETFs, J-REITS)	Balance Sheet Target annual increase from 35 to 60 tri
QQME	Apr/13 onwards	Public (JGBs) and private securities (corporate bonds, commercial papers, ETFs, J-REITS)	Balance Sheet Target annual increase from 60 to 80 tri Lengthen term of JGBs purchases (40 years)
ECB			€ Bi
CBPP	Oct/14 - Dec/18	Bank bonds against posted collateral	New Purchase flows per month: 60 (Mar 2015/ Mar 2016) 80 (Apr 2016/Mar 2017) 60 (Apr/ Dec 2017) 30 (Jan/ Sep 2018) 15 (Oct/ Dec 2018)
ABSPP	Nov/14 - Dec/18	Securitized private assets	
PSPP	Mar/15 - Dec/18	Bonds issued by Euro area governments (including regional/local), national agencies, EU multilateral institutions	
CSPP	Jun/16 - Dec/18	Corporate bonds	

Note: The Securities Markets Programme (SMP) was an asset purchase program performed by the ECB from 2010 to September 2012. We did not include it in the previous table, as bond purchases under this program were sterilized, and its geographical coverage was not for the whole Euro area, but limited to periphery countries. See SMP additional information on subsection 3.2.4. Source: Author own elaboration, based on Fed, BOJ, BOE, ECB data.

One important case to be discussed is Fed's asset purchase programs. The Fed increased its balance sheet from US\$ 0.9 trillion in November 2008 to US\$ 4.5 trillion in October 2014. Regarding UMPs transmission mechanisms, its programs have operated through the portfolio rebalancing channel, both through scarcity and duration mechanisms. LSAP 1, 2 and 3 promoted balance sheet expansion and had the scarcity mechanism as their main focus. Conversely, Maturity Extension Program (MEP) or "Operation Twist" (Fed selling short-term securities and buying long-term bonds) did not promote balance sheet expansion, operating basically through the duration mechanism.

One of the major critics of Fed's asset purchase programs was Woodford (2012). According to the author, the portfolio rebalancing channel has serious conceptual problems, which would limit its performance. Regarding the scarcity mechanism, Woodford (2012) assumes the following assumptions: (i) all assets other than currency are valued only for their pecuniary returns; (ii) all investors may purchase any amount of non-cash assets at the same market price. Thus, the author argues that at very low interest rates, assets available in the market become perfect substitutes, since excessive issuance of bank reserves by the central bank eliminates reserve's liquidity premium, turning agents indifferent to hold reserves or bonds. Thus, although banks have more reserves and the central bank more bonds, central bank purchases are unable to influence assets' relative prices. This perfect asset substitutability would turn the scarcity mechanism ineffective. As for the duration mechanism, Woodford (2012) sees as its main problem the existence of the so-called "Wallace Neutrality", a concept of neoclassical inspiration introduced by Wallace (1981). This hypothesis states that open market operations do not change financial assets' prices, as they do not reduce private sector risk of income losses. Central banks' current losses are Treasury losses and should mean a future increase in taxes²⁸. Ultimately, since the central

²⁸ This result is a consequence of the Modigliani-Miller Theorem, and a similar version for the monetary policy of the Ricardian Equivalence concept for fiscal policy.

bank is owned by the public, programs that operate through the duration mechanism (like Operation Twist) would, in fact, transfer securities between two accounts of the same owner. Therefore, relative asset prices would not be affected, and the duration mechanism would be ineffective.

These claims by Woodford (2012) also received criticisms. For example, Davies *et al.* (2012) argue that in the case of the scarcity mechanism, Woodford's proposal to assume assets' perfect substitution is not feasible. In fact, even in ample liquidity conditions, agents would still have different asset preferences, according to the "preferred habitat" theory (e.g., pension and insurance funds prefer long-term securities, commercial banks, and asset managers prefer short/medium-term bonds). This imperfect substitutability would generate asset market segmentation, so a specific supply shock in a given segment is able to influence relative asset prices in general. Therefore, public bonds' maturity structure would affect yields, so programs that operate through the scarcity mechanism (such as QEs) would be effective. In addition, in the case of the duration mechanism, Davies *et al.* (2012) criticize the "Wallace Neutrality" hypothesis. According to these authors, the model on which it is based imposes very restrictive conditions, which are distant from reality (e.g., perfect information, agents with rational expectations and a complete understanding of the institutional system, including the content of central bank's balance sheet and the fact that they are "owners" of this balance).

2.3.2.2. Yield Curve Control

Among unconventional monetary measures that were implemented by major central banks after the 2008 crisis, the direct or indirect control of yield curves by monetary authorities was also included as an alternative policy option. They were already implemented in the USA and UK in the 1940s and at the beginning of the 1950s, as discussed in subsection 2.2.3. On the one hand, those previous experiences of Yield Curve Control (YCC) by the Fed

and the BOE were focused on controlling public debt cost of borrowing. On the other hand, the more recent YCC experience by the BOJ aims to achieve price stability and avoid deflation.

The main example of a recent YCC measure was the one adopted by Japan in September 2016. At this occasion, the BOJ also implemented a commitment to pursue an inflation target of 2% and even overshoot it for some time, until it had more certainty this level was achieved on a sustainable manner, before accommodative monetary measures start to be removed. This forward guidance (accommodative measures will be kept until the inflation target is exceeded in a stable manner) reinforced the institution's easing stance. In order to achieve this objective, the BOJ replaced the monetary base with interest rates as the main operational target for money market operations. The target for short-term nominal interest rates was kept in -0.1% for a certain amount of excess reserves, according to the multiple-tiered reserves system introduced in January 2016. Furthermore, for long-term interest rates, the BOJ announced a target of 0% for 10-year yields of Japanese Government Bonds - JGBs. By using these two pinpoints of interest rates, the BOJ intended to stabilize the expected path of short-term interest rates at low levels, as well as prevent a sudden sharp hike in long-term yields. Moreover, the switch from the quantity-centered to the interest rate-based approach suggested that BOJ's main operational mechanism of monetary policy would not be any more massive asset purchases. Instead, it would be more linked to forward guidance, affecting the expectations for the future path of short-term interest rates and thereby long-term interest rates. At the same time, the choice of the long-term peg at 0% was a sign that the BOJ preferred maintaining a low level for the 10-year yield, but not a significantly negative level²⁹, that could bring adverse impacts on financial institutions.

²⁹ After the introduction of the short-term negative interest rate framework in January 2016, 10-year JGBs yields also lowered considerably, reaching negative levels on several occasions. Those negative levels in long-term maturities were seen as a threat to the stability of the financial sector, especially institutional investors, which were

Moreover, the BOJ dropped its previous guideline for average maturity of JGB purchases, between 7 to 12 years. In fact, from September 2016 onwards, the BOJ started purchasing a greater amount of short-term JGBs, and a smaller amount of super-long-term JGBs (over 10 years)³⁰. With this, while short-term yields were in negative territory, yields beyond the 10-year maturity would remain in positive territory, at moderately higher levels. However, with new flows of bond purchases and the reinvestment of the stocks of bond purchases, the BOJ tried to prevent an eventual overshooting of long-term yields, which could be triggered by a possible change in the monetary easing framework. Ultimately, with the YCC framework and this profile of JGB purchases, the BOJ would be contributing to steepen the yield curve, which would influence agents' inflation expectations that it would move towards its 2% target in the medium-term.

This yield curve control mechanism would promote several consequences to the Japanese economy and its monetary policy, some of them positive, others potentially negative, and others with no clear impact. A more in-depth analysis of those effects is presented by Shirai (2018).

Regarding the positive aspects, the first one could be to allow a reduction in the amount of JGB purchases to a more sustainable level. In the occasion of the YCC announcement in September 2016, the BOJ stated that it did not intend to increase its annual pace of JGB purchases beyond 80 trillion yen. This signal was seen as appropriate owing to the deterioration in JGB market functioning observed during UMPs implementation by the BOJ, especially after the introduction of negative rates in January 2016. In fact, JGB markets were observing rising supply scarcity issues, which could be explained by the following factors. On the one hand, there was an increase in the demand for short-term JGBs to carry

already struggling with low profitability levels. Therefore, the introduction of YCC measures partly mitigated the negative pressures on those institutions' balance sheets.

³⁰ If compared to previous Fed experiences in 1961 and 2011-2012, this BOJ action could be considered a "Reverse Operation Twist".

out speculative operations (*Nichigin Trade*), in which agents purchased JGBs at the Ministry of Finance auctions and sold them within a few days to the BOJ at higher prices. On the other hand, long-term JGBs were experiencing reduced market liquidity, once a significant share of agents was unwilling to sell their bonds to avoid losses with nominal negative interest rates. Moreover, the amount of BOJ target purchases (including new purchase flows and reinvestments of the stocks) was roughly equivalent to the amount of JGB gross issuance by the Ministry of Finance, which created additional operational challenges to BOJ purchases. For all those reasons, a reduction in the amounts of JGB purchases by the BOJ to a more sustainable level could be seen as a welcome step.

A second positive consequence would be to enable the BOJ to perform a smoother transformation of monetary policy. Instead of focusing on massive amounts of JGB purchases, the BOJ would be able to gradually reduce those amounts and rely more on its commitment that interest rate levels would be kept low for an extended period. With proper communication, financial markets participants' understanding of the forward guidance would improve, increasing BOJ's policy effectiveness and credibility. Moreover, the shift from monetary base to interest rate as the main operational target turned BOJ's framework closer to the standard monetary policy approach previously adopted (short-term interest rate control, based on an uncollateralized overnight call rate). By the time the BOJ sees its inflation objective is achieved on a consistent basis, the institution will be able to raise the call/deposit interest rates accordingly. In this sense, the BOJ's transformation from a quantity-centered to an interest rate-based monetary framework would facilitate monetary policy tightening process when its appropriate time comes. Furthermore, it would not prevent the institution to reduce interest rates, or apply other additional unconventional measures, if they are seen as necessary in the future.

One factor that the YCC framework would have no clear impact is on Japan's foreign exchange rate. The YCC framework would play a role in keeping interest rate differentials between Japan and other main jurisdictions significantly large³¹. Hence, this would imply in theoretical terms (uncovered interest parity theory) a more depreciated exchange rate for the yen, which would play in favor of higher imported inflation rates and export growth. However, the yen kept relatively stable after the announcement of the YCC framework in September 2016, only presenting a considerable depreciation after the election of President Trump in the USA (November 2016). Since then, the yen has partly recovered its previous losses against the dollar, oscillating between moments of appreciation and depreciation. Therefore, we cannot affirm that the implementation of this framework had a clear impact on Japan's foreign exchange rate.

When it comes to the negative consequences or challenges related to the YCC framework, several of them can be mentioned. The first one would be the contradiction in BOJ's communication, once it announced a change in the operational target from the monetary base to interest rates, but it stated its intention to continue JGB purchases "around the same previous amount" (80 trillion yen per year). This communication was contradictory because once the BOJ changed to an interest rate-based framework, its amount of JGB purchases became endogenous (i.e., the BOJ did not buy a predetermined amount, but the levels required by market supply/demand conditions, in order to keep interest rates at their target levels). By announcing to keep the same annual pace around 80 trillion yen over the year, maybe the BOJ wished to stress continuity from its previous framework, to avoid an impression of denying the effectiveness of the former volume-centered practices, or to refrain from being misinterpreted by markets of an eventual policy tightening if the BOJ removed the

³¹ With YCC in Japan, interest rates would be kept at low levels for an extended period. Conversely, other major jurisdictions have already increased interest rates (e.g., USA), or have changed their communication, reducing their pace of monetary easing (e.g., Euro area). In particular, the framework would allow the maintenance of very low yields at short-term maturities, which are the maturities that usually attract more focus of exchange rate markets.

purchase target. Nevertheless, this brought some ambiguity to the framework, opening space to various interpretations by agents, and preventing them from setting clear expectations on BOJ's reaction function. For instance, the reduction in the accommodative stance of main jurisdictions (i.e., USA, Euro area) imposed an upward pressure in JGBs' yields in 2018 Q3. Hence, the BOJ needed to make larger JGB purchases (especially long-term bonds), possibly above its purchase target, to cope with this upward pressure. Such situations place the institution in a difficult position, since the BOJ has also stated that it did not intend to increase its annual pace of JGB purchases beyond 80 trillion yen. Moreover, it opens space to some potential balance sheet risk in the BOJ, since a significant rise in JGB yields (fall in JGB prices) may result in capital losses for the institution³².

A second challenge for the YCC framework would be related to eventual distortions that BOJ purchases may generate in JGB markets. With the framework, beyond regular auctions (when the BOJ buys a certain amount of JGBs at available market prices), the BOJ also began to conduct fixed-rate auctions at several maturities (authority establishes the yield level, and buys all the securities offered at that level). By performing those regular and fixed-rates auctions, it would be expected that the BOJ could anchor more easily JGB yields at their targeted levels. But some analysts claim that, after the introduction of those auctions, yields became indeed more volatile, and in some occasions, the BOJ had to announce it would buy "unlimited amount of securities" in order to keep yields closer to their targeted levels. Other analysts claim that the price information reflected in the long-term interest rates (real interest rate, long-term inflation expectations, and term premium) could be lost with BOJ's continuous interventions, which would imply a further reduction of JGB market liquidity.

³² BOJ's balance sheet has a considerable amount of provisions and legal reserves that could help to cover eventual capital losses. Nonetheless, if those losses achieve a significant magnitude, and occur over a prolonged time period, they may result in negative capital. Furthermore, as under the Bank of Japan Act (1998), the government is not supposed to directly recapitalize the BOJ in case of negative capital, it would have to find alternative ways to support the central bank (i.e., government would buy JGBs from BOJ's balance sheet at higher prices).

This would be the case, as BOJ's JGBs bond holdings have already reached around 50 % of the entire market. If the YCC framework was sustained for a long time, this eventual "loss of price information" could amplify the risk of a sudden reversal of long-term interest rates, which would turn BOJ's future intent to reduce purchases and gradually raise monetary policy interest rates even more challenging. Beyond possible distortions in JGBs prices and volatility, there was also a concern with the shape of the JGB yield curve. As previously mentioned, the YCC framework aimed to maintain JGB purchases in a level of around 80 trillion yen, but buying a greater amount of short-term JGBs (below 10 years), and smaller amounts of long and super-long JGBs (beyond 10 years). Meanwhile, the Ministry of Finance had lengthened its JGB issuance over time. In this context, this meant that yields on longer-term maturities would face upward pressure due to smaller demand from the BOJ and greater supply by the Ministry of Finance. Conversely, yields on shorter-term maturities would face downward pressures, due to greater demand from the BOJ and smaller supply by the Ministry of Finance. The increase in long-term yields could be detrimental to agents which rely on variable interest rate loans (which is the case of certain households with mortgages), although it could mitigate short-term pressures of low profitability on institutional investors. Furthermore, the decline in short-term yields to more negative levels could be detrimental to other institutions (i.e., commercial banks, since their loans to the corporate sector are concentrated on maturities from 3 to 5 years).

A third challenge linked to the YCC framework would be to keep term premiums³³ at negative levels for an extended time, which could bring adverse effects to the economy. Keeping a significantly low nominal long-term interest rate with negative term premiums for an extended time could provoke distortions, since holding long-term bonds would be more penalized than short-term bonds. Hence, firms could be encouraged to use their borrowing to

³³ "Term premium" can be understood as the excess yield that investors require when holding a long-term bond instead of a short-term bond. For instance, considering a 10-year bond, the term premium could be estimated by subtracting the 10-year yield from the sum of the "natural" rate of interest with the expected inflation.

purchase short-term speculative assets, to incur in stock buybacks or refinance debts at better terms, instead of increasing their productive business investment. Moreover, cheap borrowing could open the way for firms (especially ones with poor track records) to undertake projects with low profitability. So commercial banks could end up offering credit to those firms, even if with the low interest rate environment, they might not be able to charge lending rates that appropriately reflect such risks. At an initial point, this cheap credit could allow those unviable (“zombie”) firms to survive in the low interest rate environment, but also delay a necessary corporate restructuring and reorganization process. In the medium term, the result could be a deterioration of financial conditions (buildup of debts/ non-performing loans affecting non-financial/ financial sector), and also of real conditions (stagnant productivity leading to sluggish investment and lower growth).

A fourth challenge related to the YCC control framework would be its unclear effect on stimulating aggregate demand and inflation. Keeping long-term interest rates for low and controlled levels for an extended time period could not be translated into higher growth and inflation for several reasons. One of them was presented in the last paragraph: borrowing could be more channeled to less profitable projects or non-productive purposes, instead of productive investments, leading to lower productivity and growth. Another one would be the fact that agents could regard low interest rates not necessarily a demand-stimulating policy, but simply as a reflection of the prevalence of low growth and low inflation. Under this pessimist environment, agents would be encouraged to save more and spend less. Those lower spending levels would be reinforced in Japan by uncertainties related to demographic trends (rapidly aging population) and concerns on the sustainability of pension schemes (i.e., pension funds low returns). In such a context, households would have fewer incentives to consume and firms to invest, also finding limited room to raise sale prices amid intensified competition in a stagnated market.

A fifth challenge of the YCC framework could be the risk of undermining government debt sustainability in the long-term. Japan government debt has reached a level of around 253% of GDP in 2017. However, as a large majority of this debt is held by domestic investors, and is serviced with extremely low interest rates, this level has been manageable so far. Nevertheless, keeping interest rates at low levels for an extended period may generate an impression that the government would be able to continue increasing its debt indefinitely. The main concern would not be the level of debt *per se*, but the market credibility in the government ability to continue servicing this debt, in an environment of low growth and higher interest rates. This credibility could be threatened in an adverse event which government bond yields rise quickly and in a significant amount. In such a situation, negative consequences would be observed not only for the government with the deterioration of its fiscal position but also for the pension/insurance sector and eventually households. Since a significant part of government debt is held by pension and insurance institutions, it has low liquidity, and hence is subject to eventual disruptions in yields.

Taking into account all positive and negative effects that the yield curve control policy could generate, the overall opinion of authors as Shirai (2018) was broadly in favor of the YCC framework, since it corrected some of the side effects caused by the implementation of negative interest rates in January 2016, and could help in the transition to a framework with more sustainable monetary accommodation. The author considered the YCC measures should be kept at least until all CPI indexes (headline, core, core-core) turned positive on a sustained basis.

Nonetheless, Shirai (2018) also proposed some suggestions for the improvement of the BOJ monetary framework³⁴. First, the author argued in favor of raising the 10-year yield target or introducing a target range for yields. She supported this argument taking into

³⁴ These suggestions have been partially adopted by the BOJ since July 2018, by allowing a trading range for 10-year JGB yields and achieving JGB purchase targets in a “flexible manner”, opening the door for a reduction in JGB purchases in practical terms. See further details in chapter 5, subsection 5.3.

account all the potential negative effects that very low interest rates can have on the economy, especially in the long-term (further discussion of this topic in section 2.3.5.4). Therefore, she considered the BOJ should evaluate two issues: (i) If the 10-year yield target at around zero percent was excessively low. In this case, the suggestion would be to raise the 10-year yield target level to around 0.5% as a first step; (ii) Whether the gap between the 10-year yield and the negative interest rate (-0.1%) was too small. In this situation, the alternative approach would be to introduce a target range for the 10-year yield, around the interval of 0% and 0.5% as a first step. Second, the author argued in favor of an official reduction in the annual pace of the monetary base expansion and in JGB purchases. Both should be done by the BOJ with a clear communication strategy. The authority should state that it was shifting from a monetary base-centered to an interest rate-based framework, removing the ambiguity of its operational targets. Therefore, an official reduction in the pace of JGB purchases would open the way for monetary easing measures to be maintained for a longer period, and in a more sustainable manner. JGB purchases could be gradually reduced towards the amount of JGBs net issuance (around 50 trillion yen per year in 2017)³⁵. This process should be carefully designed by the BOJ, with effective coordination between this institution and the Ministry of Finance in monitoring JGB supply-demand conditions, and implemented in a gradual way, over a longer period than the Fed tapered its net asset purchases in the USA. Due to possible adverse financial market reactions, it would be more advisable to implement first the change in the 10-year JGB yield target, and reduce JGB purchases only after some time.

The BOJ might start to withdraw its monetary stimulus once it is closer to achieve its inflation target of 2%. The more logical sequencing (as was the case of the USA) would be first to reduce central bank's net asset purchases towards zero, and later start increasing the

³⁵ According to the author, reducing BOJ's JGB purchases to this level would not be so problematic, once at this point there was sufficient alternative demand for JGBs for the part of commercial banks and institutional investors. However, lowering net JGB purchases by the BOJ towards zero would be more challenging, since it would be hard to find a large and stable demand for those bonds (i.e., Government Pension Investment Fund had to reduce JGB portfolio after recent reform).

deposit and call rates. However, Shirai (2018) acknowledges that, in the case of Japan, lowering BOJ's net JGB purchases towards zero would be quite challenging, while the criticisms on short-term negative interest rates are quite strong. Hence, the author believes that the BOJ will first remove short-term negative interest rates, while BOJ's net JGB purchases are still kept at a slower pace. In this case, it would be probably observed a flattening of the yield curve (since short-term yields would rise, while long-term yields would remain under downward pressure). In this context, keeping a YCC framework with a higher target range for long-term bonds would be advisable, in order to avoid further distortions in the yield curve.

Another analysis of the YCC framework in Japan is presented by Amamiya (2017). According to the author, this monetary policy is feasible in practical terms, since it can bring a sizeable effect in long-term interest rates, which might eventually lead to higher inflation and growth. However, the YCC can be questioned from a normative point of view. Criticisms such as interference of government fiscal interests on central bank's decisions and independent mandate were usually raised. Therefore, this author only supports its use in crises periods, when central banks regular tools of short-term interest rates are clearly insufficient measures. In the YCC implementation, the author underlines the importance of proper coordination between fiscal and monetary authorities, in order to help yields to converge to target levels. In addition, the central bank should have a clear communication procedure, that its actions are fully consistent with its objectives. This way, the institution could enhance agents' predictability on interest rates expected path and credibility in monetary policy outcomes, which would reduce volatility episodes, and increase the confidence that monetary policy targets may be achieved in the medium-term.

2.3.3. Forward Guidance

Regarding forward guidance (FG), it consists of central banks' active participation in the management of financial market participants' expectations on the course of its future policy actions, in particular interest rates. Even before the 2008 crisis, it was already part of the framework of some central banks (e.g., New Zealand, Norway, Sweden), which sought to fine-tune their monetary policy communication by disclosing their interest rate curve projections. In the case of New Zealand, Guthrie and Wright (2000) show evidence that central bank statements on its desired path for short-term interest rates ("open mouth operations") were effective in influencing interest rate changes across all maturities. With the 2008 crisis and interest rates at very low levels, central banks adopted FG as a strategy to introduce additional monetary accommodation. In general, the forward guidance mechanism was implemented on interest rates, although it can be also adopted on central bank balance sheet size³⁶.

The main transmission channels of FG also differed before and after the 2008 crisis. Before 2008, FG was basically associated with the expectations channel of monetary policy (i.e., since agents expect lower interest rates in the future, the central bank can expect a flatter yield curve). After 2008, FG was also associated with the signaling channel of monetary policy. Central banks' commitment that would keep interest rates low for an extended time period would indicate to agents that there would be more economic growth in the future, which would induce higher inflation expectations, and a lower real interest rate, generating an incentive to current output.

In order to distinguish these different approaches of FG adopted before and after the 2008 crisis, Campbell *et al.* (2012) gave different names to them. The approach that was already used before the 2008 crisis, in which the central bank merely disclosed its interest rate

³⁶ For instance, the BOJ has adopted forward guidance of an expanded balance sheet size since 2010, and only well after (2016) also introduced forward guidance on interest rate levels.

curve projections, and followed its normal monetary policy response function (usually following a Taylor rule framework), was named “Delphic”. The approach that also came to be used after the 2008 crisis, in which the central bank clearly communicated its intention to deviate from its underlying policy path (Taylor rule) in the future, in order to provide expectations of an additional monetary stimulus, was named “Odyssean”.

Among the types of FG that were implemented after the 2008 crisis, the first one that could be mentioned was the date-based. In this type, a central bank states an intention to keep interest rates low for a specific time period. One of the first central banks to introduce the date-based FG was Canada, since in April 2009 it announced a commitment (conditional on inflation projections) to keep interest rates low until the second quarter of 2010. The Fed also initially adopted a date-based FG: in August 2011, monetary accommodation until mid-2013; in January 2012, accommodation until the end of 2014 and in September 2012, accommodation until the middle of 2015. One of the questions posed to the date-based FG was the ambiguity that can occur in case of extension of its term. It could be interpreted both positively (further opportunities with new monetary stimulus) and negative (more pessimistic projections by the central bank, which could weaken output in the present). In addition, there could be problems in the joint announcement of a date-based FG with central bank interest rate projections, as occurred with Sweden in April 2009. At that time, the Riksbank announced a cut in the policy rate to 0.5% per year, a forward guidance based on an “expectation” that interest rates would remain low until the beginning of 2011, as well as an interest curve projection that rates would remain constant in this new level until at least 2011. With this combined announcement, many agents believed that the Riksbank had reached its lower limit (although the central bank had no such intention, as it did not consider the 0.5% necessarily its lower limit), and revised their interest rate expectations upwards. Hence, future interest rate expectations rose, rather than falling as desired by the Riksbank. Therefore,

disclosing central bank's future course of policy through a "commitment" (strong "Odyssean" FG, as it was Canada's case) would have higher credibility and be more effective than disclosing central bank's "expectations" together with future macro indicators' projections under its perspective (combining a weak "Odyssean" with a "Delphic" FG), as it was Sweden's case.

The second type of FG adopted after 2008 was the quantitative one. In this type, the central bank establishes specific targets (thresholds) for main economic policy indicators (e.g., inflation, unemployment), that would be necessary conditions to be reached for the monetary stimulus be withdrawn. In the U.S., this was done in December 2012, when the Fed announced it would maintain monetary accommodation while the unemployment rate was not below 6.5%, and inflation in two years was not above 2.5% YoY. In the UK, the BOE introduced the quantitative FG in August 2013. The accommodative monetary policy would be maintained until unemployment was below 7%, except in case of three "escape clauses": if inflation exceeded 2.5% YoY; if inflation expectations increased sharply; or if there were risks to financial stability. Although the quantitative FG has attempted to move towards greater transparency of central bank's reaction function, its main setback was to tie monetary authority's actions around a specific number. In both United States and United Kingdom, minimum thresholds of unemployment were reached, while other indicators still showed clear signs of slack in the labor market (e.g., high levels of long-term unemployment and forced part-time workers, low wage growth), thus justifying the stimulus maintenance. Hence, the quantitative FG was abandoned by the BOE in February 2014 and by the Fed in April 2014³⁷.

The third type of FG adopted after 2008 was the open-ended one, that is, without a specific time limit. In an open-ended FG, there is a specific mention that monetary

³⁷ In the case of USA, there was a complicating factor of two distinct thresholds for a single decision. It was not clear what would happen if two indicators gave opposite signs (e.g., unemployment rate below 6.5%, but inflation still well below 2.5%). This ambiguity was what actually occurred, and was one more factor that led the Fed to abandon the thresholds in April 2014.

accommodation lasts “for an extended period”, or “as long as necessary” to achieve monetary authority’s objectives (in general, medium-term inflation around 2% YoY). This FG type was the one adopted by the BOJ in April 2013³⁸, by the ECB in July 2013, and by the Fed from April to December 2014. On the one hand, it gives central banks a greater degree of flexibility on its measures across time. On the other hand, a broader time horizon reduces the pressure over the accountability of results presented by the policies implemented.

The fourth type of FG adopted after 2008 was the state-dependent one. It was adopted by the BOE since February 2014 and by the Fed from December 2014 until December 2015. It differs from the quantitative FG by taking into account not only one or two specific indicators, but a broad set of macroeconomic variables (e.g., inflation, labor market, financial) to take the decisions related to the continuity or not of the monetary accommodation. It also differs from the open-ended FG. While the open-ended FG usually holds its decisions for an extended period, the state-dependent FG takes its decisions based on a broad set of economic indicators and conditions available at each meeting, so it is subject to considerable changes from one meeting to the next. Thus, the state-dependent FG gives greater flexibility to monetary authority’s policy decisions. However, only informing that interest rates will remain below the pre-crisis level, but without communicating with greater clarity the timing and the likely path of interest rate changes, can convey to the market a greater degree of uncertainty about the future course of monetary policy that will be adopted.

Finally, one central bank can adopt a forward guidance which is a combination of those types. For instance, the ECB in June 2018 adopted a FG which is both date-based (end of net asset purchases in December 2018, and interest rates kept at their levels at least until summer 2019), and also state-dependent (end of net asset purchases subject to incoming data related to medium-term inflation outlook, and interest rates kept at low historical levels as

³⁸ The BOJ initially sought to achieve its inflation target within approximately two years. However, due to the uncertainty associated with this goal, it announced later that accommodative monetary policies would be maintained for as long as needed to achieve its inflation objective.

long as necessary to ensure that the evolution of inflation remains aligned with expectations of a sustained adjustment path). With this combination, the central bank conveys to the market more clearly the baseline scenario of its policy path but gains some flexibility to change its course in case an unexpected event materializes.

An extensive analysis of forward guidance policies implemented by central banks is carried out by Woodford (2013). According to this author, such policies would have at least two merits: i) Convey to markets more clarity regarding the future path of interest rates, which would avoid greater volatility in times of high uncertainty; ii) Establish a stronger central bank commitment to the public, which would make it more difficult to ignore this past commitment in a future decision, increasing the credibility of its actions. However, Woodford (2013) criticized how the Fed conducted its FG policy at that time, based on its “future expectations” (i.e., promising to base its actions on current and future forecasts of economic variables, in a “forward-looking” approach). Stating that interest rates were being kept low because inflation and growth forecasts were low could imply to agents a pessimistic view, which would further weaken current output. According to the author, Fed’s FG should be on a “historical” basis. It means that the central bank needed to make a firm commitment in the present that would keep its future interest rates low, while not resuming its historical growth trend (as proposed by the Bank of Canada until 2013, with Mark Carney). In this FG under a “historical” approach, there would be room for tolerance of higher inflation in the future, in order to compensate for past inflation below the target.

Nevertheless, other authors have criticized Woodford’s views on forward guidance programs, including Davies *et al.* (2012). According to these authors, the FG under a “historical” approach as proposed by Woodford (2013) would suffer a time inconsistency problem. At moments with interest rates at very low levels, it would be convenient to promise low interest rates in the future to allow an increase in inflation and output expectations. Once

the recovery begins, and with inflation rising again, the central bank would be tempted to break the pledge and raise interest rates, even if the economy was still below a previously established level. Due to the high chances that members of a future central bank board could disrupt the previous commitment, members of the current central bank board would rather not make such a commitment. Hence, the fact that FG policy has no future credibility could undermine its effectiveness in the present. In addition, tolerance to price increases (as suggested by Woodford, 2013) could bring undesired changes in inflation expectations, which would be: i) Uncertainty, which could lead to an increase in long-term real interest rates; ii) Rapid increase, which could push inflation expectations out of control. Therefore, both problems of time inconsistency and of uncertainty/ uncontrollability in inflation expectations would be able to undermine central bank's credibility in the present.

2.3.4. Exchange Rate Ceiling

After the 2008 global crisis, several small advanced economies eased their monetary policies to very low levels. However, some of them also faced significant capital inflows and currency appreciation pressures, which reinforced the threats of deflation or persistent very low inflation. The capital inflows and currency appreciation pressures led some of them to implement a different unconventional monetary instrument: a foreign exchange rate ceiling. With this ceiling, a central bank would be able to buy an unlimited amount of foreign currencies to prevent domestic currency appreciation beyond a certain level. Two examples of countries that used this tool were Switzerland (Swiss National Bank - SNB, September 2011) and Czech Republic (Czech National Bank - CNB, November 2013). This measure made sense in those countries, since both are economies that adopt an inflation target (around 2% YoY) and have a high degree of trade openness (share of imports on GDP of 60% in Switzerland and 72% in Czech Republic in 2013, according to the World Bank), implying that the exchange rate pass-through of imported goods to prices would be an important channel to

increase inflation. As the largest trading partner of these countries is the Euro area, the exchange rate ceiling was adopted against the euro.

However, some important differences between these countries in the implementation of this instrument could be observed, according to Grady and Kalani (2015). First, while in Czech Republic the exchange rate ceiling objective was primarily to avoid the deflation threat (in order to seek the return of inflation towards its target, initially until the beginning of 2015 and later until the middle of 2017), in Switzerland there were explicit concerns both about deflation and excessive exchange rate appreciation (which in fact had appreciated around 50% in previous four years because of the country's "safe haven" status with the worsening of the Euro area crisis). Thus, soon after the ceiling introduction, the nominal depreciation that occurred was stronger in Switzerland (8%) than in Czech Republic (4%). However, due to the higher previous exchange rate appreciation in the Swiss case, the new exchange rate was similar to that observed in previous three months, while in Czech case it was equivalent to previous four years. Second, while the adoption of the ceiling in Switzerland took place only one month after the SNB lowered its monetary target range to near zero (0% to 0.25%), in Czech Republic it was adopted one year after the central bank lowered its monetary policy target (repo) rate to near zero (0.05%). Third, central bank's balance sheet expansion due to the accumulation of foreign reserves was far greater in the case of Switzerland (foreign reserves/GDP ratio since the beginning of the exchange rate ceiling rose from 35% to 80%, while in Czech Republic it increased from 20% to 27%).

This large expansion of central bank's balance sheet was presented as the main justification for the abandonment of the exchange ceiling by the SNB on January 15, 2015. According to the central bank, the maintenance of the ceiling would be possible only through an "uncontrollable expansion" of the institution's balance sheet, which could lead it to lose control over monetary conditions and its mandate of price stability. Indeed, with ECB's

imminent introduction of QE (PSPP was announced a week later), SNB would be forced to buy very large amounts of Euros to keep its ceiling. In addition, with the end of Fed's QE in October 2014, the dollar had already appreciated against the Swiss franc, which partly removed SNB's concern about the currency overvaluation. On the other hand, CNB's exchange rate ceiling remained in place until April 6, 2017, when CNB's Board considered it was no longer necessary to maintain it, with the materialization of domestic and foreign price pressures that made inflation return towards the 2% YoY target on a consistent basis. After this period, the CNB stated it intended to reduce the amount of expansionary monetary policies, but it was ready to continue intervening in the foreign exchange market or use other instruments, to mitigate potential excessive exchange rate fluctuations following the exit from the commitment.

2.3.5. Negative Interest rates

Differently from other unconventional monetary policies described before, which had some previous experiences before the 2008 crisis (as discussed in section 2.2), negative nominal interest rates were never implemented on a large scale before the 2008 crisis. Therefore, we make a more detailed analysis of the implementation of such policies in this section.

2.3.5.1. Negative Interest rates - Introduction

The implementation of negative nominal interest rates by central banks is a recent event in historical terms. It appears after the 2008 global financial crisis, as an additional tool, among other unconventional monetary policies that were adopted, such as liquidity provision operations, public/private asset purchases and forward guidance.

Negative interest rate policies (NIRPs) were first introduced by Denmark's Central Bank in July 2012. In June 2014, they were also implemented by the European Central Bank

(ECB). In 2015, they were adopted by Switzerland (January) and Sweden (February). In 2016, Japan (January) also joined these policies³⁹.

In the countries that adopted NIRPs, nominal negative interest rates were introduced for central banks' interest on reserves/deposit rates (the ones that are applied over banks excess reserves at central banks). Target/main refinancing rates (the ones used as a reference for open market operations) were usually kept at zero (Denmark, Euro area, Japan), and only in Sweden at a negative level (-0.5%, in February 17, 2016).

The implementation of negative interest rates had different objectives according to the country. NIRPs were used as an instrument to counter deflation/low inflation in most of them, especially in the Euro area, Japan and Sweden. In Denmark and Switzerland, they were also used as a tool to tame currency appreciation pressures and huge capital inflows. Several of them (Denmark, Switzerland, Japan) adopted tiered reserve systems: institutions that kept excess reserves above some threshold at the central bank would incur in lower (more expensive) deposit rates, while the ones below the threshold would have access to higher (cheaper) deposit rates. This way they could discourage the accumulation of excess reserves at high levels by some institutions, acting in a way to ensure that excess reserves were distributed more efficiently across the interbank market⁴⁰.

The implementation of negative interest rates by various countries in the recent period, with different purposes, raised important questions for debate: (i) What was the economic theoretical background that justified NIRPs introduction, and what were the criticisms presented by other economic schools? (ii) How were the transmission and the impacts of

³⁹ Other countries have lowered their deposit rates to negative territory, such as Norway, Hungary, Bulgaria, and Bosnia Herzegovina. Nevertheless, they cannot be considered as having implemented NIRPs on a "strict" sense, as argued by Angrick and Nemoto (2017). In the cases of Norway and Hungary, the intention was to affect cross-border financial flows, among other objectives. Moreover, the negative levels were just applied for deposit rates, while refinancing and interbank rates remained at positive levels. In the cases of Bulgaria and Bosnia Herzegovina (currency boards with the euro), the intention was to approximate them with the monetary policy of the Euro area. Also, as currency boards, interest rates are not the main instrument of monetary policy, but usually foreign exchange interventions to keep the exchange rate stable.

⁴⁰ For instance, the implementation of a two-tiered reserve system in Switzerland exempted banks of charge over negative interest rates until 20 times their reserve requirements (minus cash).

NIRPs implementation on agents' balance sheets (financial and non-financial) and foreign economies? (iii) What is the overall analysis of NIRPs? What alternative policy proposals could mitigate some of the most negative effects presented by NIRPs so far?

2.3.5.2. Negative Interest rates - Theoretical debate

Ideas that would be embedded with a similar notion of negative nominal interest rates (“tax on money”) were already discussed since the late 19th century/beginning of the 20th century. The first accredited proponent of a tax on money was the economist Silvio Gesell (1916, published in English in 1958). Gesell was in favor of the implementation of a “stamp script”: a stamp worth a thousandth of the note's face value had to be attached to it once a week (amounting to an annual depreciation rate of approximately 5 %), so this note could remain legal tender. According to this author, this tax on money would discourage cash hoarding and encourage spending, acting as a tool to prevent deflationary pressures that emerged in situations of economic stagnation. Gesell's proposal was acknowledged by other contemporaneous economists who also based their views on the Quantity Theory of Money (QTM), such as Irving Fisher, but criticized by Keynes (1936). Keynes affirmed that, although Gesell considered that interest rates were a monetary phenomenon, he failed to recognize the role of uncertainty in determining liquidity preference and the interest rate. The probable appearance of money substitutes⁴¹, high implementation costs, and political opposition were factors that contributed to Gesell's “tax on money” proposal not being actually adopted on a large scale.

The debate about whether alternative monetary policies should be used as the main tool to overcome stagnation/deflation was revisited after Japan's “lost decade” in the 1990s. These policies were supported by mainstream schools of economic thought, such as Monetarists and New Keynesians, who would later include among their alternative monetary

⁴¹ For instance, if cash could be substituted by equivalent bank deposits which were not subject to the “stamp script” (or not subject to negative interest rates, as it usually happens nowadays with retail depositors), money would still be kept at banks, and Gesell's tax-avoidance spending channel would not work.

tools the use of negative interest rates. One of the main defenders of Monetarism, Milton Friedman (2000), when asked how Japan could exit its situation at that time, said the BOJ should expand the monetary base by buying government bonds.

According to the Monetarist view, the implementation of negative interest rates would work on an equivalent way of an increase in money supply, as negative interest rates would be a similar mechanism to impose a penalty for banks to deposit their excess reserves at central banks, as argued by authors such as Sumner (2009) and Dasgupta (2009). Hence, the availability of excess liquidity would push banks to expand their loans to other agents in the economy, through the standard model of base money multiplier and fractional reserve banking. This additional money supply would generate higher inflation and, by reducing real interest rates, increase investment and economic output.

For New Keynesians such as Krugman (1998), the reason for Japan's problem was the impossibility of nominal interest rates fall below zero, so as to adjust the economy towards its real interest rate equilibrium level. For him, the BOJ should adopt a credible policy of "permanent" expansion of the monetary base (with positive inflation target), which would allow the country to reach a negative real interest rate, fostering consumption and investment. This nominal rigidity of interest rates around zero came to be known after the 2008 global financial crisis as "Zero Lower Bound" (ZLB). New Keynesian authors used several arguments to explain the unanticipated stagnation after the 2008 crisis: global imbalances and "savings glut" (Bernanke, 2005); over-indebtedness and deleveraging shock (Eggertsson and Krugman, 2012); "secular stagnation" (Summers, 2014). All those arguments interpreted the ZLB as an impediment that would prevent real interest rates from adjusting downward, restoring inflation to its target and employment to its long-run level.

However, more recently New Keynesian authors started to argue that, due to costs related to storing and handling cash⁴², the actual floor for nominal interest rates (the “Effective Lower Bound”) would be below zero. It would be determined by the cost of holding cash instead of remunerated assets, including deposits. Therefore, several of those authors started to argue in favor of NIRPs, claiming that a decline in nominal interest rates to negative values could eventually be a tool to avoid deflation, using the channels of inflation expectations - as argued by Schmidt (2016) - and/or exchange rate depreciation - as suggested by Svensson (2014). Regarding inflation expectations, this group of New Keynesian authors in favor of NIRPs supported their view on the Taylor Principle (Taylor, 1993). According to this principle, a decline in nominal interest rates to negative values should outpace the decline in inflation, which would imply lower real interest rates. This would increase inflation expectations and stimulate demand, allowing that inflation returned to its target and the negative output gap was closed. Regarding the exchange rate depreciation, this group of New Keynesian authors in favor of NIRPs based their argument on the Uncovered Interest Rate Parity theory. According to the theory, the use of nominal negative interest rates would widen the domestic interest rate differential vis-à-vis international levels, fostering capital flows to other countries with higher yields and depreciation of the local currency, which could help to increase domestic inflation. However, local currency depreciation might be offset by the following reasons: i) higher inflation or inflation expectations in other countries; ii) the favorable effect of negative rates on aggregate demand and rising asset prices in real terms.

Nevertheless, another group of New Keynesian authors does not support NIRPs below some certain level, once at this level, a decrease in monetary policy rate would depress, rather than stimulate lending and the overall economy. This level would be the “reversal

⁴² Although cash is a convenient means of payment for transactions, it yields no interest, it is costly to store safely, and also loses real value when prices rise. Therefore, agents may tolerate slightly negative interest rates on bank deposits, if negative rates do not impose costs higher than holding cash.

interest rate”, the rate at which accommodative monetary policy “reverses” its effect and becomes contractionary for lending, as suggested by Brunnermeier and Koby (2017). The exact level of the reversal interest rate would depend on parameters of the economic environment and financial sector, such as banks’ interest rate exposure, banks’ equity capitalization, financial sector market structure, macro-prudential policies/financial regulation. In addition, the reversal interest rate would also vary over time. While positive effects on banks’ balance sheets from NIRPs related to an increase in asset values would fade out after some time, negative effects of compressing net interest income could be persistent. Thus, the minimum threshold of negative interest rates would increase over time (“creeping up effect”), so maintaining low interest rates for a long period could depress lending. Furthermore, with quantitative easing (QE), there is usually a change in banks’ balance sheet profile, reducing the share of long-term fixed income bonds (bought by the central bank) and increasing the share of short-term assets with floating interest rates. Hence, banks become more exposed to interest rate changes through time. Therefore, the implementation of QE would also increase the “reversal interest rate” over time, and turn further interest rate cuts less effective/ counterproductive.

Besides this latter group of New Keynesians who do not support NIRPs below the “reversal interest rate”, another strand of economic thought which comes from mainstream and believe that negative interest rates can have adverse effects is Neo-Fisherianism. Both New Keynesians and Neo-Fisherians recognized under the so-called “New Consensus Macroeconomics” that the monetary base is endogenous, and nominal interest rates are exogenously determined by rules set by monetary authorities. However, while New Keynesians base their interest rate analysis on a Taylor rule⁴³, Neo-Fisherians believe that nominal interest rates are determined by a Fisher rule, as a reference to Fisher (1930). He

⁴³ Neo-Fisherians claim that the Taylor Principle (explained before in this subsection) may not apply at all times, which would lead to an inflation path of multiple equilibria and indeterminacy.

defined the long-term relationship between interest rates and inflation through an equation which nominal interest rates would be equal to real interest rates plus inflation. With this relationship, although in the short term an increase in nominal interest rates would increase real interest rates, reducing aggregate demand and inflation, in the long term nominal interest rates and inflation would move in the same way. This would happen because Neo-Fisherians (as other mainstream economists) consider real interest rates as variables determined by factors not related to policy making (e.g., productivity, demographics), so in the long run, they would move to their equilibrium (“natural”) value. Hence, nominal interest rate reductions would be associated with a decrease in inflation in the long run. Thus, for Neo-Fisherians, reducing nominal interest rates to the negative territory would only aggravate the deflation problem in the long term.

Among Neo-Fisherians, we can identify two different strategies to escape the low inflation/deflation problem. The first strategy would be the central bank raising nominal interest rates to its intended target for an extended time period to boost inflation expectations and output, as argued by Schmitt-Grohé and Uribe (2017) and Uribe (2018). According to these authors, once the economy has been at the zero lower bound for some time, the central bank should gradually raise the policy rate to its target level in gradual steps (e.g., 25 bps per quarter), in a way to foster inflation expectations and output/employment. Once interest rates are back to normal level, the central bank could return to follow a Taylor rule.

The second strategy to escape the low inflation/deflation problem would be a fiscal expansion in the following terms: i) Not financed by future tax increases or spending cuts; ii) With a clear communication that it will not be offset, so agents will manage their expectations towards higher spending, which will push prices up. This strategy would be based in the Fiscal Theory of Price Level (FTPL)⁴⁴, in models with flexible prices. So by this logic, the

⁴⁴ According to this theory, the price level is not only the rate at which currency trades for goods in the economy; it is also the rate at which interest-bearing government liabilities trade for goods. So as Cochrane (2016) argues,

creation of inflation would come as a wealth effect on individuals in a non-Ricardian fiscal regime⁴⁵. In this process, the real value of government bonds also drops, and prices adjust until the government intertemporal budget constraint is again in equilibrium (real value of government debt equals the net present value of future surpluses). Therefore, according to this strategy, under a scenario of very low inflation/deflation, reductions in nominal interest rates can stimulate demand only if they are accompanied by effective fiscal expansion⁴⁶. In other words, in a very low inflation environment, fiscal policy should be aimed at increasing the inflation rate, with monetary and fiscal policies coordinated on this objective.

Nevertheless, it is important to mention that for Neo-Fisherians which base their arguments on the FTPL, fiscal policy expansionary role would be indicated only in occasions of deflation or strong recession. As Tcherneva (2010) argues, they would still be embedded with mainstream views that in the long run, expansionary fiscal policies have distortionary supply-side effects, and therefore the notion of long-term strict fiscal discipline would be relevant for them.

The inadequacy of negative interest rates is discussed outside the mainstream, notably among Post-Keynesian authors. In situations of low inflation and protracted stagnation when NIRPs are usually applied, those authors support their views on the Liquidity Preference Theory to explain the possibility to occur a “Liquidity Trap” (LT). A broader discussion on the concept of liquidity trap is done in appendix 2.1 at the end of this chapter. In order to exit a liquidity trap, Keynes and Post-Keynesian authors would still see a role for monetary

the value of money is set by its availability in quantity *versus* how much people expect the government will soak up via taxes - or bond sales, backed by credible promises of future taxes. Alternatively, as pointed out by Sims (2016), interest rate, tax, and expenditure policies, both now and as they are expected to evolve in the future, jointly determine the price level.

⁴⁵ For FTPL authors such as Woodford (2000), the government intertemporal budget constraint is just an equilibrium condition and not an actual constraint on the government imposed by private agents. This denial of the Ricardian equivalence is a very controversial point even among mainstream authors, such as Buiter (2002), who criticize this point and other issues of the FTPL.

⁴⁶ Conversely, in a FTPL framework, under a scenario of very low inflation/deflation, if nominal interest rates are pushed into negative territory, and the resources extracted from the banking system/savers by those interest rates just reduce nominal deficits (without committing to achieve higher inflation with anticipated tax cuts or expenditure increases), negative interest rates create deflationary, not inflationary pressure.

policies, as mentioned in appendix 2.1. Nonetheless, unlike Monetarists and a group of New Keynesians, the macroeconomic policies advocated by Post-Keynesians would not be through negative interest rates, and monetary policies would not be the main tool to exit the trap. As noted by Lavoie (2016a), monetary policy would have an asymmetric role: although higher interest rates may be more efficient in fighting inflation and reducing output, lower interest rates clearly have a weak power to create inflation and increase output⁴⁷. Conversely, the basic pillar for escaping a liquidity trap and fostering sustained economic growth would be fiscal policy. In fact, unlike Neo-Fisherians, for Keynes and Post-Keynesians fiscal policy has a permanent role, with the government expenditure multiplier as an important mechanism to increase aggregate demand/employment, and as a stabilization tool to smooth business cycles.

Post-Keynesians present various criticisms to the views in the mainstream that support the use of NIRPs. The Monetarist view, based on the loanable funds theory and QTM, had serious conceptual problems, as pointed out by Kaldor in several of his publications (1970, 1982, 1985), and by various other Post-Keynesian authors later: i) exogenous money (central bank capacity to set the monetary base, and hence fully control total money supply); ii) the stability of the velocity of circulation of money; iii) a direct relationship between the money supply and inflation. Current authors who adopt a Monetarist approach already recognize that the monetary base is not completely exogenous and central banks have the power to set short-term nominal interest rates. However, these Monetarist authors keep the misguided idea of the existence of a predictable causality between monetary policy and inflation, whether through changes in money supply or in interest rate levels, as argued by Rochon (2016).

⁴⁷ The power of lower interest rates to restore inflation and growth would be weaker in countries which have a large stock of public debt to GDP, and this debt is held predominantly by domestic investors (e.g., Japan). In this case, lower interest rate payments from governments to households would reduce private disposable income, consumption, and hence slowdown inflation/GDP growth, as pointed out by Lavoie (2014, p.346).

In fact, according to Post-Keynesians, money creation is endogenous: loans create deposits⁴⁸, not the opposite, as suggested by the loanable funds theory. Banks do not have their lending levels constrained by their previous amount of deposits/reserves. They lend according to their liquidity preference views and the demand from borrowers that meet their creditworthiness criteria. In addition, an increase in money supply does not necessarily lead to an increase in inflation, as suggested by the QTM. Conversely, Post-Keynesians acknowledge that, even if the decrease in interest rates promoted by NIRPs reduces the minimum rate of return banks request for loans, eventually increasing the number of agents considered as creditworthy borrowers, there is no guarantee these loans will be directed towards consumption/ investment, leading to higher output/ inflation. According to Kaldor's reflux principle, "*there can never be an excess supply of money*", as noted by Lavoie (2016b, p. 69). So there is a high probability that these agents will use the funds to pay back their debts and deleverage. With this behavior, the net amounts outstanding of loans may not increase, or actually decrease. Once their balance sheet conditions improve, agents may use loans to build up cash balances (for liquidity preference reasons). In the case of corporations, they may engage in repurchasing equity and buying non-produced assets (e.g., merger/ acquisition activity), focusing on a governance model that prioritizes maximizing shareholder's value. Thus, new loans would not necessarily lead to an increase in investment. In this sense, Post-Keynesian authors point that the New Keynesian view which considers ZLB as the cause of stagnation is mistaken, and negative nominal interest rates may not alleviate the problem of aggregate demand shortage. Instead, the problem of enduring demand shortage would be related to other reasons: i) Continuous trend of real wage growth below labor productivity, falling share of wages in income and rising inequalities of income/wealth, as argued by Taylor (2017); ii) Lack of real investment, with firms preferring to engage in

⁴⁸ The adequate sequencing for money creation would be: banks lend first, create the corresponding deposits for borrowers, and then search for the respective reserves to satisfy legal reserve requirements, settle interbank transactions and clear with the central banks.

share buybacks and merger/acquisitions, as suggested by Palley (2018); iii) The financialization of corporations and the economy as a whole, as mentioned by Lazonick (2017) and Storm (2018).

If for Post-Keynesians the impacts of NIRPs on consumption and investment are limited, their effects on financial conditions could lead to serious imbalances in the long term. In the case of the financial sector, institutions may see their balance sheet/income statements deteriorate with the downward pressure in profitability. This would occur due to a compression in net interest income, once NIRPs tend to reduce financial institutions' interest earnings (e.g., lending rates), without necessarily reducing its funding costs (i.e., downward rigidity of deposits, especially for retail investors). In a broader context (including financial and non-financial sectors), in an initial stage right after a crisis, NIRPs could help to lower yields and avoid a collapse of bond/equity prices. Nevertheless, as NIRPs are kept/strengthened some time after a crisis, the upward pressure on asset prices persists, and agents may increase leveraging again. So the financial fragility is increased, once higher debt levels make agents more vulnerable to future adverse developments (e.g., unexpected interest rate hikes), and the economy as a whole is subject to a new asset boom/bust cycle, as suggested by Minsky (1992). This fact creates a contradiction: policy measures to revive the economy in the present (as NIRPs) can generate even greater imbalances and instability later. This process was named by Palley (2018) "whiplash effect". Each new crisis would be harder to escape because the economy enters it with greater debt burdens and more fragile balance sheets. The history of successive crises may also induce a form of "traumatic" effect that ends up increasing risk aversion (which lowers investment and increases saving), thereby aggravating the sluggishness of aggregate demand.

The idea of using NIRPs as a way to depreciate the domestic currency and generate inflation is also a very contentious issue. Authors like Shirai (2018) argue that the impacts of

the exchange rate on inflation are temporary and may be unsustainable since the exchange rate cannot continue to depreciate indefinitely. If the exchange rate trend changes from depreciation to appreciation, an opposite price development occurs. Moreover, NIRPs may create competitive devaluation policies (“currency wars”). They could lead to undesired effects at an international level, in current accounts (increase in one country exports at the expense of the other – “beggar-thy-neighbor policies”) and capital accounts (huge financial flows, with investors searching for higher yields and speculative carry trade operations).

Furthermore, NIRPs may have significant effects on income/wealth distribution. As they increase financial asset prices, they provide capital gains for financial asset owners, especially those with higher risk profile. Since riskier assets are predominantly held by more affluent households, this would be one of the groups that would most benefit from NIRPs, exacerbating the problems related to income/wealth inequality⁴⁹. NIRPs also have important effects on the outlook for retirement income. Very low or negative interest rates decrease pensions’ returns. Ordinary households are more exposed to that squeeze, because of their lower wealth and inability to bear losses. This squeeze may be particularly challenging at a time there is a trend to switch pensions from defined benefit to individual contribution schemes in most countries. Moreover, NIRPs may exacerbate distortions in real estate/mortgage markets, potentially fostering housing bubbles. Overall, Post-Keynesian authors as Palley (2018) understand that NIRPs induce asset price inflation in the present, bringing forward capital gains that would be earned in the future and transferring it to current owners, while buyers are more subject to financial risk. Therefore, this intergenerational transfer would increase risks and deteriorate prospective outlook, removing an important source of future economic stimulus.

⁴⁹ Another strand of non Post-Keynesian authors disagree with this view, arguing that these distributional issues may be offset by other countervailing forces, as discussed further in subsection 2.4.1.

2.3.5.3. Negative Interest rates - Transmission to Agents

Regarding the transmission of negative interest rates to the economy as a whole, we could say in broader terms it was more significant for financial institutions and markets (money markets/sovereign bonds)⁵⁰ than for non-financial agents (households/ majority of companies).

In terms of money markets, negative interest rates were transmitted by following central bank's official rates. Data for European countries is provided by Bech and Malkhozov (2016). These authors show that in the Euro area and Switzerland, money market rates usually tracked the deposit rate. In Sweden, money market rates generally followed the repo rate. In Denmark, rates were sometimes closer to the certificate of deposit rate, and other times closer to the current account rate. In Japan, this data can be obtained in the BOJ *Financial System Report* of April 2017. This publication shows that overnight money market rates (call/repo) tracked the short-term policy rate. Therefore, in terms of money market rates, there was a clear downward trend in recent years⁵¹, consistent with negative rates and other accommodative measures implemented by central banks. In terms of trading volumes, the argument is more nuanced. On a first approach, one could say that negative interest rates, together with QE and other unconventional measures, increased market liquidity and decreased the need for financial institutions to tap interbank markets, thus having a negative effect on money market volumes, mainly in unsecured transactions (more subject to volatility). Changes in the financial regulatory framework (e.g., new European Union - EU money market fund regulation, entering into force in July 2018 for new funds, and 2019 for

⁵⁰ Exception of this trend are financial institutions unable/unwilling to deal with negative cash flow securities (e.g., insurers and banks that issue covered bonds), which increased their demand for instruments with interest payments floored at zero.

⁵¹ This downward trend was observed in countries implementing NIRPs, even taking into account that the transmission of marginal policy rates to money market rates might not always work, due to: i) Large amount of excess liquidity and fraction of it exempted from negative interest rates; ii) High spread between marginal/average policy rate for excess reserves; iii) Bank's resistance to lending in the interbank market.

existing funds) might also have some downward impact on money market volumes. However, other important factors should also be analyzed: i) Expansion of secured lending with repo transactions, which capital markets/non-bank financial institutions have an increasing role; ii) Arbitrage opportunities in markets with tiered reserves (e.g., Japan, Switzerland), stimulating secured trading of funds between banks that are below and above central banks' exemption thresholds. Therefore, although negative interest rates and stricter regulation might have a downward influence on money market volumes, the overall result may be of volumes not falling (mainly in secured lending) due to those other factors, which also vary according to the jurisdiction.

In terms of sovereign bonds, we have observed that negative rates have reached not only short-term maturities as in money markets, but also mid /long-term maturities (e.g., 10-year yields in Switzerland, and some occasions in Germany/Japan). To have an idea of the amount of debt being traded in international markets with negative yields, some estimations⁵² pointed to a level near US\$ 12 trillion in mid-2016 (by this time Denmark, Euro area, Switzerland, Sweden, and Japan had already implemented NIRPs). This amount declined later to around US\$ 7 trillion in 2018, once global financial conditions became less accommodative.

The pass-through of short-term negative rates to medium/long-term sovereign bond yields was explained not only by NIRPs. Among the factors that increased the demand for sovereign bonds in those countries, even at negative levels, we can mention: i) other accommodative measures taken by central banks (i.e., asset purchases); ii) precautionary purposes ("safe haven" asset in occasions of uncertainty); iii) transactional purposes (collateral for repo transactions); iv) speculative purposes (obtaining capital gains with price

⁵² The estimations mentioned are from the "Bloomberg Barclays Global Aggregate Negative Yielding Debt Index", available in Bloomberg database.

increases in the future); v) regulatory reasons (e.g., mandatory posting of collateral for uncleared derivatives).

In terms of non-financial agents, we have observed different outcomes whether the agent is a large corporation or a small firm/household (retail depositor). As wholesale depositors, large corporations had to incur in negative interest on deposit rates in countries like Denmark and Sweden. However, their cost of handling cash (storage/security) is larger. In addition, large companies can get funding in markets at lower rates (many of them had bonds trading in secondary markets with negative yields). Thus, mildly negative interest rates are manageable for those large corporations. Conversely, for small firms and households (retail depositors), negative rates have not been imposed, once banks/authorities feared large deposit withdrawals with such a measure. Due to the arguments presented above, and data shown by Dell'Ariccia *et al.* (2017), there was no evidence that cash hoarding increased in countries which implemented negative interest rates.

2.3.5.4. Negative Interest rates - Impacts on Agents

At first glance, it could be said that NIRPs deepen accommodative monetary conditions, which would possibly generate several positive effects for governments, central banks, financial institutions, and the real economy. Some of those positive effects are mentioned by authors such as Viñals *et al.* (2016). Governments would benefit from lower sovereign bond yields, reducing their debt rollover costs. Lower bond yields would also boost asset prices, providing temporary capital gains to agents. For central banks, NIRPs would strengthen other accommodative policies being implemented by them, whether through the signaling channel (reinforcing forward guidance commitment of low interest rates) or through the portfolio rebalancing channel (fostering banks to substitute excess reserves by assets with higher yields). For financial institutions, NIRPs would result in lower funding costs, which would provide incentives to offer lower lending rates and increase their credit supply

(according to the so-called credit or bank lending channel of monetary policy). Better expectations for loan recovery rates would also allow them to reduce non-performing loans (NPL) provisioning costs. Easier financial conditions could also encourage credit demand, increasing consumption and investment. Households would have positive wealth effects with higher asset prices and lower interest expenses. Firms would also benefit from lower capital costs (with lower rates, more investment projects would become profitable). If NIRPs eventually trigger a foreign exchange depreciation (or avoid excessive capital inflows/currency appreciation pressures), they could also benefit exporting companies, according to the exchange rate channel of monetary policy.

However, all those positive effects that can supposedly take place (usually in the short term) should be analyzed from a broader perspective, which takes into account other side effects that may occur, according to the agent, place and time period the negative interest rate policy was implemented.

2.3.5.4.1. Negative Interest rates - Impacts on Financial Institutions

In this subsection, we expand our analysis at the beginning of section 2.3.5.4, where only NIRPs possible positive effects for financial agents were presented.

Related to the debate if negative interest rates increase or not bank lending, at the theoretical level, we have arguments that support this view (such as the bank lending transmission channel of monetary policy), and other arguments which go against this view (such as the reversal interest rate, as discussed in section 2.3.5.2). The empirical evidence on this subject is also mixed. We have some authors who find results that negative interest rates increase bank lending, such as Brauning and Wu (2017), Demiralp *et al.* (2017), Eisenschmidt and Smets (2018). However, other authors find opposite results, such as Eggertsson *et al.* (2017) and Heider *et al.* (2018).

The impacts of very low/negative interest rates on bank profitability is also a contentious issue. From one point of view, authors such as Altavilla *et al.* (2017) do not find a negative relationship between bank profits and negative interest rates, once controls for financial/macro conditions are used. Conversely, authors such as Borio, Gambacorta, and Hofmann (2017) and Claessens *et al.* (2017) find strong empirical evidence at an international level that very low/negative interest rates erode bank profitability.

In fact, the adoption of negative interest rates imposes two kinds of costs for financial institutions. One is a direct cost an institution should incur for its amount of excess reserves placed at central bank's balance sheet. The implementation of tiered reserve systems allows that institutions which are below certain threshold pay less/do not pay for their excess reserves at central bank's balance sheet, thus reducing their direct costs. At the same time, with tiered reserves, central banks can avoid massive transfers of reserves into cash, and allow better liquidity management. Another kind of cost faced by institutions is an indirect cost, given by the net interest income (the difference between lending and funding rates). Following the decrease in monetary policy interest rates to negative levels, while lending rates tended to drop, funding rates did not necessarily fall at the same pace. This happened mainly with institutions whose main funding source was retail deposits. Retail deposit rates tend to present downward stickiness, once households and small firms have lower costs than large corporations/banks in storing cash, and a below zero interest rate may not be "psychologically" tolerable for small investors. Thus, institutions did not pass along negative interest rates to retail depositors, in order to avoid large withdrawals. This fact tended to reduce the net interest income of financial institutions more reliant on deposits, and eventually put downward pressure in institutions' profitability.

In order to mitigate those costs, financial institutions may implement alternative measures, or rely on other compensatory effects, such as: i) Increase funding in wholesale

markets at lower levels, trying to compensate for the downward stickiness of deposit rates; ii) Increase loan volumes and/or the share of riskier loans, trying to offset lower lending rates; iii) Raise non-interest income, by imposing higher fees and commissions; iv) Rely on capital gains or lower provisioning costs with a potential improvement in borrowers' balance sheets; v) Undertake operational restructuring, seeking to raise efficiency and reduce costs.

However, each one of those alternatives presents obstacles. First, increase funding in wholesale markets may not be feasible for smaller institutions. Even when they have access to wholesale markets, the sources of funding in those markets are more volatile, turning small institutions more exposed to sudden changes in market conditions. Furthermore, increase loan volumes, the share of riskier loans or fees/commissions is difficult in an environment where credit demand is low, assets are repriced quickly, and bank competition is high. Moreover, counting on temporary capital gains or uncertain better conditions (lower loss provisions with a potential improvement in borrowers' balance sheets) cannot be a long-term solution. Finally, operational restructuring is a measure that takes some time to be implemented, and a deterioration of market conditions may happen before results appear.

In fact, there is evidence that NIRPs affect banks' balance sheets in different ways, according to each banking system framework. Dell'Ariccia *et al.* (2017) point that net interest margins have remained resilient in several jurisdictions which have adopted NIRPs. For nations like Sweden and Denmark, margins have remained broadly stable, once those countries have a narrower deposit base (with a higher reliance on non-deposit funding), allowing banks to benefit from lower rates in wholesale/money markets⁵³. In the case of Denmark, lower policy rates have not been entirely transmitted to lending rates. In Switzerland, the exemptions in the tiered reserve system and a temporary rise in mortgage lending rates partially protected banks of negative effects on margins. Conversely, for the

⁵³ The compensatory effect on net interest margins promoted by cheaper funding in Sweden and Denmark wholesale markets is also documented by Madaschi and Nuevo (2017).

cases of Japan and Euro area, the authors confirm there was a reduction in net interest margins. However, the overall effect on bank profitability has been limited so far, once banks had on average managed to partly compensate the negative effects with alternative measures, such as the ones enumerated before in this subsection. This information is acknowledged by the financial supervision authorities of Japan and Euro area. When we analyze their reports (BOJ, 2017 and ECB, 2017a), those publications point to additional structural factors (beyond monetary policies) that would put downward pressure in bank profitability. In the case of Japan, an intensification in competition due to the entrance of new players in financial services (e.g., fintech companies), and the decline in the demand for conventional financial intermediation services due to demographic trends. In the case of the Euro area, a high number of branches over total population and low diversification of revenues by activity/geographical region. Hence, financial supervision authorities call for structural reforms in the banking system, which not only cut operational costs, but also raise income with more efficiency (i.e., increase earnings with more modern Information Technology solutions and online business).

In the case of the Euro area, its heterogeneous banking system framework is described in more detail by Jobst and Lin (2016). According to these authors, we would have two different groups of countries, where each group would have a particular banking system profile. In one group, we find nations that have higher excess liquidity amounts, due to trade surpluses (e.g., Germany, Netherlands) or ECB purchases (i.e., France). Banks of this group of countries are more subject to NIRPs direct costs, because of their higher level of excess reserves. However, bank profitability is not much sensitive to negative interest rates on excess reserves, since banks' cash balances represent only a small fraction of their asset base. Banks of this group also have a lower loan share based on variable rates (especially for households). Hence, banks of this first group have less pressure to reduce lending rates, which mitigates

NIRPs negative impacts on net interest income (indirect costs). For the central bank, if less pressure on net interest income is a good outcome in terms of financial stability, the fact that lending rates do not decline on the same proportion as official rates would be a sign that monetary policy transmission is finding constraints. The second group of countries is composed by nations that have a large share of their loans based on variable rates, and a wider reliance on retail deposits as a funding source (i.e., Italy, Spain, and Portugal). Thus, after NIRPs, banks' lending rates in this group have declined considerably, with the repricing of existing loans outweighing eventual profits with new loans. Conversely, banks' funding costs in this group did not reduce in the same proportion, due to the downward stickiness of retail deposits. Hence, banks' indirect costs with NIRPs increased considerably in this group. According to those authors' estimations, banks' annual indirect costs with NIRPs in the Euro area (€ 8.8 billion) are far higher than direct costs (€ 0.8 billion). There are also other structural problems in the banking systems of this group, notably high asset impairment constraints, due to the crisis legacy of high NPL levels. Therefore, even if in the countries of the second group the pass-through of NIRPs to lending rates is higher (which could be interpreted as a more powerful transmission of monetary policy), downward pressures in banks' net interest income, combined with other structural problems in these banking systems, raise financial stability concerns⁵⁴. NIRPs adverse effects on bank profitability could increase if they continue to be implemented for a long time and have negative spillovers for the rest of the economy as a whole. Therefore, the Euro area experience shows that negative interest rates may asymmetrically affect agents/ countries. In this case, the paradox would be that NIRPs negative effects would be more significant in the less solid banking systems, with potential adverse impacts in the economies which in fact most suffered after the 2008 crisis.

⁵⁴ Those financial stability concerns are also pointed out by authors such as Heider *et al.* (2018). These authors have evidence that after the implementation of NIRPs, Euro area banks with more reliance on deposits as funding source ended up lending lower amounts, but for riskier borrowers. This fact turned banks' balance sheets more exposed to risks, in case of deterioration in debt repayment capacity of those borrowers.

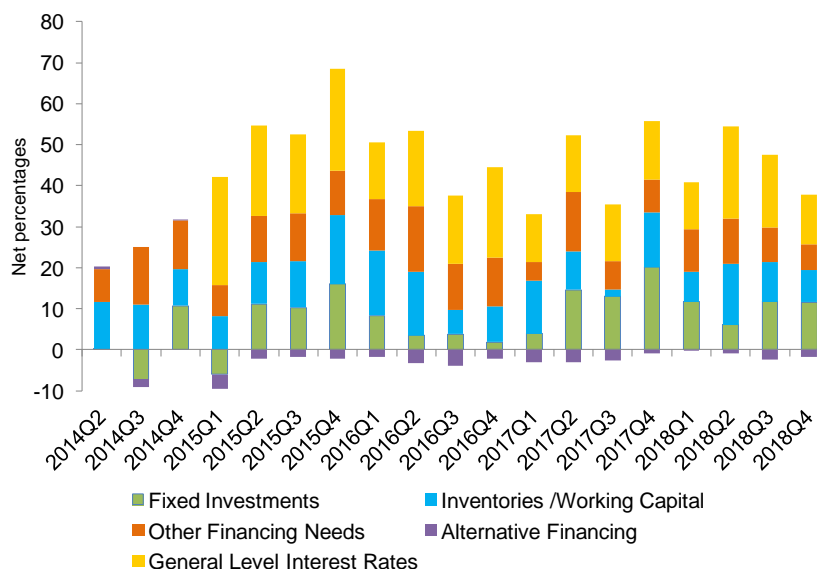
2.3.5.4.2. Negative Interest rates - Impacts on Non-Financial Agents

In this subsection, we expand our analysis at the beginning of section 2.3.5.4, where only NIRPs possible positive effects for non-financial agents were presented.

In terms of negative rate impacts on the corporate sector, it could be argued that NIRPs would significantly lower the profitability constraint for new investments, which could encourage excessive risk-taking, promote low productivity projects and foster excess capacity. Conversely, there is evidence at the macro level that in most countries which implemented NIRPs, while credit levels have presented a modest growth, companies' investment levels remained subdued, amid an environment of low demand and still high uncertainty. For jurisdictions such as the Euro area, the destination of resources borrowed by firms can be inferred from data contained in ECB *Bank Lending Surveys*, as it can be seen in graph 2-2 in the sequence.

According to data available in these publications from 2014 Q2 to 2017 Q1, the main reasons pointed by banks to the increase in demand for loans were: i) the “general level of interest rates” (from 2015 Q1 onwards); ii) “other financing needs” (which include debt refinancing/restructuring/renegotiation, mergers/acquisitions, and corporate restructuring). “Inventories and working capital” would explain a smaller share, and “fixed investments” took the lowest share of all factors. Therefore, we could infer that new lending in this period was more used for financial purposes, instead of real investments. Only at a later stage (Surveys of 2017 Q2, 2017 Q4, 2018 Q1, and 2018 Q4), this trend was not observed, with fixed investment being reported as having a role equal/ more important than other categories. Nevertheless, in 2017 Q3, 2018 Q2 and Q3, the general level of interest rates retook the lead from fixed investments as the main factor for the increase in the demand for loans to enterprises in the Euro area.

**Graph 2-2 Changes in demand for loans to enterprises, contributing factors:
2014 Q2-2018 Q4**



Note: Net percentages for the questions on demand for loans are defined as the difference between the sum of the percentages of banks responding “increased considerably” and “increased somewhat” and the sum of the percentages of banks responding “decreased somewhat” and “decreased considerably”. “Use of alternative finance” is the unweighted average of “internal financing”, “loans from other banks”, “loans from non-banks”, “issuance/redemption of debt securities” and “issuance/redemption of equity”. Source: Author own elaboration, based on ECB Bank Lending Surveys.

Moreover, despite being able to ease financial constraints to borrowers in the short term, NIRPs may create distortions in debt affordability in the long term. For instance, more accommodative conditions could lead firms to raise leverage, but turn them more exposed to interest rate increases. For instance, in the Euro area, this would be a possible concern more for non-financial corporations (around 88% of them have loans with floating rates/ interest rate fixation period of up to one year) than for households (29% of loans in the same conditions), according to ECB data. Furthermore, lower borrowing costs could avoid that firms with debt overhang undertake a necessary restructuring, or even delay the exit of non-viable firms from the market. All those arguments point for the need to improve corporate restructuring/resolution frameworks, as well as financial regulation/supervision, to address problems of companies’ over-indebtedness and high NPL levels.

For households, some of the negative impacts of NIRPs on increasing inequality, problems for retirement income and imbalances in housing markets have already been

mentioned at the end of subsection 2.3.5.2. It is worth mentioning that the increase in house prices and the risks they pose for generating bubbles in mortgage markets and over-indebtedness of households bring concern⁵⁵ in countries like Sweden and Denmark, as indicated in their 2017 *Financial Stability Reports*. Although house prices and household debt growth are also usually linked to other local factors (e.g., land supply scarcity in some regions, tax-deductibility of mortgage interest payments in those countries), NIRPs might have played an important role in this increase by easing lending conditions. In particular, there is evidence that higher integration in international financial markets and accommodative monetary conditions in advanced economies fostered global and institutional investors' search for yield, triggering a synchronized increase in house prices in several major cities and countries, among which Sweden and Denmark, as reported in IMF (2018). Macroprudential measures have been already implemented in Sweden and Denmark⁵⁶ in recent years in order to contain those risks, which should be carefully monitored.

2.3.5.4.3. Negative Interest rates - Impacts on Foreign Economies

The literature that documents the spillovers of unconventional monetary policies in general on foreign economies is quite vast. On broader terms, this literature points that while UMPs implemented by the Fed had higher cross-border impacts, due to the predominant role of the dollar and U.S. interest rates in global commercial/ financial flows, the cross-border impacts of ECB and BOJ UMPs would be smaller, and the transmission channels weaker, as documented by Chen *et al.* (2017), Fratzscher *et al.* (2016), Spiegel and Tai (2017). However,

⁵⁵ In the case of the Euro area, strong house price increases were observed in some big cities. However, according to the ECB *Financial Stability Review* - May 2017, those increases were not associated with an overvaluation in the Euro area housing market as a whole. For Japan, the real estate market showed signs of enlarged activity, with financial institutions expanding loans to the sector or investments in real estate funds. Nonetheless, according to BOJ *Financial System Report* – April 2017, there were no signs of overheating in real estate markets. In Switzerland, after 16 years of continuous house price increases, in 2017 house prices declined. According to the SNB *Financial Stability Report* 2017, this decline in house prices followed continuous efforts by the SNB with macroprudential measures to reign in excessive house price growth (e.g., countercyclical capital buffer on banks, cap on mortgage loan-to-value ratios).

⁵⁶ For instance, we had the implementation of the following macroprudential measures in 2016: in Sweden, an amortization requirement for new mortgages until its loan-to-value ratio reaches 50%; in Denmark, reduction of the scope and amount of mortgage interest tax relief.

ECB and BOJ policies would promote some cross-border impacts on certain indicators, which would usually be more relevant for their neighboring economies, such as the East Asia in the case of Japan, and Emerging Europe in the case of Euro area.

Even if there are not so many articles which document the specific impact of the adoption of NIRPs on foreign economies on a cross-country basis, the ones which we had access and report in the sequence are consistent with the findings of the general literature of UMPs spillovers.

In the case of Japan, focusing on the effects of NIRPs adoption on the stock markets of Korea, Singapore, Taiwan and Thailand, Fukuda (2018) finds temporary positive effects soon after NIRP implementation, and then decreasing afterward. According to the author, these initial positive effects would have been fostered by financial institutions that saw reduced profit opportunities in Japan, and went in search of more profitable opportunities in other markets, particularly in Asia⁵⁷. This movement of Japanese financial institutions trying to expand their activities abroad after the BOJ implemented NIRPs is also reported by McCauley (2018). According to this author, following the adoption of NIRPs by the BOJ, financial conditions for Asian countries' borrowers eased through two mechanisms: i) Increasing presence of Japanese financial institutions in their jurisdictions, which due to competitive pressures and the objective to increase market share, offered more favorable loan terms and conditions; ii) A "bond boomerang effect": BOJ NIRPs fostered hedged outflows from Japan mainly to USA bond markets. With heightened global demand for dollar-denominated assets, there were sizable outflows from the USA to other markets, among which Asian economies, stimulating borrowing in local currency and dollar-denominated bonds in Asian countries.

⁵⁷ Japanese biggest banks increased their market share in many Asian countries (e.g., Korea, Taiwan, Philippines, Vietnam, India, Indonesia), except in China and Hong Kong. This increase occurred even if the cost of U.S. dollar funding became more expensive for Japanese institutions, due to the higher deviation in the yen/dollar cross currency basis swap.

Another study which takes into account NIRPs implemented not only by Japan but also by Switzerland, the Euro area, and their spillovers for emerging/ developing economies is done by Arteta *et al.* (2018). These authors find that, on each day of respective NIRP announcement, the responses of emerging and developing economies assets performed on average as expected: emerging/ developing countries currencies appreciated, bond spreads declined, and equity prices increased. If the event window is extended from one day to one month, there is not anymore a clear pattern, due to a wide range of other concomitant factors.

Nevertheless, all authors mentioned in this subsection make the cautious note that NIRPs spillovers may pose future financial stability risks for foreign jurisdictions. That would happen because the temporary positive effects could eventually feed the buildup of imbalances (excessive capital inflows and growth of credit/asset prices). Those imbalances, combined with an unexpected reversal of favorable international financial conditions⁵⁸ and domestic vulnerabilities, could lead to severe capital outflows and financial/economic crises.

2.3.5.5. Negative Interest rates – Overall analysis

Section 2.3.5 presented a debate on the adoption of negative nominal interest rates on a theoretical level, and also discussed the transmission mechanisms of NIRPs among different economic agents, as well as distinct effects they may generate on domestic financial/ non-financial agents and foreign economies.

Regarding the theoretical analysis, it is interesting to observe that, despite the arguments supporting the implementation of NIRPs originally came from mainstream authors (Monetarists and some New Keynesians), their adverse effects have been clearly pointed out also by authors coming from the mainstream (group of New Keynesians and Neo-Fisherians), recognizing the flaws of views such as exogenous money and QTM. The more sharp

⁵⁸ A gradually and properly communicated announcement of removal of a NIRP probably would not lead to disruptions in international financial conditions. Conversely, an unexpected monetary policy announcement (e.g., faster than expected tightening of monetary policy by the Fed) could have broader negative implications for global financial markets and the overall economy.

criticisms came from Post-Keynesians. For this last group, instead of NIRPs, monetary policies (low/positive interest rates, with central bank interventions to stabilize bond yields if necessary) should act as a complement to fiscal policies, which would have a permanent role in increasing aggregate demand/employment and stabilizing business cycles.

In respect to NIRPs transmission mechanisms, these were more significant for financial institutions/markets (money markets/sovereign bonds) than for non-financial agents (households/ majority of companies).

In terms of the effects presented by NIRPs on the countries they were adopted, certain authors claim those policies increased accommodative monetary conditions, generating some positive effects for agents, usually in the short term. However, other authors present arguments that while NIRPs positive effects were usually small and progressively faded out, various other negative effects may appear over time. NIRPs may raise imbalances in the balance sheets of banks, firms, and households, turning them more fragile and exposed to sudden changes in market conditions. If those imbalances did not show up so far, they might materialize in the medium/long term, raising macroeconomic and financial stability risks. Imbalances and financial stability concerns emerge not only in countries where NIRPs were implemented but also in foreign jurisdictions more affected by their spillovers. This fact calls for continuous improvement of regulatory frameworks of financial/non-financial agents, on a coordinated basis between monetary/fiscal/financial supervision authorities, at a national and international level. It would allow that those imbalances were properly addressed, so that economies would be better prepared to face future crises.

Furthermore, instead of insisting on the implementation of negative interest rates, we argue that an active fiscal policy would be one of the main pillars for a strategy towards sustained economic growth. An active fiscal policy could foster public/private investment (boosting employment /demand) and promote a more equitable welfare system (supporting

income/wages). However, we understand that more active fiscal policies face considerable legal/ political constraints that currently limit their use in countries implementing NIRPs⁵⁹. Therefore, we argue for a complementary/alternative role of initiatives to improve debt restructuring/insolvency frameworks and of macroprudential measures/targeted liquidity operations in these jurisdictions.

Initiatives to improve debt restructuring/insolvency frameworks should count on the support of public and private actors in a coordinated manner. Private actors could provide resources for bank recapitalization to build buffers against losses, for debt restructuring/resolution of unviable loans and participate in asset management companies which buy distressed assets from firms/ banks and eventually resell those assets to potential investors. Public actors should provide an adequate legal and judicial system (i.e., with balanced rights between lenders/borrowers, and not very lengthy disputes in courts), mechanisms for mediation and incentives for out-of-court resolutions, and financial support (including in asset management companies) when private alternatives are not available. In this sense, agents' over-indebtedness and high NPL problems⁶⁰ could be addressed more efficiently, and balance sheets properly repaired.

In addition, macroprudential measures should be designed in such a way that banks have an incentive to increase lending to the real economy, instead of expanding their activities with financial/real estate assets. Hence, macroprudential authorities in countries that adopted NIRPs could lower capital requirements for loans to firms which do not manage to issue

⁵⁹ For instance, in EU countries, commitments with agreements that impose fiscal rules (Stability and Growth Pact, Fiscal Compact). In Japan, eventual concerns with public debt sustainability (around 253% of GDP in 2017), and a considerable share of this debt concentrated with pension funds (not liquid assets, whose eventual price disruption could have significant consequences for households/financial sector).

⁶⁰ In the Euro area, several improvements in debt restructuring/insolvency frameworks have already been done (especially in the banking sector, with the Single Resolution Mechanism, the Banking Recovery and Resolution Directive and harmonized minimum coverage ratios for new NPLs), while others are under discussion among European authorities (e.g., European Deposit Insurance Scheme). However, significant challenges still remain open, such as how to deal with the high existing stocks of NPLs. Due to difficulties related to moral hazard in risk sharing/ harmonization of distinct legal frameworks, it is more likely that the measures to address the existing high stock of NPLs remain at the national level, instead of European level.

stocks or corporate bonds (and hence rely more on bank loans for their funding), compatible with a bank exposure level proportional to each firm debt repayment capacity⁶¹. At the same time, their central banks could provide targeted liquidity operations, which offer lower funding costs for banks that lend more resources to firms/households (except for real estate purchases). Lower capital requirements for loans /targeted liquidity operations should work on a countercyclical way, so they would be removed/ reverted in proper time, to avoid the buildup of financial stability risks. Those measures would be appropriate for economies that are currently implementing NIRPs, since they broadly have a larger share of their financial system based on bank loans, instead of on capital markets.

The implementation of countercyclical macroprudential measures/targeted liquidity operations and initiatives that improve debt restructuring/insolvency frameworks in a combined way would act in two fronts: i) Enhance credit supply conditions for productive purposes, reducing banks' balance sheets constraints⁶² and creating incentives to lend for the real economy; ii) Increase credit demand for productive purposes, by helping to repair consumers and entrepreneurs' balance sheets and promoting a positive effect in their state of confidence ("animal spirits"), which fostered an expansion in credit demand for consumption

⁶¹ In the EU, a measure close to this proposal was adopted by article 501 of the Capital Requirement Regulation in January 2014. The Regulation allowed a 25% reduction in the capital requirement ("supporting factor") of banks that lend to eligible firms, with a maximum annual turnover of € 50 million. Those firms are usually SMEs - small and medium enterprises (which comprise firms that have a maximum turnover of € 50 million or total assets of € 43 million, and also a maximum of 250 employees, according to EU definition). This supporting factor is capped at € 1.5 million in bank exposure with each firm. Evidence in the literature shows that the supporting factor is usually associated to an increase in lending for eligible firms after its implementation, in the cases of French SMEs (Dietsch *et al.*, 2018) and Spanish medium-sized firms (Mayordomo and Rodriguez Moreno, 2016). However, our proposal would not be identical to the one already implemented by the EU. We argue the lower capital requirement on bank loans should apply to all firms which do not manage to issue stocks or bonds in capital markets (the ones more reliant on bank loans), and not necessarily the ones which are below the annual turnover of € 50 million defined by the EU. Moreover, the lending threshold should not be arbitrarily capped at € 1.5 million. Instead, it should be on a risk-weighted adjusted basis, in order to ensure that a bank exposure level is proportional to each firm debt repayment capacity. This risk-weighted adjustment would avoid an adverse credit rationing effect of banks limiting their loan exposure to each SMEs in € 1.5 million (regardless of firms' debt repayment capacity), which is reported by Dietsch *et al.* (2018).

⁶² This could be of particular importance in some jurisdictions under NIRP, which have actors that are claiming the need to increase interest rates quickly, in order to mitigate problems in financial institutions' balance sheets. However, we know that quick interest rates hikes could have destabilizing impacts in such economies, possibly derailing previous efforts of economic recovery. Hence, we argue in favor of a careful approach in the monetary stance of those countries, with very gradual removal of negative interest rates, while monetary conditions still remain accommodative, to avoid possible destabilizing effects.

and investment. We believe such policy mix would bring a favorable contribution to promote a more sustained economic growth in countries that adopted NIRPs, and lower financial stability concerns for domestic agents and foreign economies eventually affected by negative interest rate spillovers.

2.4. Unconventional Monetary Policy - Effects

When estimating the macroeconomic effects of unconventional monetary policies, the ideal would be to have a counterfactual scenario, which took into account what would have happened if UMPs had not been implemented. This counterfactual would be particularly relevant for estimating the effects of measures shortly after the 2008 crisis, when macro-financial risks were more severe. Nonetheless, conventional models usually do not perform well for measurement in crises times, especially since past empirical regularities are not observed. Therefore, when making an empirical estimation of UMPs effects, most authors use the method of observing the marginal effects of these policies over main macroeconomic variables.

2.4.1. Effects of UMPs in Countries of Origin

A compilation of unconventional monetary policy effects between 2008 and 2013 is carried out by IMF (2013a). According to the authors, policies aimed at restoring the proper functioning of financial markets and their intermediation mechanisms generally had positive effects. The perception is that such measures were very important at the moment right after the 2008 crisis, to avoid a financial collapse. Subsequently, they sought to improve funding conditions, intermediation mechanisms and balance sheets of financial institutions, obtaining mixed results depending on where they were implemented.

Concerning liquidity operation measures, in the U.S., TALF allowed the return of liquidity to the securitized credit market, and Fed's foreign exchange swap lines with several central banks allowed the continuity of financial flows among countries. In the United

Kingdom, between 2012 and 2013 the FLS provided more funding for loans to households (housing acquisition) than for companies, which is one of the reasons the program was redirected from 2014 onwards to encourage loans to small and medium-sized enterprises (SMEs), providing a modest improvement in credit supply to this sector after this change.

Regarding private asset purchase programs, the most positive results were in the USA. In this country, after LSAP 1, there was a drop in yields of 50 bps on mortgages and 150 bps in MBS. In Japan, post-2010 private asset purchases (commercial papers, corporate bonds, ETFs and J-REITS) also had favorable effects on those asset prices, although more modest than in the U.S., as private securities markets in Japan are not so deep as in USA. In the Euro area, between 2010 and the first half of 2012, the implementation of phases 1 and 2 of CBPP (as well as liquidity operations - LTROs) prevented a collapse of financial institutions, but did not prevent the worsening of sovereign debt banking crisis ongoing at that time. The risks of an economic collapse of the Euro area only began to be dissipated in the second half of 2012, with ECB's verbal intervention strategy ("whatever it takes speech", OMT) and other measures announced by the EU (European Stability Mechanism, Banking Union project). Other private asset purchase programs were implemented in the Euro area later in 2014 (CBPP 3, ABSPP) and 2016 (CSPP), with the latter presenting better results, by fostering corporate bond issuance and liquidity. A Corporate Bond Purchase Scheme (CBPS) was also implemented in the UK in August 2016, in order to lower companies' funding costs and mitigate risks posed to them right after the uncertainty shock stemming from the referendum in favor of UK's departure from the EU (Brexit).

About forward guidance programs, their effectiveness may be estimated by the effects on future interest rate expectations, taking into account the communication of central banks' future reaction function. However, together with FG announcements, in general, central banks' inflation and GDP forecasts are also announced. As announcements are simultaneous,

it becomes difficult to isolate FG effects (communication of central bank reaction function) from agents' future interest rate projections. Nevertheless, some studies manage to isolate the two elements, with evidence that FG was effective in countries such as the USA. For example, Woodford (2013) shows that in the USA, 2, 3 and 5-year Overnight Index Swap (OIS) spreads fell around 10 bps on dates when there were only FG announcements, without disclosure of Fed forecasts (August 9, 2011, and January 25, 2012). Indeed, Woodford (2012) believes that most of the decline in sovereign yields observed in the USA between November 2008 and February 2010 (73 out of 91 basis points) would have been because of forward guidance policy announced together with the asset purchase program, not because of the asset purchase program itself.

However, FG may not be effective when it fails to communicate a change in central bank's reaction function (example of Sweden in April 2009, described in subsection 2.3.3). Moreover, there is evidence in the literature that standard Dynamic Stochastic General Equilibrium (DSGE) models tend to overestimate the impact of forward guidance on macroeconomic variables, with the strength of the effect increasing with the expected horizon of the interest rate change. This phenomenon was identified by authors such as Del Negro *et al.* (2015), and named as "forward guidance puzzle". This puzzle would have strong links with the rational expectations hypothesis used by those models, since future commitments would have immediate and outsized effects on macroeconomic variables. In fact, the effects would be smaller once more realistic assumptions are incorporated (i.e., imperfect information, adaptive expectations). For instance, using a model that mixes adaptive and rational expectations, Gertler (2017) argues that he can describe better the case of Japan, once this country has implemented aggressive FG measures since 2013, but the inflation recovery was limited. In Japan's case (with a history of low inflation rates for several decades, and

without an anchor of inflation target⁶³), individuals would need concrete evidence that the central bank is capable of delivering on its promises. In other words, agents would have to see first, to actually believe that the central bank is able to move the inflation towards its target.

With respect to public asset purchase programs, their effects can be measured under three different perspectives: i) Transmission channels (signaling, scarcity, duration); ii) Impacts on financial variables (e.g., sovereign yields); iii) Impacts on macroeconomic variables (i.e., inflation and output).

Concerning the transmission channels of public asset purchases, the results found by IMF (2013a) are in line with those of Woodford (2012), which support that the main transmission channel would have been signaling, with the portfolio rebalancing channel having important effects on some specific occasions. In the case of USA, IMF (2013a) points out that the signaling channel had a major effect, while the portfolio rebalancing channel was relevant in two moments: in LSAP 1 and LSAP 3, mainly through the scarcity mechanism associated with MBS purchases; in Operation Twist, notably through the duration mechanism. In Japan, the main channel was also signaling, with portfolio rebalancing related to scarcity (ETF purchases) having some role. In the case of the Euro area, Public Sector Purchase Program (PSPP) was announced on 22 January 2015 and implemented on 10 March 2015. Analyzing the area's sovereign yields in both dates, one observe more intense yield drops in periphery countries, mainly in the announcement date (implying a stronger role for the signaling channel of unconventional monetary policy), whereas in core countries yield drops were smaller, but more significant in the implementation date (implying a stronger role for the portfolio rebalancing channel of unconventional monetary policy)⁶⁴. In the UK, the portfolio rebalancing channel (scarcity and duration) would also have been predominant, since the financial market segmentation is higher and the interconnection is lower than in the USA.

⁶³ Inflation targeting of 2% was just officially introduced by the BOJ in January 2013.

⁶⁴ Those results are reported with greater details in section 3.5.1.3.

When it comes to the effects on financial variables, the most directly affected by UMPs are sovereign yields. Because a series of factors can impact their levels at the same time, a strategy that is generally used in the literature is trying to isolate the effects of bond purchases after a short-time interval (“event study”). For this, it is assumed that the UMP announcement dominates other momentary factors, and security prices react instantaneously. These short-time interval studies have some limitations: i) Very short intervals (e.g., on the hours around the announcement) may not capture persistent changes in yields, which would be observed over a longer time; ii) On the day of the UMP announcement, other relevant macroeconomic indicators that may impact sovereign yields can also be disclosed, which may mask results. Despite these limitations, event studies are able to provide valid estimates. For example, IMF (2013a) estimates that in the USA, LSAPs 1 and 2 had an effect of reducing yields by 90-200 bps; In the United Kingdom, APPs 1 and 2 had a reduction effect of 45 to 160 bps, and in Japan, the CME had a 30 bps reduction effect. Another conclusion obtained by the study is that the degree of impact on yields is larger on the following occasions: i) The greater the degree of “surprise” of the announcement on markets, inferred by the change in one-year future interest rates. For example, a drop of 25 bps at the one-year future interest rate would be associated with a reduction in current yields of 25 bps in the U.S. and 20 bps in the United Kingdom and Japan. ii) In initial announcements, more effective in alleviating financial conditions and reducing tail risks. The study associates initial QEs with smaller asymmetries in the distribution of inflation estimates and lower probabilities of future exchange rate volatility. In addition, it mentions evidence of diminishing effects on different U.S. QE rounds (i.e., the yield drops in subsequent programs would have been lower than in initial programs)⁶⁵. The theoretical justifications presented for this finding are as follows. In the case of the signaling effect, it would weaken as long-term bonds reach very low levels. In

⁶⁵ There is evidence of diminishing effects of subsequent rounds of asset purchase programs not only for USA, but also for UK, as shown by Goodhart and Ashworth (2012).

order to continue the decline in expected interest rates, central banks would have to promise longer-lasting accommodation, which would reduce the credibility of their announcements. In the case of the portfolio rebalancing effect, it would weaken as arbitrage conditions between assets improve. However, if markets remain fragmented, even if the signaling effect diminishes, the portfolio rebalancing effect continues active, which would reduce but not eliminate asset purchase effectiveness. However, the study presents evidence that when programs have significant size/scope change (e.g., QQME in Japan, LSAP 3⁶⁶ in USA), or are adopted in case of further economic and financial deterioration (e.g., OMT in the Euro area), its effects may be significant, even if they were not initial programs. Davies *et al.* (2012) agree that in the U.S. LSAP 1 had the largest initial effect of yield decline. However, for these authors, once yields reach a very low level, they would not decrease even if QE continues, since agents would not be willing to carry the duration risk implied in long-term securities (more sensitive to losses with interest rates increases). Thus, government bond purchase programs would be effective until a certain point, when they would no longer have impact on yields. However, the purchase of other private assets (such as mortgages and MBS) could have effects on private spreads, and thus on economic activity.

When it comes to analyzing QE effects on macroeconomic indicators, there is a large variance in estimates, due to the instability of relationships between GDP *versus* sovereign yields and inflation *versus* sovereign yields over time. However, the compilation of studies analyzed by IMF (2013a) shows that QE effects in the U.S. and UK were greater on GDP (median around +2 pp) than on inflation (median around +1.5 pp), although the effects on inflation lasted longer (up to 4 years, against 2 years in the case of GDP). In addition, the study affirmed that the signaling channel had an impact on GDP up to two times larger than the portfolio rebalancing channel. This lower impact of the portfolio rebalancing channel on

⁶⁶ It differed from LSAP 2 because it included MBS purchases and had no previously announced end date.

GDP would occur because of two elements: i) Portfolio rebalancing channel relies more on volatile market conditions, which would have more temporary and reversible effects; ii) The decrease in risk premium associated with portfolio rebalancing may induce firms to refinance debts, instead of making productive investments. Furthermore, other factors could limit QE effects on macroeconomic indicators: weaknesses in the banking sector, high debt levels in private/ public sectors, political and economic uncertainty.

Regarding the distributional effects of UMPs, the evidence so far is mixed. Colciago *et al.* (2018) compile a literature survey of studies which report the effects of UMPs on income and wealth inequality. These authors find studies which show opposite results for both indicators. For income inequality, they identify two different channels: i) The earnings heterogeneity channel, in which UMPs would stimulate output, employment, and wage growth, hence reducing income inequality; ii) The income composition channel, in which UMPs boost asset prices, and since capital gains are skewed towards richest individuals, income inequality increases. For wealth inequality, these authors mention the following channels: i) the savings redistribution channel, in which UMPs favor borrowers (usually younger middle-class households with mortgage debt) instead of lenders (usually older individuals with larger savings in long –term bonds). With accommodative measures, while borrowers increase their net wealth with lower debt servicing costs, lenders see their net wealth fall with lower saving returns, thus reducing wealth inequality; ii) The portfolio composition channel, in which UMPs would push up asset prices (including equity, bonds, and houses). While an increase in financial asset prices would favor mostly richest individuals, and hence increase wealth inequality, higher house prices could benefit more middle-class individuals who are house owners, and thus reduce wealth inequality. Therefore, the evidence of the distributional effects of UMPs is not clear cut⁶⁷. These effects vary

⁶⁷ In terms of UMPs effects on income inequality, Montecino and Epstein (2015) find an increase in USA, once the upward effect on financial asset prices (income composition channel) is prevailing. Casiraghi *et al.* (2018) find

depending on the unconventional policy being analyzed, the distributional channels in place, as well as on the economic structure of the country under consideration and the income and balance sheet profile of individuals.

2.4.2. International Effects of UMPs

Having been implemented by central banks of major global economies, monetary stimulus had consequences not only in the countries where they were implemented but for the whole international economy. Empirical evidence is that, at their beginning, the overall effect of UMPs was positive, including for emerging countries. Measures to restore the proper functioning of financial markets and their intermediation mechanisms would have helped to prevent a collapse of the financial sector and a large recession in countries of origin, which would have adverse effects on all countries. For example, currency swap lines announced between major central banks (e.g., Fed with 16 other countries, including 4 emerging countries: Brazil, Mexico, South Korea, and Singapore; ECB with 5 countries, including Hungary) allowed the normalization of foreign currency flows between countries. Even when those swap lines were not effectively used, they had a significant confidence effect, avoiding that international trade and capital flows were paralyzed.

However, measuring the overall costs and benefits of subsequent UMPs is more complicated, given the difficulty of isolating UMPs effects in other countries, as well as establishing an adequate counterfactual. According to IMF (2013c), on the one hand, conventional models of general equilibrium would point to a positive effect of UMPs on other countries, including greater global growth, lower public/private financing costs and increased trade flows (the latter partially offset by exchange rate appreciation). In the U.S. case, UMPs

a reduction in Italy, due to the predominant role of the earnings heterogeneity channel. Inui *et al.* (2017) find no conclusive effects in Japan, once an eventual rise in inequality levels due to higher wage dispersion following an expansionary policy would be offset by a decline in earnings inequality due to higher employment levels. For UMPs effects on wealth inequality, Domanski *et al.* (2016) find an increase in U.S., UK, Germany, France, Italy and Spain, due to the prevailing effect of rising equity prices. On the other hand, Adam and Tzamourani (2016) find inconclusive net wealth inequality effects on Euro area countries, once the increase in inequality caused by higher equity prices on fewer top-class individuals would be compensated by a decrease in inequality with higher house prices on a larger set of middle-class households.

(notably LSAPs 2 and 3, when U.S. outflows were larger) would have led to a rise in global asset prices (stocks, public and private securities). In the Euro area case, ECB measures such as repurchase operations and swap agreements would have benefited Emerging Europe, particularly in commercial and financial flows (a large share of banks operating in Emerging Europe have their headquarters in Euro area).

In an alternative view, UMPs would have stimulated outflows from advanced countries, seeking higher returns abroad, leading to capital inflows into emerging countries. UMPs impacts would depend on the recipient country business and financial cycle phase. For countries operating below full-employment capacity, or still with some room for credit/financial sector growth, inflows could be beneficial, due to the factors previously mentioned. Conversely, for countries operating above full-employment capacity, or already with an excessive credit/financial sector growth, capital inflows would pose an additional complication. In these latter cases, continuous inflows would generate adverse effects, such as currency overvaluation (with possible losses to the export sector); asset price bubbles; unsustainable credit expansion, including an increase in foreign currency debt. All this would bring financial fragility/vulnerability, as well as risks of a sudden reversal of these flows in the future.

Thus, emerging economies should seek to manage capital inflows adequately. First, a sound macroeconomic framework, with appropriate monetary and fiscal policies, should be in place. Monetary policies should calibrate their interest rate level so that it is neither too high (stimulating a large capital inflow), nor too low (encouraging an excessive increase in inflation and credit). Fiscal policies should avoid creating permanent expenditures based on temporary revenues from inflows, as well as foreign currency over-indebtedness. In the case of the exchange rate, fluctuations according to the fundamentals could be tolerated, but excessive volatility that could lead to disordered adjustments should be avoided. In addition,

in order to safeguard financial stability, micro and macroprudential initiatives, as well as capital flow management measures in cases of greater vulnerability would be recommended.

Even so, a sound macroeconomic framework lowers risk, but it does not guarantee that an emerging country is fully protected from sudden reversals when they are triggered by large international movements. For example, in May 2013, following Fed signals of a possible start of tapering, there was a global movement of risk aversion, with strong capital outflows from emerging countries towards the USA (“taper tantrum”).

Hence, UMPs impacts in other countries may change over time. If at an early stage the effects would be beneficial for most countries, with reduced uncertainties and tail risks, later the effects would be ambiguous. According to IMF (2013a), prolonged UMPs implementation would present a number of risks for both advanced and emerging countries: (i) Financial institutions may increase their liquidity risk, assuming that they can ultimately be rescued by government authorities; (ii) Further monetary accommodation could lead to a postponement of structural reforms (e.g., financial, fiscal), which would require an extension of monetary accommodation (which would be increasingly ineffective, assuming its effects to be decreasing). In this case, a dilemma may arise. If interest rates are held at very low levels for an extended time, an increase in inflation beyond expected could eventually occur, damaging central banks’ credibility. Conversely, if the central bank raises interest rates, it increases public and private debt costs, which may aggravate problems in the balance sheets of public/private agents; (iii) Extending monetary accommodation may stimulate riskier positions, with underestimation of credit risk, increased indebtedness and foreign exchange exposure in emerging countries; (iv) Large and volatile capital flows can be generated, with undesirable consequences for emerging countries.

Each of these risks requires monitoring, and could be mitigated in the following ways:

i) Strengthening non-bank financial institutions regulation/supervision, and improving

financial institutions' restructuring/resolution frameworks; ii) Improvement in the coordination of overall economic policy implementation; iii) Adoption of macroprudential measures, to curb the excessive buildup of risk in financial markets and the real economy; (iv) In emerging economies, excessive/volatile capital flows could be mitigated through macroprudential/capital management measures. Advanced economies implementing UMPs should keep the communication of their monetary actions in a gradual and transparent way, and consider to offer alternatives that minimize UMPs impacts on third parties (e.g., currency swap lines), to mitigate sudden reversals of flows.

2.5. Alternative Monetary Policies and Targets

After the 2008 crisis, central banks began to be questioned whether their monetary policy regimes, generally driven by inflation targeting frameworks (IT), would not have become inadequate or obsolete, even as interest rates were cut to minimum levels. First, inflation targeting seemed incompatible with conventional monetary tools, since interest rates were already at very low levels. Even with the implementation of unconventional measures, inflation responses were mixed according to the jurisdiction, and at some places took quite a long time to dissipate deflation fears. Furthermore, since the adoption of IT in the 1990s, despite relatively stable inflation and inflation expectations, there were large output gap fluctuations. All these factors led to question whether only keeping inflation under control could be considered a good outcome in terms of monetary policy. In this context, several proposals emerged arguing in favor of adopting alternative monetary targets (i.e., nominal GDP or price level) and policies (e.g., monetary finance), as well as enlarging central banks' mandates (e.g., incorporating employment, wages, inequality, and environmental objectives).

2.5.1. Nominal GDP target and price level target

An evaluation of the evolution of inflation targeting regimes is carried out by Woodford (2013). The author argues that IT regimes had the merit of increasing central bank

transparency both through their long-term objectives and through their decision-making (i.e., the path they intend to conduct policies in the future to achieve those targets). So despite being aware of the criticisms on inflation targeting, he did not consider IT regimes should be abandoned, but instead improved.

One of the improvements considered more suitable by some authors for IT regimes would be the introduction of an alternative monetary policy target, such as price level or nominal GDP⁶⁸. These targets would aim to minimize price/output deviations from a predetermined path. They would be based in concepts such as historical dependency (seek to maintain an average price level/ nominal GDP target, instead of a specific number over time) and automatic stabilizer (lower inflation/output in the past would justify actions to increase inflation and GDP in the future towards the target).

Woodford (2012) argued that the ideal target to be adopted by central banks would be an output-gap adjusted price level target. Monetary policy should reach a certain price level compatible with an output growth towards its potential level. If the output was below potential, monetary accommodation should allow for a higher price level for some time until the current output and price level were at their target. Since this ideal target would be difficult to be measured, the most feasible would be to adopt a proxy for it, the nominal GDP level. In the case of the USA, the author affirms that this target would be represented by the extrapolation of the pre-crisis nominal GDP level trend (1990-2008). Interest rates would remain low until the nominal GDP level presented “significant” growth, in order to restore the pre-crisis trend. Nominal GDP target would be reached when real GDP had reached the same level of potential GDP (i.e., the one estimated by the Congressional Budget Office - CBO)

⁶⁸ The initial proponent of a nominal GDP target was Meade (1978), then becoming more popular in the 1980s (e.g., Mc Callum, 1984; Taylor, 1985) as a candidate to succeed money targeting, because it did not share the latter's vulnerability to shifts in money demand. For the price-level target, it was originally implemented in Sweden in the interwar period (1931-1937) as an anchor for prices, since the country left the gold standard in 1931 (Berg and Jonung, 1999). In the 2000s, the idea reappeared as an alternative policy proposal (Eggertsson and Woodford, 2003), based on the Japanese experience of a prolonged period of mild deflation, even with zero interest rates.

and the cumulative inflation level since the pre-crisis was not higher than 2% per year. Therefore, the alternative nominal GDP target would have the advantage of providing a basis for short-term policy decisions that do not ignore current output levels, but remain focused on reaching a given inflation target in the medium term. In the face of very low interest rates and nominal GDPs in past periods well below the target, this alternative target would sanction a future accommodative policy that is consistent with nominal GDP returning to its previous trend, creating future expectations of stimulus, without abandoning conventional inflation objectives. In the case of the U.S., which for some time maintained a two-threshold forward guidance, it would eliminate policy ambiguity by pursuing a single variable (nominal GDP level) until FG was withdrawn. In Woodford's view, the alternative nominal GDP target would not be "abandonment", but "flexibilization" of conventional IT regimes, which would strengthen this scheme by turning central bank's commitments more explicit and the decision-making process more transparent. For authors such as Williams (2014), it would be more appropriate to effectively replace IT regimes with price level or nominal GDP target regimes, since such alternative targets could solve possible communication problems of forward guidance policies, such as misinterpretation of quantitative FG and low credibility of FG over time due to changes in central bank decision-making committees.

However, in the view of other authors, the adoption of price level/nominal GDP monetary policy targets would have several negative points. The main criticism of these alternative targets would be their time inconsistency: since they are path-dependent and require compensation for past deviations, they incorporate a larger commitment that can "tie" monetary authorities in the future. For example, IMF (2013a) states that in the case of the price level target, it may be procyclical (requiring very low inflation when an economy is already contracting, only to compensate for higher past inflation), or inflation may not be sensitive to output. In the case of the nominal GDP level target, nominal GDP and potential

GDP are often subject to revisions, and on a lagged basis. Therefore, the expectation of changes in nominal and potential GDP levels could lead to questioning these targets. In particular, the calculation of potential GDP is subject to a number of methodological controversies. Potential GDP is considered to have declined in recent times, due to factors such as demographic aging, but the intensity of this and other effects is still doubtful. This difficult measurement/uncertainty about potential output could be reflected in the nominal GDP target, which would have undesirable effects on the economy. Thus, excessive optimism in the calculation of potential GDP could lead to an increase in inflation, thereby unanchoring inflation expectations.

In the particular case of the USA, Davies *et al.* (2012) refute some arguments presented by Woodford (2012). First, these authors argue that if the optimal policy was indeed the “output-gap adjusted price level target”, post-crisis monetary policy should not recommend an expansion of monetary accommodation, since there was no deviation of the headline PCE deflator to a level below its historical trend in U.S. post-2008. Second, even if the option were made for the nominal GDP target as a linear extrapolation of the nominal GDP trend between 1990 and 2008, it would still be problematic to disregard possible revisions in potential GDP. If the 1990-2008 trend were taken into account, nominal GDP would be 14% below potential in 2012. A subsequent CBO calculation pointed out that nominal GDP would be only 6% below potential in 2012. Hence, if CBO calculation was correct and the nominal GDP target considering the 1990-2008 trend had been adopted, the Fed would have aimed an above potential output growth, which could have been reflected in very low interest rates for a period beyond recommended and higher inflation than desired.

2.5.2. Monetary finance

Although monetary finance can be considered as one type of unconventional monetary tool, it is definitely not a new measure, having been used by many governments in the past. In

the 2000s, it was mentioned by economists such as Bernanke (2003) and Buiter (2003) as an alternative way for Japan to fight its deflation problems. After the 2008 crisis, with the threat of deflation and recession over several advanced economies, other authors also started to support it as an extraordinary measure to face those threats, for instance: Wolf (2013), Galí (2014), Turner (2015) and Watt (2015).

The concept of monetary finance can be understood as a one-off increase in the monetary base by the central bank, in order to finance an expansionary fiscal policy by the Treasury (tax cut or public expenditure). There are several ways by which monetary finance can take place: i) The central bank directly credits government current account; ii) Government issues interest-bearing debt, which the central bank purchases and converts to non-interest bearing irredeemable government liabilities; iii) Government issues interest-bearing debt, which the central bank purchases and perpetually rolls over⁶⁹.

Several authors argue in favor of monetary finance technical feasibility, in the sense that it is always able to stimulate nominal demand. For authors such as Buiter (2014) and Turner (2015), the main reason would be that it does not create a future debt commitment (which could make agents save money for a future repayment, according to the Ricardian equivalence principle, so agents have a stimulus to spend), and increases government's fiscal space. For authors such as Galí (2014) and Watt (2015), the effectiveness of monetary finance does not necessarily need to rely on non-Ricardian agents. Instead, they believe that the direct expenditure allowed by the measure results in larger fiscal multipliers. In any case, for all those authors, the policy would be superior (or at least as good as) other alternatives of expansionary policies. Regarding debt-financed fiscal deficits, monetary finance would provide a similar stimulus, but without the future commitment of repayment that would exist

⁶⁹ Some authors as Turner (2015) consider that public asset purchase programs by certain central banks would be roughly similar to monetary finance, once the central bank is buying long-term bonds (e.g., BOJ - 40 year JGBs) and will continue a reinvestment policy of those securities for an extended time, even when new asset purchases come to an end. Thus, their balance sheets will remain considerably larger than the pre-2008 period, and rolling over those long-term securities for an extended time would have an effect equivalent to "perpetual bonds".

in debt-financed deficits, monetary finance stimulus would be larger. When compared to a forward guidance policy, monetary finance effects would be more certain, once forward guidance's ability to change inflation and interest rate expectations through current words/actions is uncertain. The same could be argued regarding quantitative easing policies, as QEs transmission channels sometimes are indirect and harder to quantify. Furthermore, it would be preferable than sustained negative interest rates, once keeping negative interest rates for an extended period gives room to several financial stability concerns, including excessive private leverage growth.

Nevertheless, other authors do not agree with the technical feasibility of monetary finance. For instance, Borio and Zabai (2016) argue that the analytical models used to address this issue fail to appreciate that either monetary finance results in interest rates permanently at zero (not desirable) or it is equivalent to either debt or tax-financed government deficits (having no superior performance when compared to those policies). Under these authors' view, this would happen because unless the central bank sets the interest rate permanently at zero, it would have two options to implement the desired expansion in reserves. The first would be to pay interest on reserves at the policy rate. However, this would be equivalent to debt financing from the perspective of the consolidated public sector balance sheet, as there are no interest savings. The second would be the implementation of a non-interest bearing compulsory reserve requirement by the central bank. Nevertheless, this would be equivalent to tax-financing, as private sector agents must bear the cost of those requirements. Either way, monetary finance's superior performance by providing an additional boost to aggregate demand would not be materialized.

A response to those criticisms is presented by Bernanke (2016a). This author recognizes that, with the expansion of central banks' balance sheets after 2008, they pay interests on reserves which are very close to the remuneration of public bonds, which would

turn monetary finance equivalent to debt-financing. Nonetheless, if the interest paid by the central bank on the remuneration of reserves to banks is compensated by a tax levied over banks' total liabilities (not over their reserves), the net position of banks would remain unchanged, while the cost associated with monetary finance would be lower. Hence, this measure would be technically feasible.

Even among authors that believe in the technical feasibility of monetary finance, they recognize there are many political obstacles in its implementation. Some of them are the following: i) Possibility of inflation overshooting, undermining the trust in the currency value; ii) Interference in central bank independence, if governments determine the timing and amount of money created according to their own interests, instead of central banks' technical view of what would be the adequate timing and amount to ensure the desired effects in inflation and output ; iii) Conflict of interest with governments, if the central bank pushes for a monetary finance (expansionary) policy at the same time the government is pursuing a contractionary policy (e.g., fiscal austerity)⁷⁰; iv) Legal/accounting questioning, surrounding deviation from central banks' mandate of ensuring price stability, or lack of transparency in accounting operations between the central bank and the Treasury.

Turner (2015) puts into perspective those criticisms. For instance, the case of overshooting inflation depends on how much money is created, how that money is used, the state of the economy, and whether there are appropriate institutional mechanisms to prevent excessive government money creation. However, recognizing the political risks associated with monetary finance, this author suggests the use of this policy just on very specific occasions. In particular, when governments/central banks are able to make credible commitments to adopt monetary finance only in appropriate circumstances (i.e., extraordinary cases of huge economic downturns/ deflation threats) and appropriate amounts (e.g., not

⁷⁰ This incompatibility between monetary and fiscal objectives would more likely occur in jurisdictions such as the Euro area, which has a unique central bank, but 19 fiscal authorities at national level, that may desire or be constrained by EU rules to pursue fiscal consolidation.

excessive to the point of creating inflation overshooting fears). Otherwise, the belief that this measure can be repeated again and again can undermine central bank's credibility, turning it ineffective to stimulate demand, and generating additional side effects (such as the ones mentioned in the previous paragraph). Moreover, proper governance of such policy would be only ensured with adequate coordination between the central bank and the government. The first would be in charge of defining the right timing and amount of money to be issued, according to the expected economic impacts in inflation and output. The second would be responsible for deciding the adequate destination of resources within sectors and agents. This coordination would ensure central bank independence and transparency /accountability in its relationship with the government.

2.5.3. Broader mandates for central banks and unconventional monetary policies

The notion of “achieving price stability” as the single mandate to be pursued by central banks was forged at 1979, when Fed Chairman Paul Volcker started a considerable tightening of monetary policy to contain inflation pressures at that time. It was locked-in during the period 1990s-2007, when the Inflation Targeting framework was deemed one of the main tools to achieve price (and therefore macroeconomic) stability. After the 2008 global financial crisis, it became a consensus that central banks' mandates could not rely exclusively on achieving price stability, in order to ensure a stable macroeconomic environment. Therefore, a financial stability mandate was also incorporated, with regulatory/supervisory/micro and macro prudential tools in order to oversee systemic risks and shield the economy against future crises. If in certain countries financial stability was not directly incorporated into central banks' mandates, the powers of separate regulatory/supervisory authorities previously in charge of those issues were strengthened, and central banks of those jurisdictions increased their coordination with them. Nevertheless, the

slow recovery in economic growth/employment levels, low wages, rising inequality, and environmental problems, increased the calls for central banks to extend their mandates to also act on those other areas.

In terms of the role of employment in central banks' mandates, after the inflationary episodes in the 1970s, it has lost importance in most monetary authorities in the world⁷¹, giving room to money supply targets in the 1980s and inflation targets since the 1990s. After the 2008 crisis, the limits of inflation targeting regimes increased the call for changes in its framework, introducing alternative goals, such as the nominal GDP or price level, as discussed in subsection 2.5.1. Some claimed it was necessary to bring back unemployment as a more explicit element in central banks' reaction function (as the USA and the UK did with their Quantitative Forward Guidance experiences between 2012 and 2014). Others went beyond, in favor of including not only inflation and unemployment on central banks interest rate rules, but also real wage growth, at the same pace as trend productivity growth (Palley, 2017; Seccareccia and Lavoie, 2017). The weights of these objectives could change over time, according to long-term priorities. These authors argue that the inclusion of the real wage in central banks' reaction function would be an important step in tackling inequality issues, answering criticisms that central banks' actions are not distributionally-neutral and this should be taken into account in their decisions.

Other authors and institutions are in favor of widening central banks' existing mandates to act on those other issues (employment/wages/inequality/environment) by adopting unconventional monetary policies.

⁷¹ The Fed has adopted a "dual mandate" with the Federal Reserve Act in November 1977, with "maximum employment" as the first goal, and then the goals of stable prices and moderate long-term interest rates. Yet, the autonomy the institution has to pursue these goals has allowed it to conduct a strong monetary policy tightening at the admission of Paul Volcker as Fed Chairman in 1979, showing a clear priority of inflation rather than unemployment rate at that time. Still today, the "dual mandate" receives several criticisms. Certain analysts say the unemployment target should be dropped, because on some occasions it leads to ambiguity (since inflation and unemployment could send opposite signs of tightening and expansion to Fed's reaction function). Others say the unemployment target as it is measured is insufficient, because headline unemployment numbers do not capture other major problems in labor market, such as an increase in long-term unemployment and precariousness.

One example of UMP that was already deployed with that intent was *targeted liquidity provision* for banks to extend credit towards the real economy (non-financial firms/households, except for house purchases), which was the case of Euro area (ECB's Targeted Long Term Refinancing Operations- TLTROs) and UK (BOE's Funding for Lending Scheme-FLS). They actually fostered a modest recovery in credit in those jurisdictions. However, some critics argued banks also found ways not to channel resources to the real economy, but to other purposes (e.g., refinance debts at better terms, speculative purposes).

A second example of UMP under consideration would be *central bank asset purchases*. On the one hand, public bond purchases (especially those from supranational authorities, such as the European Investment Bank - EIB) could fund public investments in “strategic” areas, such as infrastructure, education, research, innovation, “decent job” creation and environmental purposes. Public bond purchases would also have an indirect transmission effect to private agents, by easing borrowing constraints and lowering spreads (in particular for agents most affected during the 2008 crisis, such as SMEs and highly-indebted households). On the other hand, private bond purchases would have a direct transmission effect to these agents, allowing companies to use those funds in several of the “strategic” areas mentioned before.

Corporate bond purchase programs were adopted in UK, Japan, and Euro area. Among those jurisdictions, the biggest program in size was Euro area's Corporate Sector Purchase Program (CSPP). When defending its implementation, the ECB claimed it eased firms' financial constraints and allowed them to increase real investments and job creation. For the sake of market neutrality and to avoid distortions in bond markets, the ECB tried to keep its purchases as close as possible to investment-grade corporate bonds availability in markets, in terms of countries, industry sector and risk rating. However, its critics argue that with CSPP,

corporations were actually increasing the accumulation of financial/speculative assets, instead of making real investments and creating jobs. Moreover, the “market neutrality” principle followed by the ECB would not be desirable, because maintaining the status-quo did not give support to countries and sectors which most needed it. For instance, in environmental terms, big high polluting companies (e.g., fossil fuel, nuclear) received more funds than truly green companies (i.e., renewable energies). CSPP defenders as De Santis *et al.* (2018b) argue that the ECB has bought a significant share (20%) of ECB-eligible green corporate bond universe, although those purchases have been highly skewed (94%) towards carbon-intensive industries (which are issuing green bonds to try to reduce their carbon footprint and improve their image). Critics argue that, since climate/ecological risks may have direct and indirect impacts on macroeconomic and financial stability conditions, they do need to make part of the agenda of monetary/financial supervision authorities in more direct and transparent ways. Among the various proposals that emerge on this direction, some of the most mentioned are: i) Implement a “Green QE”, with a specific share of central bank bond purchases destined towards environmentally friendly projects. This “Green QE” could comprise bonds issued by corporations in ecologically certified projects (to avoid “greenwashing” activities) and by development banks, as suggested by Anderson (2015) and Campiglio *et al.* (2017); ii) Accepting corporate green bonds as collateral for central bank loans, as mentioned by authors such as Aglietta and Espagne (2015); iii) Designing macroprudential regulation to foster the transition to a low carbon economy, with differentiation of capital requirements for loans (green-supporting factor and brown penalizing factor, also properly calibrated according to financial stability concerns), as proposed by the European Commission (2018).

A third example of UMP under consideration would be *helicopter money*. The expression was coined by Friedman (1969), to convey the image of a one-off currency issuance by the central bank that would be distributed to agents, increasing their nominal

purchasing power in the form of an addition to their money balances. Nowadays it is a proposal under discussion, being supported by several economists (e.g., Blyth and Lonergan, 2014; Van Lerven, 2015; Keen, 2016) and civil society movements (i.e., the European “Quantitative Easing for People”). More specifically, they argue in favor of a “citizen’s dividend” payment, with direct cash transfers from central banks to individuals’ bank accounts, not using the Treasury as a vehicle (therefore not identical to monetary finance)⁷². In operational terms, direct transfers from central banks to individuals would be easier in case of the creation of central bank digital currencies⁷³.

The background of the “citizen’s dividend” proposal is the view that the ones that benefited most from unconventional monetary policies implemented so far were financial asset holders, because the rise in financial asset prices promoted by UMPs increased their wealth considerably, while the rest of the population kept struggling with low wages and precarious labor market conditions. In this sense, their supporters argue that a UMP based on a “citizen’s dividend” would be preferable to tackle those inequality issues, once it would distribute income equally across agents. In addition, it would stimulate consumption and investment more than a debt-financed expansionary policy, as the direct increase in agents’ purchasing power would not be attached to a commitment to be paid back in the future. Nonetheless, the political feasibility of a “citizen’s dividend” proposal has been highly disputed. Beyond some criticisms already mentioned to monetary finance policies, this

⁷² The concept of helicopter money is sometimes confused with other policy proposals which have a distinct nature: Universal Basic Income and Sovereign Money System. Universal Basic Income involves fiscal money transfers to individuals on a permanent basis, with a wide set of objectives (i.e., workers’ emancipation, poverty alleviation, income redistribution). This differs from helicopter money, which would be a punctual (one-off) initiative with a more narrow purpose (increase purchasing power and aggregate demand during a crisis). In a Sovereign Money System, the central bank would be the only agent in the economy responsible for money creation (single monetary circuit). This would be achieved by removing current accounts from banks’ balance sheets, and placing them onto central banks’ balance sheets (transactions accounts). Those accounts would be owned by citizens, but banks would still continue playing administrative services. However, loans would merely transfer money around the system, with no new money or purchasing power created when loans are made (Van Lerven, 2017). The main objective of this measure would be to control excessive credit growth and indebtedness. Conversely, in the “helicopter money” proposal, instead of a single monetary circuit, we would still have the usual split monetary circuit (based on a mix of money supply of deposits and reserves), where banks can proactively create money.

⁷³ The issues related to the creation of central bank digital currencies are discussed in subsection 5.9.

proposal also received other criticisms, such as: i) Individuals might not spend the income earned, or spend it with “non-productive”/speculative assets; ii) Disincentive to work, if individuals expect that the measure can be repeated over time; iii) Individuals might not receive the money if they do not have proper access to financial services (e.g., bank accounts), weakening the equanimity of income distribution effects generated by the measure; iv) Temporary nature would not allow a durable recovery in investment, which is required for a sustained growth in the medium-term.

Overall, despite the movements in favor of extending central banks’ mandates to include other targets than just inflation, all those criticisms mentioned before and political/legal constraints have so far impeded that most of those proposals came into reality, with the exception of targeted liquidity provision operations fostering credit to the real economy.

2.6. Conclusions

This chapter intended to discuss the historical background and the main conceptual issues related to unconventional monetary policies implemented by major central banks. First, we have noted that the current understanding of “conventional” monetary policies (setting short-term interest rates to control inflation) refers to a relatively recent period between the 1990s and 2007. By reporting several historical experiences of the BOE, Fed, and BOJ, we have observed that policies which after the 2008 crisis were considered to be “unconventional” (i.e., broad liquidity provision operations, asset purchase programs, yield curve controls) were not new. Even if in some of those past experiences (e.g., BOE as lender of last resort in 1825, Fed asset purchases in 1932), central banks took a considerable time to act, they ended up intervening to avoid a broader deterioration of financial and macroeconomic conditions. Moreover, in the case of yield caps on bonds adopted by the BOE and the Fed in the 1940s/1950s, those policies were not considered as “extraordinary” measures in order to face

acute financial distress. Conversely, they were part of the central bank toolkit at that time (to control long-term interest rates and the rise of public debts after World War II) and were implemented for some years. Therefore, while the measures that today are known as “unconventional” were already adopted in the past to deal with difficult situations in the financial system and the macroeconomic scenario, some of them were not considered as “extraordinary” alternatives to be implemented in a huge financial crisis, but as measures of the monetary framework prevailing at that time, as shown by the yield caps on bonds in the 1940s-1950s.

Furthermore, with the extensive liquidity provided by UMPs, central banks had to adjust their monetary policy operational framework (from a “corridor” system to a “floor” system) and the interest rates used as a reference to steer short-term interbank markets (from the target/refinancing rate to the interest on reserves/deposit rate). UMPs would essentially have two objectives: (i) Restore the proper functioning of financial markets and their intermediation mechanisms; ii) Introduce additional monetary stimulus, once conventional channels were limited. To this end, they would operate through different measures: credit policies (for the first objective), and quasi-debt management policies, forward guidance, exchange rate ceilings, negative interest rates (for the second objective).

The idea is the first objective has been reasonably met, as credit policies (liquidity provision and private asset purchase programs) had an initial positive effect of preventing a widespread collapse of financial markets. However, financial intermediation regular operations and the transmission of falling yields to the private sector occurred at different times depending on the location, starting in the U.S., then in the UK and Euro area core countries. In Japan, yields have not changed much, and in Euro area periphery, financial fragmentation has remained quite high until 2012, only starting to improve more broadly since the beginning of 2015. Not surprisingly, accommodative measures remained in place in

Japan and Euro area (even if ECB net asset purchases ended in December 2018). In the UK, monetary stimulus measures were reintroduced between August 2016 and January 2017, after the uncertainty scenario following the referendum vote in favor of Brexit.

As for the second objective, the evidence is that in forward guidance programs and public asset purchase programs, the main transmission channel of UMPs has been signaling, with the portfolio rebalancing channel also playing a relevant role in some asset purchase programs (e.g., in USA LSAP 1 – LSAP 3, mainly through the scarcity mechanism, and in Operation Twist notably through the duration mechanism).

We examined in more detail the case of nominal negative interest rate policies, unconventional measure not implemented in large scale before the 2008 crisis. Regarding the theoretical analysis, despite the arguments supporting the implementation of NIRPs originally came from mainstream authors (Monetarists and some New Keynesians), their adverse effects have been clearly pointed out not only by heterodox authors (Post-Keynesians), but also by other authors coming from the mainstream (group of New Keynesians and Neo-Fisherians), recognizing the flaws of views such as exogenous money and QTM. In practical terms, we have observed that while NIRPs positive effects were usually small and temporary, these policies have brought additional macroeconomic and financial stability challenges for the jurisdictions they were implemented. Hence, instead of insisting on the implementation of NIRPs, we argued that an active fiscal policy would be one of the main pillars for a strategy towards sustained economic growth in those jurisdictions. However, due to fiscal policies' legal/ political constraints in most jurisdictions where NIRPs were implemented, we argued for a complementary/ alternative role of macroprudential measures/targeted liquidity operations and initiatives to improve debt restructuring/insolvency frameworks in these countries. We believe such policy mix would enhance credit supply/demand conditions and promote a more sustained economic growth in jurisdictions that adopted NIRPs, as well as

lower financial stability concerns for foreign economies eventually affected by negative interest rate spillovers.

Regarding the effects of UMPs on financial variables, the evidence is that UMPs supported financial asset prices in general. In the case of sovereign bond yields, they usually promoted a reduction in their levels, with larger impacts in initial announcements, or announcements with a greater degree of “surprise” on markets. In terms of UMPs effects on macroeconomic variables, the evidence is that the impacts on GDP were of higher magnitude than on inflation, although the effects on inflation usually lasted for a period longer than GDP. However, the effects of these programs would tend to decrease in time, which would require that authorities proceed with modifications in their scale and scope, so that they would continue to be effective should it be necessary to keep them. Maintaining these programs for a very long time would also create a number of risks, especially for financial stability. On UMPs distributional effects, the evidence is mixed, depending on the UMP being analyzed, the distributional channels in place, the economic structure of the country under consideration and the income and balance sheet profile of individuals. Unconventional monetary policies also had significant effects on international terms by stimulating strong capital flows to other economies, usually towards emerging countries. In general terms, the evidence is that these economies had temporary benefits with liquidity inflows, but in some places, excessive inflows generated imbalances in foreign exchange, credit, and asset markets. Taking into account the potential imbalances generated by UMPs in the countries of origin and foreign jurisdictions affected by their negative spillovers, there is a need for continuous improvement of regulatory frameworks. This improvement would apply both for financial and non-financial agents, on a coordinated basis between monetary, fiscal and financial supervision authorities, at a national and international level. It would allow that those imbalances were properly addressed, so that economies would be better prepared to face future crises.

Due to the supposed inadequacy of the inflation targeting regime to respond to the 2008 crisis, some authors have proposed the implementation of other measures beyond UMPs already implemented, such as alternative monetary targets (nominal GDP or price level) and policies (monetary finance), as well as enlarging central banks' mandates (incorporating employment, wages, inequality and environmental objectives). Regarding nominal GDP and price level targeting, due to the lack of consensus on their effectiveness (e.g., nominal GDP is subject to frequent revisions, price-level target may be procyclical), such targets have not been implemented in post-2008 frameworks. In the case of the proposals of monetary finance or enlargement in central banks' mandates, their supporters presented numerous arguments defending them in theoretical terms. However, those proposals face several challenges in practical terms, and strong political dissent, which turn their implementation very difficult in most jurisdictions.

Appendix 2.1 - Liquidity Trap and Debt Deflation

The original concept of Liquidity Trap (LT) was originally enunciated by Keynes (1936) in Chapters 15 and 17 of the *General Theory of Employment, Interest and Money*. Although he has not used the term “liquidity trap”, he explained how its mechanism worked based on his Liquidity Preference Theory: in periods of great economic uncertainty, when agents’ liquidity preference increased significantly, they desired to hold only risk-free assets. This behavior would occur even if interest rates were taken to a level below the one considered to be “safe”, according to agents’ convention. Below this point, the monetary authority would have lost control of determining the interest rate, in a sense that liquidity preference had become absolute, and agents would desire to retain only money.

Keynes “exit plan” to a LT required: i) The purchase of inventories (lower excess stocks) to reduce excess capacity; ii) A low and positive short-term interest rate, on a level considered by agents as “safe”, with the central bank also intervening in bond markets to stabilize long-term yields if necessary. This yield curve control would reduce uncertainty/volatility in the monetary policy path, and allow an increase in the present value of capital assets’ expected income; iii) Most importantly, the action of government through fiscal policy, with autonomous government spending reactivating investment and also acting on private agents’ animal spirits, generating positive effects on the recovery of consumption/investment.

Authors of the Neoclassical Synthesis, among who Leijonhufvud (1967) took the Liquidity Trap concept to the IS-LM model within the context of “elasticity pessimism”. In LT situations, the IS curve would present a low interest elasticity of investment, assuming a vertical direction. The LM curve would present an infinite interest elasticity of money demand (currency and bonds would be perfect substitutes), assuming a horizontal direction. In those occasions, the IS-LM diagram composed the “Keynesian Cross”, in which monetary

policy would be ineffective: any additional quantity of currency injected by the monetary authority would be absorbed into economic agents' portfolios as inactive balances (speculative demand), rather than active (transactional demand) resources. In those cases, only an expansionary fiscal policy would have an effect on income and output levels.

Initial criticisms of the LT hypothesis were made by both Neoclassical Synthesis and Monetarist economists. Neoclassical Synthesis economists, such as Pigou (1943), argued that the deflationary situation that was usually associated to LT situations was translated into an increase in agents' real income, a "wealth effect" that was also known as "Pigou effect". This effect implied a shift to the right of the IS curve, which would be enough to start an economic recovery. Later, monetarists like Friedman (1956) argued that liquidity preference would never become absolute. Therefore, monetary policy would be able to maintain its effectiveness in the short term if certain measures were adopted: setting a higher target for the monetary base growth rate, or diversifying the securities acquired by the monetary authority in its open market operations, favoring long-term assets.

The LT debate reignited in the 1990s with the prolonged stagnation of the Japanese economy ("lost decade"). The modern version of LTs was analyzed by Neoclassical and New Keynesian authors based on DSGE models. Thus, while in the traditional version LT emerged within a context of uncertainty, in the modern version it came from a negative shock on a system of equations in equilibrium. As a general rule, this shock occurs on the dynamic aggregate demand equation derived from the optimizing behavior of a representative agent, which has rational expectations. A situation of LT is represented as a consequence of a negative shock on this equation, which is used as a proxy for complex situations such as acute crises that would result in a decrease in nominal interest rates to near zero levels and a negative output gap. While for neoclassical authors monetary policy would be ineffective and neutral over real variables even in the short term, for New Keynesians monetary policy would

have short-term effects due to market imperfections such as transaction costs, asymmetric information, and price rigidity.

In the 1990s, one of the key New Keynesian contributions to the debate on LT came from Krugman (1998). According to him, expansionary monetary policies perceived as temporary by agents have serious credibility problems, which would lead to a reduced impact in output. This credibility problem would occur because a temporary monetary expansion would tend to be reversed in the future, since it would be incompatible with price level stability in the long term. Therefore, agents would believe that central banks would stop monetary expansion before it was promised to control inflation when it increased, which would lead to an increase in current savings and a decrease in output, removing the effectiveness of this type of measure. In this context, Krugman pointed out as a solution to the exit from LT in Japan the adoption of a “permanent” monetary policy (a positive inflation target), which would allow the country to reach a negative real interest rate, fostering consumption and investment.

Other New Keynesian authors who appeared in the discussion about liquidity traps were Auerbach and Obstfeld (2005). These authors claimed that, in situations of LT, central bank purchases of public securities in the open market could be an effective strategy for macroeconomic stabilization, not only in monetary but also in fiscal terms, provided that some conditions were fulfilled. According to these authors, to be efficient, open market purchases should present the following prerequisites: i) Long-term interest rates should be positive over some time horizon; (ii) Central banks should incur in permanent increases in the monetary base level. Thus, with agents perceiving the monetary expansion as permanent, price levels would be positively affected and, in the presence of price rigidity, output levels would also be affected, which would turn open market purchases an efficient monetary policy. In addition, by signaling a positive nominal interest rate in the future and buying

bonds in the present, central banks would be reducing the future cost of debt service, and it would not be necessary to impose distortionary tax increases in the future. In this way, public bond purchases in the open market in LT would also be an efficient fiscal strategy. Finally, according to the authors, in the case of Japan, low inflation expectations would already be rooted in the country. In this way, it was necessary that the country adopted a price level target to overcome the “deflationary mentality” then in force. In parallel, it would be crucial that the BOJ developed a good communication strategy to increase its credibility, and that those policies were implemented in a consistent way.

The view that monetary policies could have a role to exit from a LT, provided they were implemented correctly, came to be defended not only by New Keynesian authors but also by Post-Keynesians. Those latter intended to differentiate themselves from Neoclassical Synthesis’ authors. Post-Keynesians argued that, beyond the essential role played by fiscal policies, adequate monetary policies could also help to remove the economy from a LT situation. According to Bibow (2006), a liquidity trap would occur when, for any interest rate (i.e., without a previously determined “low level”), monetary supply policies would be blocked by the expectations channel. This blocking effect would occur because, in an uncertainty environment, there would be a change in agents’ convention, which would expect higher long-term interest rates in the future, and therefore would prefer to retain currency in the present. One of the strategies to help to revert this situation would be a monetary policy which included a commitment to keep interest rates low for a long time in the future. This commitment would guide market expectations around a new interest rate convention, so that liquidity would be directed back to the real economy instead of being stored. In this sense, an appropriate and transparent communication strategy by central banks would also be important to ensure the credibility and effectiveness of monetary policy.

Like the notion of liquidity trap, the concept of “debt deflation” also appeared in the 1930s as an additional explanation for the adverse economic outcomes in the aftermath of the 1929 crisis that led to the Great Depression. The debt deflation concept gained notoriety with Irving Fisher (1933). According to this author, under a state of over-indebtedness, an eventual adverse event could trigger a disorderly process of debt liquidation. This debt liquidation would take to a “fire sale” of assets, pushing down prices. Lower prices would lead to losses and bankruptcies in firms, with a contraction in output and employment. The pessimistic environment would lead agents to reduce even more their spending levels (investment/consumption) and hoard money. Furthermore, lower prices would push an increase in real interest rates. All those factors combined would trigger a spiral of lower prices and higher debt burdens.

The concept of debt deflation has been influential both in mainstream (“credit crunch” - Bernanke, 1983) and heterodox literature (“Financial Instability Hypothesis” - Minsky, 1978) to explain the adverse consequences of the burst of debt bubbles. It has also been applied to explain the prolonged Japanese deflation since the 1990s. The prolonged nature of the deflationary episode in Japan led several authors (e.g., Ito and Mishkin, 2006) to describe the country situation as a “deflation trap”.

With the 2008 global financial crisis, several advanced economies were faced with stagnant output, very low inflation and near-zero interest rates. In this scenario, the debate on liquidity traps and deflation traps gained renewed force.

According to Licha (2015), in situations of deflation trap, the Taylor principle would not be valid. It means that deviations from the nominal interest rate would be smaller than deviations from inflation, which would imply a change in real interest rate in the opposite direction desired by the monetary authority (e.g., in a situation of deflation, even with a reduction in nominal interest rates, we would have lower inflation and higher interest rates).

So under very low interest rates, the use of a Taylor rule by central banks would generate the existence of multiple equilibria, and the equilibrium in deflation traps would be unstable because the Taylor principle is invalid under such circumstances. In addition, in situations of increased risk perception, financial intermediaries only demand risk-free assets, in a situation similar to a liquidity trap. As a result, financial intermediaries would drastically reduce their leverage ratios, creating a strong constraint on credit supply. With those restrictions, conventional monetary policy channels would be limited.

Thus, after the 2008 crisis, the discussion about the role to be played by monetary policies gained in importance. They could no longer be limited to “conventional” actions (e.g., reducing short-term interest rates), but also incorporate other “unconventional” strategies, in order to increase agents’ inflation expectations and avoid a prolonged depression/stagnation of economic output.

Chapter 3. Unconventional Monetary Policies in Advanced Economies:

The Euro Area Experience

3.1. Background: Banking and Sovereign Crisis

The use of unconventional monetary policies in the Euro area began in 2008, in the aftermath of the international financial crisis, with its epicenter in the United States and global implications. After the collapse of Lehman Brothers in September 2008, the world's leading central banks, including the ECB, enacted initiatives to avoid a more severe spread of the crisis to the financial sector and the real economy. In this regard, they took not only conventional measures (e.g., rapid and significant reduction of interest rates), but also a series of unconventional measures, such as extensive liquidity provision operations and foreign exchange swap agreements to ensure the liquidity needs of banks in foreign currency, according to Lane (2012). European banks also had significant exposures in the U.S. subprime market. In this sense, the action of central banks in 2008 has helped to contain panic and avoid a massive failure of banks.

However, the worsening of the crisis in the Euro area in 2009 showed that the situation was not just an “external shock” originated in the USA, but a crisis with roots deeply inserted into the monetary union. Indeed, since the adoption of the euro as the single currency in 1999, it was hoped that the monetary union would promote an improvement of the economic and financial integration and, coupled by the output expansion that occurred in the 2000s, would help Euro area's less developed countries (*periphery*, namely: Greece, Ireland, Portugal, Spain, Italy, Cyprus) in a movement towards convergence with the development level achieved by Euro area's *core* countries (namely: Germany, France, Netherlands, Austria,

Finland, Luxembourg, Belgium)⁷⁴. Nevertheless, what actually happened was an increase in the area's economic asymmetries.

We find in the literature several views which aim to explain the Euro area crisis⁷⁵. In this chapter, we discuss two widely accepted views: the Balance of Payments (BoP) and the Monetary Sovereignty.

The BoP view is supported by authors from various economic strands, from mainstream (Sinn and Wollmershäuser, 2012) to Post-Keynesian authors, such as Cesaratto (2015). Under this view, since the creation of the euro, current account imbalances that existed within the region started to widen significantly. During the 2000s decade, core countries increased manufacturing and capital goods' exports, while the periphery expanded the supply of basic goods, services and construction sectors. This fact implied that Germany, Netherlands, Austria, Finland, and Luxembourg widened their current account surpluses, while other countries increased their current account deficits, especially in the periphery.

According to the BoP view, one of the roots to these current account imbalances would be cost divergences between core and periphery countries. On the one hand, mainstream authors who support this view put more emphasis on the periphery side, where wages have grown above productivity, fostering an increase in imports. On the other hand, Post-Keynesian authors who support this view highlight more the policies that led to cost compressions in core countries (notably in Germany), fostering an increase in exports. First, unit labor costs grew much less in Germany than in the periphery. Net real wages barely grew in Germany in the 2000s, and actually fell in some years, between 2004 and 2008 (Brenke,

⁷⁴ We use this core/periphery division of countries in this text because it is common in the literature and useful to explain Euro area's asymmetries. However, we acknowledge that this division is subject to criticisms. For instance, in terms of GDP size, Italy and Spain are the third and fourth largest countries of the Euro area, and hence cannot be considered "at the margin" of the Euro area.

⁷⁵ Other interpretations for the origins of the Euro area crisis would be: i) High public spending/wage growth in periphery states - fiscal profligacy view; ii) European monetary union's arrangements serve exclusively German's capital purpose, and disregard other countries - Marxian view; iii) A monetary union would lead to an endogenous mechanism of economic activity regional specialization, increasing income divergence between regions within the monetary union – Krugman (1993) view. We do not develop those interpretations in the text, but some of their ideas are also embedded in the two main views we present.

2009). The reasons behind this would be the relative loss of bargaining power from labor unions (mainly in industry) and labor market reforms implemented in 2002 and 2008, which increased labor market flexibility and reduced employees' benefits. In addition, taxes were shifted away enterprises towards individuals. These facts allowed Germany to increase manufacturing production and exports, keeping lower levels of domestic consumption and imports. Within the monetary union, in the absence of a mechanism to adjust the exchange rate, while Germany could improve its surplus, periphery countries remained dependent of basic goods exports and capital goods imports, increasing their current account deficit.

So an important component of the BoP view was the lack of an exchange rate mechanism to adjust current account imbalances, which would put periphery countries in a position close to emerging countries under fixed exchange rates, subject to convertibility risks and a sudden stop once a crisis of confidence hit those countries. According to Cesaratto (2015), the existence of the Target 2 payment system (allowing that cross-border claims and liabilities from national central banks vis-à-vis the ECB increased substantially) could delay, but not stop such movements.

Another essential element which would have allowed the rise of these current account imbalances was the fact that current account deficits in the periphery were financed by huge capital flows from core countries, notably during the 2000-2008 period. Those flows have been fostered by the abundance of liquidity, and low sovereign and corporate bond spreads from periphery to core countries. The easy financial conditions allowed that banks in the core lent money to banks in the periphery, which in turn lent money domestically cheaply to firms and households. Credit expansion was accelerated in the periphery in the 2000s, especially in the housing/real estate sector of countries like Spain and Ireland. Thus, according to the BoP view, the structure of an asymmetric monetary union in a fixed exchange rate regime would have led to over-indebtedness and moral hazard in periphery countries.

After the 2008 financial shock in USA, due to the liquidity scarcity, banks in the core interrupted their flows to the periphery and claimed their loans there. Then, banks in the periphery claimed their loans to enterprises and households. This provoked a sharp rise in non-performing loans/default rates and fire sales of assets. At this point, the banking crisis affected severely private agents and impacted directly the real economy.

Those imbalances in the banking system and the private sector were transferred to periphery's public sector through the fiscal channel. Since the 2000s, some periphery countries (Greece, Portugal) already had primary fiscal deficits, once a significant share of their economic growth counted on public expenditure. After 2009, the abrupt drop in income, the growth in expenditure needs to rescue banks/firms in difficulty and pay unemployment benefits forced fiscal deficits to rise quickly in the whole periphery. At the same time, public debt, which until then was relatively manageable in most of these countries (except for Greece, which at that time was 120% of GDP), increased rapidly. This rise in public debt made sovereign yield curves steepen considerably in the periphery. At that time, mechanisms for the mutualization of risks within the monetary union were temporary or insufficient. Then, each national government had to bail out numerous domestic banks and private agents. This fact actually turned a banking crisis into a sovereign debt crisis in each country. To make matters worse, since 2010 the sovereign crisis assumed nature of "contagion": high public bond yields in a single periphery country began to transmit to other periphery countries, perceived by the market as facing similar macroeconomic problems.

This event began with Greece, which disclosed a record fiscal deficit in late 2009, starting a process that led to the announcement of three rescue programs: € 110 billion in May 2010, € 130 billion in February 2012, and € 86 billion in August 2015, totaling € 326 billion. Rescue packages by the Troika (ECB, European Commission, IMF) were also announced for Ireland (€ 85 billion in November 2010) and Portugal (€ 78 billion in May 2011), and later for

Spain (availability of up to € 100 billion for banks in June 2012, of which € 41 billion were used in recapitalization) and Cyprus (€ 10 billion in March 2013).

Conversely, the Monetary Sovereignty view of the crisis does not put weight on cost differentials and current account imbalances like the BoP view. Instead, it links the origins of the crisis with the following arguments: i) The divorce between Euro area's monetary and fiscal authorities: the lack of a Euro area central fiscal authority limited the ECB to have a true role as Euro area lender of last resort (De Grauwe, 2013; Arestis, 2015); ii) The role of the Target 2 system, which when properly backed by a supranational fiscal authority and a central bank capable to act as a Euro area lender of last resort, would ensure the role of the euro as a unique currency in a single monetary regime, avoiding convertibility risks that exist in fixed exchange rate regimes (Lavoie, 2015); (iii) Financialization or money manager capitalism, which shifts the origin of the crisis to a transformation of the capitalist system, where finances play an increasingly relevant role, at the expense of the real economy (Hein, 2013; Wray, 2015).

Our point is that the Euro area crisis emerged from an export-driven and debt-driven growth model, which resulted in a rapid increase in private current account imbalances and debt ratios. So it had origins in factors explained both by the BoP view and Monetary Sovereignty view, but with more emphasis on the latter, following authors such as Stockhammer *et al.* (2016). While current account imbalances and intra-Euro area capital flows are significant aspects for understanding how financial fragilities built up within the Euro area, one of the key factors to understand how imbalances transformed into a sovereign debt and banking crisis is the policy framework design, which split Euro area's monetary and fiscal spaces, and did not provide adequate financial regulatory mechanisms. With those limits in the policy framework, any serious financial crisis could lead to a deep recession, even if it was not preceded by current account imbalances. On the other hand, if the

constraints on the policy framework and to implement stabilizing/regulatory measures did not exist, current account imbalances could not necessarily lead to a crisis.

Having presented the basic features of Euro area's banking and sovereign debt crisis, the following sections analyze monetary policy actions taken by the ECB after 2008, observing to what extent they were able to contain the crisis and influence the economic performance of Euro area countries as a whole in the period. Section 3.2 discusses conventional and unconventional measures taken between 2008 and 2014, before the implementation of Asset Purchase Programs (APPs). Section 3.3 focus on the programs implemented from September 2014 onwards (APPs/TLTROs) - and the evolution of Euro area main economic indicators (credit, exchange rate, output, inflation, labor market/wages, sovereign yields) during their implementation. Section 3.4 presents a literature review of the effects of ECB's unconventional policies on economic indicators, focusing on output, inflation and bond yields. Section 3.5 describes our own analysis of Euro area's sovereign and private yield curves levels and differentials, taking into account ECB's asset purchase programs announced/implemented from 2009 onwards. Section 3.6 presents the main conclusions of the chapter with an overall analysis of monetary measures implemented so far, showing their positive aspects, risks, and policy alternatives in other sectors (fiscal, industrial, institutional, financial) that would also be important to ensure a sustained growth path in the Euro area in the medium/long term.

3.2. Pre-Asset Purchase Programs

Before discussing ECB's unconventional programs in the post-2008 period, we present a brief overview of the evolution of ECB's official interest rates (main refinancing rate, also known as "refi", and deposit rate) during the period.

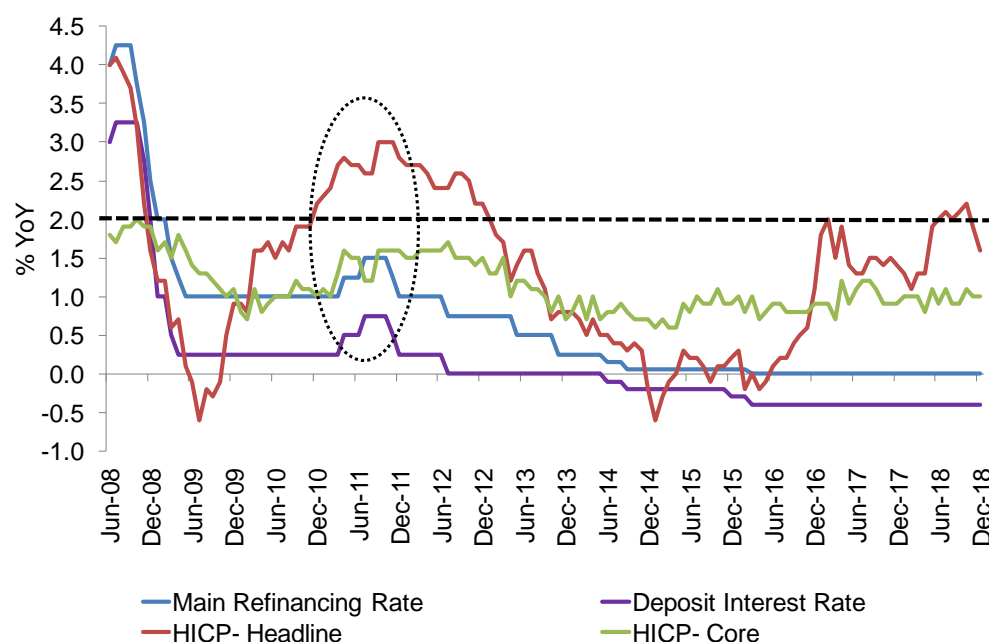
3.2.1. Official Interest Rates (Main Refinancing/Deposit)

Regarding the main refinancing interest rate, with the adverse events of the financial crisis in the USA in 2008, and the perception by the ECB that it had the features of a global systemic crisis⁷⁶, the ECB promoted a rapid reduction of this rate, from 4.25% in September 2008 to 1.0% in May 2009, 325 basis points (bps) on total. This rate has remained at that level until April 2011, when it rose 25 bps, and increased again by 25 bps to 1.5% in July 2011. ECB's Governing Council President at that time was Jean Claude Trichet. He justified the rate hikes based on two reasons: (i) To control inflation expectations' acceleration (headline inflation was at that time 2.6% YoY, above ECB's objective); (ii) To avoid forming new "asset bubbles", due to the accommodative liquidity conditions since the end of 2008. Those rate hikes were criticized by many people, as the increase in headline inflation was caused by temporary factors (such as high international commodity price levels), but core inflation remained under control (around 1.6%, as it can be seen inside the dotted part of graph 3-1).

Critics (as Nechio, 2011) argued that those rate hikes brought further restrictions to the then difficult economic environment of fiscal austerity and tight financial conditions in the monetary union, and had negative spillovers from smaller periphery countries (Greece, Ireland, Portugal) to larger nations (such as Spain and Italy). Hence, there would be no funds available to rescue all those countries together. In fact, with higher interest rates and the worsening of the sovereign crisis, the Euro area experienced sharp financial volatility during the second half of 2011.

⁷⁶ In fact, the ECB raised the main refinancing rate on July 3, 2008, by 25 bps, from 4% to 4.25%. The main justification for this decision by the ECB Board was the high level of headline HICP (4.1% YoY at that time), due to energy and food price pressures, even if the core number was below 2% YoY (1.8%). The ECB was aware of the uncertainties in the financial sector and the downside risks to growth, but considered maintaining price stability its primary objective, as stated in the Press Conference of that meeting ("*the absence thus far of significant constraints on bank loan supply in a context of ongoing financial market tensions confirm our assessment of upside risks to price stability over the medium term. At the same time, while the latest data confirm the expected weakening of real GDP growth in mid-2008 after exceptionally strong growth in the first quarter, the economic fundamentals of the euro area are sound*"). Hence, the awareness of a systemic crisis with global implications for the financial system and real economy became clear just some months later, with Lehman Brothers bankruptcy in USA in September 2008.

Graph 3-1 Euro area - Interest Rates (Main Refinancing/ Deposit) and HICP (Headline/Core, % YoY)



Note: Euro area core inflation excludes energy, food, alcohol, and tobacco. Source: Author own elaboration, based on Eurostat data.

However, it was just in November 2011 (when Mario Draghi assumed as the new President of ECB Governing Council) that rates began to change their course. The main refinancing rate was reduced in November (-25 bps) and December 2011 (-25 bps), to 1.0%. Since then, it was observed a downward trend, with 100 bps rate cuts until the historic low of 0% in March 2016.

When it comes to the deposit interest rate, it has broadly followed the course of increases/reductions of the main refinancing rate, although the main refinancing rate did not reach the negative territory as the deposit rate did. Between October 2008 and April 2009, the deposit rate has fallen from 3.25% to 0.25%. It was then raised in April 2011 (0.5%) and July (0.75%), following ECB's tightening at that time. It resumed a declining path only in November 2011 (0.5%), reaching 0% in July 2012. The introduction of negative deposit rates occurred in June 2014 (-0.1%). The ECB was the first major central bank to introduce

negative deposit rates as a tool to achieve price stability⁷⁷. With this measure, it tried to strengthen the commitment of “low interest rates for an extended period” adopted in July 2013, and then re-anchor medium-term inflation expectations, that were quite subdued at that time. It was also seen as a way to implement a disincentive for banks to convert the liquidity they obtained from ECB liquidity operations as deposits at the ECB. Instead, it would encourage these resources to flow to the interbank market, improving its liquidity and trying to incentivize lending, once credit growth was very weak.

Further deposit rate cuts took place in September 2014 (-0.2%), December 2015 (-0.3%) and March 2016 (-0.4%).

3.2.2. Enhanced Credit Support and Covered Bond Purchase Program

When it comes to unconventional monetary programs in the Euro area, some initial measures had already been announced in 2008, but a formal broad ECB unconventional program was only implemented in July 2009, with a set of initiatives that was called “Enhanced Credit Support”: (i) The conduction of fixed-rate full allotment (FRFA) auctions for liquidity supply; (ii) A broader range of asset types (public and private) accepted as collateral for loans from the ECB⁷⁸; (iii) The extension of ECB’s liquidity operations maturities (from 3 months up to 1 year); (iv) The provision of liquidity in foreign currency (mainly dollars) through swap agreements with central banks; (v) The purchase of covered bonds issued by banks.

Regarding the Covered Bond Purchase Program (CBPP), the universe of assets purchased by the ECB included securities issued by banks in the primary and secondary markets, in issuances of at least € 100 million, with a minimum investment-grade rating

⁷⁷ Denmark’s Central Bank had already introduced negative interest rates in July 2012, but with an objective to counter capital inflows from the Euro area and exchange rate appreciation pressures. See further discussion on the topic of negative interest rates in section 2.3.5.

⁷⁸ Further changes in ECB collateral requirements were introduced at the end of 2011, and consolidated on ECB Guideline 2014/31: acceptance of certain ABS, Additional Credit Claims, short-term debt instruments (commercial papers), government-guaranteed bank bonds, assets denominated in foreign currency, usually lowering credit requirement thresholds.

(BBB- or similar) and backed by public or private guarantees. CBPP's objectives were: i) To promote lower interbank market rates; ii) To reduce funding restrictions for credit institutions, and indirectly to non-financial companies; iii) To encourage credit institutions to expand their loan book; iv) To improve liquidity conditions, particularly in the private debt market. The first phase of this program (CBPP 1) occurred between July 2009 and June 2010. In this phase, the ECB bought a nominal amount of € 60 billion, 27% in the primary market and 73% in secondary. The maturity of the securities purchased was between 3 and 7 years, with an average of 4.1 years, according to Beirne *et al.* (2011). Despite CBPP 1 managed to buy the previously announced amount of € 60 billion, and in general terms fulfilled its four objectives, it was not enough to prevent covered bonds yields to steepen in periphery countries affected by the banking and sovereign debt crisis.

A second phase of the program (CBPP 2) was launched in November 2011, the same month the ECB started cutting official interest rates again. In the second phase, the ECB announced an intention to buy a nominal amount of € 40 billion in covered bonds until October 2012. This time the ECB purchased securities that came from bank issuances of at least € 300 million. The CBPP 2 lasted until the intended date, but the more stringent conditions in covered bonds markets and from the program itself led the ECB to undershoot its intended amount. It purchased only € 16.4 billion (36.7% in the primary market and 63.3% in the secondary).

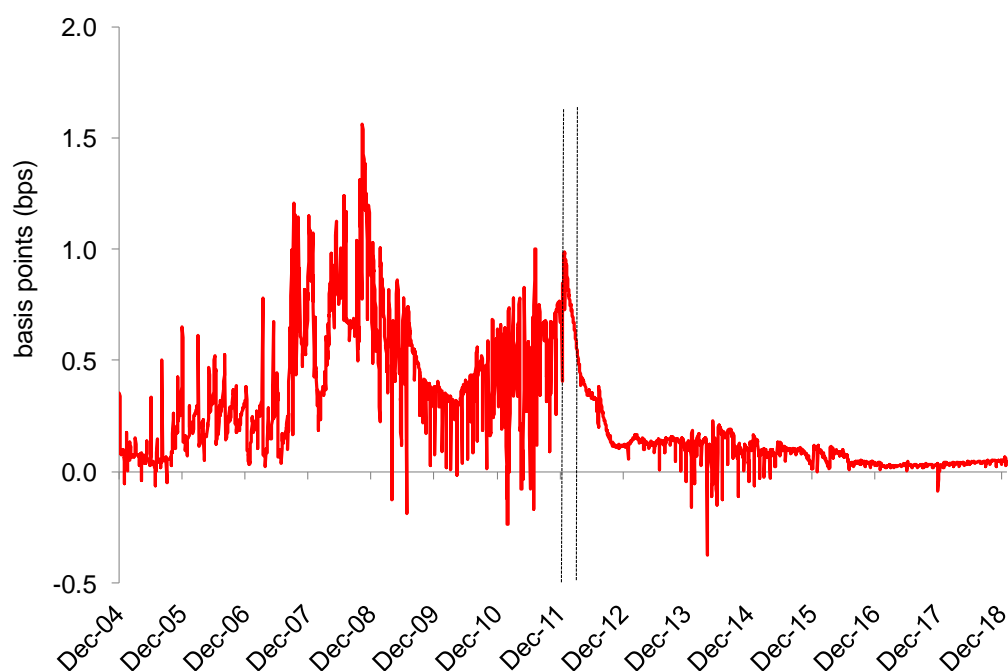
3.2.3. Long Term Refinancing Operations

Before 2008, the ECB usually offered Long Term Refinancing Operations (LTROs) monthly, to be repaid in 3 months. In 2008, it also began to offer operations to be repaid in 6 months. In June 2009, it added to its tender procedures operations with repayment in 12 months too. In November 2011, when the ECB noticed the sovereign crisis had worsened, and the liquidity available for banks and the economy as a whole had shrunk, the institution

announced two major three-year LTROs, which were held on 21 December 2011 and 29 February 2012. On those occasions, the ECB lent to banks amounts to be paid over three years, charging only the main refinancing rate (then in a level of 1.0%). The first operation amounted € 489.2 billion and the second operation € 529.5 billion, thus totaling a liquidity injection of € 1018.7 billion by the ECB within three months.

There are signs that this huge amount of money reduced liquidity constraints in Euro area financial markets. One of the signs was the decrease in credit spreads. One of the most common ways to measure credit spreads in the Euro area is the spread between Euro area interbank unsecured lending rates in 3 months (EURIBOR- 3 months) and unsecured overnight lending rates (EONIA). After growing considerably at the end of 2008, this spread moderated in 2009 with the “Enhanced Credit Support” measures. Nonetheless, with the escalation of the crisis in 2010 and 2011, this spread resumed growing up to December 2011. After the two three-year LTROs, this spread moderated again to pre-2008 crisis levels, as it can be seen in graph 3-2 to the right of the dotted lines.

Graph 3-2 Euro area – Spread EURIBOR (3 months) and EONIA Lending Rates (bps)



Source: Author own elaboration, based on Thomson Reuters Datastream data.

Nevertheless, observing the articles that analyze the effects of those operations beyond liquidity (e.g., credit levels, bond purchases), we find mixed evidence. On a more positive side, Pattipeilohy *et al.* (2013) show that three-year LTROs had a favorable short-term downward effect in government bond yields. Darracq Paries and De Santis (2015) use data from April 2012 ECB *Bank Lending Survey* to perform a counterfactual exercise, in which they infer that three-year LTROs lifted prospects for GDP/inflation and loan provision to non-financial corporations on the following 2-3 years, thereby avoiding a major credit crunch. For the Euro area as a whole, Andrade *et al.* (2017) estimate that each € 1 billion lent by the ECB through three-year LTROs increased bank loans to firms by € 186 million over one year. However, other studies show ECB three-year LTROs under different perspectives. The ones which focus their analysis on individual countries show that the increase in loans was modest in Italy (2%) and Spain (1%), according to Carpinelli and Crosignani (2017) and Garcia-Posada and Marchetti (2016), respectively. Moreover, banks increased purchases of government bonds around three-year LTROs dates in Italy and Portugal considerably, according to Carpinelli and Crosignani (2017) and Crosignani, Faria-e-Castro and Fonseca (2017), respectively. This fact would be evidence that banks purchased these bonds to engage in carry trade, pledging them as collateral for ECB loans at lower rates than the expected return on the bonds. So, due to the scenario of high uncertainty prevailing in 2011-2012 in the Euro area, a large amount of liquidity provided by three-year LTROs had two undesired destinations: i) Speculative operations (carry trade); ii) ECB's balance sheet, deposited at the current account or deposit facility. Furthermore, even if three-year LTROs allowed a modest increase in lending, corporations did not use these new funds for productive purposes. Based on a sample of more than 3000 companies in the Euro area, Daetz *et al.* (2017) find that after three-year LTROs, companies have presented a modest expansion in borrowing from banks

and bonds markets, but have mostly hoarded these funding sources, while new investments and employment creation was muted⁷⁹.

Overall, the evidence suggests that, although three-year LTROs have avoided a massive bank deleveraging and improved liquidity constraints, those operations did not achieve their goal of restore credit market dynamics and stimulate lending to productive purposes on a broader basis.

3.2.4. Securities Markets Programme

The Securities Markets Programme (SMP) was implemented in May 2010, the same month when the first Greek aid package was agreed, but markets priced high spreads between German's and periphery countries' bonds. In order to reduce financial fragmentation in the Euro area and improve monetary policy transmission, the ECB engaged in purchasing periphery countries' securities, in an attempt to prevent their yields from rising.

Although the program also legally allowed corporate bond purchases in primary and secondary markets, its implementation was through government bond purchases in secondary markets. The program focus was not to make monetary policy more expansionary or to finance member countries. As a consequence, the ECB conducted weekly open market operations to provide fixed-term deposits (with a weekly duration), in order to sterilize the liquidity injected through its purchases.⁸⁰

At the beginning (May 2010 to February 2011), purchases were limited to Greece, Ireland, and Portugal bonds. After a pause between February and July 2011, the ECB resumed its purchases in August 2011, including also bonds of Spain and Italy.

⁷⁹ Acharya *et al* (2017) find similar results for a period some months after three-year LTROs (post-OMT announcement, for the period Q3 2012- Q4 2014). According to these authors, the reduction in financial market tensions would have led banks (particularly weakly-capitalized ones in periphery countries) to roll over loans to less productive ("zombie") firms which they had previous relationship, instead of recognizing NPLs in their balance sheets. Those firms would have used most of the acquired funds for debt repayment. Yet, even "non-zombie" firms, which have also regained access to bank-based financing after OMT announcement, preferred to build cash holdings. Therefore, both "zombie" and "non-zombie" firms did not use the acquired funds for productive purposes (increase investment and employment).

⁸⁰ The ECB interrupted SMP portfolio weekly sterilization operations since July 10, 2014.

The program has officially ended in September 2012, although purchases have actually occurred until February 2012. According to ECB data, bonds acquired under the program had an average maturity of 4.3 years and a nominal amount of € 218 billion, of which almost half belonged to Italy, as shown in Table 3-1.

Table 3-1 ECB SMP - Amount Purchased by Country and Average Bond Maturity

Issuer Country	Nominal Amount (€ billion)	% Per Country	Average Maturity (years)
Italy	102.8	47.2%	4.5
Spain	44.3	20.3%	4.1
Greece	33.9	15.6%	3.6
Portugal	22.8	10.5%	3.9
Ireland	14.2	6.5%	4.6
Total	218	100.0	4.3

Source: Author own elaboration, based on ECB data.

When it comes to the evaluation of SMP impacts, there are several studies which use different methodologies to verify its effectiveness. In general, most authors agree that interventions have managed to reduce sovereign yields of periphery countries, but usually in the short term (a few weeks, as Pattipeilohy *et al.*, 2013, or even a day, as Doran *et al.*, 2013). According to Doran *et al.* (2013), although after an ECB intervention yields fell on the same day, with adverse macroeconomic events and a possible lag for a new intervention, yields resumed rising up to pre-intervention levels in the next day. From the point of view of private investors, the issue which concerned the most was that the ECB had legal seniority over them. ECB seniority implied that private investors would be the first to bear the losses of any default in these bonds, and the ECB could only be charged after all private investors had been wiped out. This fact was one of the reasons why SMP interventions had only very short-term effects, with yields soon returning to rise.

Indeed, the great controversy both in public opinion and among ECB members themselves were factors that led interventions to be discontinued in time and actually interrupted seven months before the official end of the program. The disagreement within the

ECB was such that it was pointed as a reason for the resignation of Bundesbank President Axel Weber and ECB's German Chief Economist Jurgen Stark.

Helm (2012) noted that ECB core countries (notably Germany) considered that the program did not respect ECB mandate to keep price stability. According to them, SMP would have just tried to disguise monetary financing (debt monetization) of periphery governments. Although the ECB did not purchase government securities in primary markets under the SMP, this program would have allowed periphery countries to delay the much "requested" fiscal adjustments/austerity measures.

3.2.5. Verbal Intervention Strategy and the OMT

With periphery countries bond yields rising to unsustainable levels and sovereign contagion threatening to reach even core countries (e.g., France), the ECB introduced a different communication approach. From July 2012 onwards, it started a "verbal intervention" strategy⁸¹, trying to contain negative expectations on markets and aiming to increase monetary policy credibility. At a speech on July 26, 2012, Draghi stated the ECB would do "whatever it takes to save the euro".

This change in the communication strategy continued in the following months. In August 2012 ECB meeting, it was mentioned the possibility of undertaking "outright open market operations", in order to address seniority concerns by investors. The main features of the Outright Monetary Transactions (OMT) program were actually announced in September 2012. This new program intended to restore the transmission mechanisms of monetary policy, which were notoriously disrupted. It opened the door for the ECB to buy sovereign debt of specific countries in secondary markets, in order to stabilize their yields, once they signed a Memorandum of Understanding with fiscal and reform conditionalities attached.

⁸¹ This "verbal intervention" strategy followed the tradition of "open mouth operations" (Guthrie and Wright, 2000), and had its theoretical underpinnings based on the "expectations management" proposed by Woodford (2003). Further discussion of these concepts is done in sections 2.3.3 and 2.3, respectively.

ECB purchases would be of bonds with maturities between 1 to 3 years, in unlimited amounts. The OMT focus was not on countries which were already receiving assistance from the Troika (Greece, Portugal or Ireland). Instead, it aimed to avoid spreading contagion to countries which had their debt trading on markets, but at high yields (e.g., Spain, Italy). Most importantly, the ECB would be treated *pari passu* with other sovereign bond creditors, eliminating the problem of ECB seniority that existed in SMP⁸². As the SMP, the OMT received a number of legal challenges in the German Constitutional Court (GCC) and the European Court of Justice (ECJ), related to accusations such as monetary financing of government debt. Both courts dismissed OMT's charges and gave a final ruling of "approval with conditions": the ECJ on June 16, 2015, and the GCC on June 21, 2016. Nonetheless, the OMT was never activated in practice, only remaining in the lines of verbal intervention.

ECB OMT program was part of a broader set of other institutional actions taken by the EU in that period: (i) The creation in October 2012 of a permanent bailout fund, the European Stability Mechanism (ESM), to replace other previous temporary funds (European Financial Stability Facility - EFSF and European Financial Stabilization Mechanism - EFSM). The ESM would have a higher lending capacity (€ 500 billion) and stable guarantees; (ii) The beginning of the project to create a Banking Union. Under this project, from November 2014 onwards it would be implemented a Single Supervisory Mechanism, in which the ECB would centralize most Euro area banking supervision authority under its responsibility.

Later, it would be adopted a Banking Recovery and Resolution Directive (effective since January 2015) and a Single Resolution Mechanism (effective since January 2016), so that bank resolution costs would rely mostly on private (bail-in), rather than public (bailout)

⁸² Evidence of significant drops in sovereign yields of Italy and Spain, related to the announcement of the *pari passu* clause in OMT in September 2016, removing the previous credit seniority status in SMP is provided by authors as Steinkamp and Westermann (2014).

funds. Finally, the harmonization of Deposit Guarantee Schemes would protect Euro area's depositors of up to € 100,000 from potential losses on their deposits⁸³.

All of them intended to convey positive messages to markets. In OMT's case, it showed ECB's unconditional willingness to take bold actions if necessary. The ESM ensured an increase in the amount and time period of rescue funds (now permanent). With the Banking Union, there would be a substantial advance in monetary union's banking supervision and resolution framework. The combination of these elements had an essential role in reducing investors' risk perception of Euro area countries. Therefore, from the second half of 2012 onwards, the former trend of rising sovereign yields was halted.

In fact, the gradual downward trend of yields was reinforced with the introduction of the "forward guidance" mechanism, at the meeting of July 4, 2013. This change in communication by the ECB introduced a commitment that interest rates would remain at low levels for a prolonged time period. The timing of this statement was important. While the Fed had signaled in May 2013 that it was considering to reduce its asset purchases (generating the volatility episode that came to be known as "taper tantrum"), the ECB soon after gave a clear sign to markets that it would not follow the Fed, and would keep an accommodative monetary stance for an extended period.

3.3. Asset Purchase Programs and Targeted Long Term Refinancing Operations

3.3.1. Background

Despite the less volatile scenario in 2013 and 2014, with some countries of the periphery ending their assistance programs without the need of precautionary credit lines

⁸³ The Banking Union is composed of three pillars: Single Supervisory Mechanism (SSM), Single Resolution Mechanism (SRM) and European Deposit Insurance Scheme (EDIS). The first two have already been implemented, but the third is still under discussion. According to the most recent European Commission proposal, EDIS would be implemented after a transitional period with two phases: i) First, re-insurance (only liquidity coverage, leaving losses to be covered by national deposit insurance schemes); ii) On a later date, co-insurance (EDIS would partially cover losses together with national deposit insurance schemes, but subject to the condition that measures to address risks related to NPLs/legacy assets were previously implemented). Only after those two phases have been gradually introduced, a full EDIS would be in place, but with no date yet scheduled for implementation.

(Ireland, Portugal, Spain for banks) and the gradual downward trend of sovereign yields, Euro area economy still showed slow signs of recovery in credit and output in those years.

From the middle of 2014 onwards, the most serious concern became the threat of deflation, with signs that the low inflation level was not just a temporary event (related to an oil price drop), but a more lasting element, with second-round effects that would weaken economic activity. The risk of deflation was a heavy burden for an economy with difficulty to recover, which could generate a situation that entrepreneurs would no longer invest, families would postpone spending decisions and the real value of debts would increase.

In this context, in June 2014 the ECB introduced a negative deposit rate (-0.1%) and reduced the main refinancing rate from 0.25% to 0.15%. It also began to monitor more closely medium-term inflation expectations. In August 2014, the 5Y5Y forward inflation index⁸⁴ fell below 2% YoY for the first time on record.

3.3.2. CBPP 3, ABSPP and TLTRO I

In an attempt to avoid a deflationary spiral, trying to improve the transmission of monetary stimulus to credit markets and the real economy, the ECB launched new initiatives in September 2014. In terms of interest rates, the main refinancing rate was reduced to 0.05%, and the deposit rate was reduced to an even more negative level (-0.20%). In addition, it announced a set of three unconventional measures:

- i) Covered Bond Purchase Program – CBPP 3: third round of ECB’s purchases of covered bonds issued by banks;
- ii) Asset-Backed Security Purchase Program - ABSPP: ECB’s purchases of securitized bonds, backed by guarantees from private assets (e.g., mortgages, auto loans, credit card bills);

⁸⁴ The 5Y5Y forward inflation index is one of the most tracked indexes of inflation expectations. It is a measure of expected inflation (on average) over the five-year period that begins five years from today.

iii) Targeted Long Term Refinancing Operations – TLTRO I: the provision of long-term liquidity lines to banks, which should target this liquidity preferably for loans to non-financial companies/households, except for house purchases.

Regarding the CBPP 3, net purchases of covered bonds by the ECB began in October 2014 and lasted until December 2018. This third phase of the program acquired an amount much higher than the previous phases. According to ECB data, an amount of € 262.20 billion was acquired up to December 2018, with the majority of purchases in the secondary market (63%).

In terms of the ABSPP, the program started a month later, in November 2014, and net purchases also lasted until December 2018. Nevertheless, there were some technical difficulties in its implementation. These difficulties happened because Euro area's market for securitized bonds shrank considerably after the 2008 crisis, and the availability of collateral that met ECB's requirements was small. The ECB made some changes in the ABSPP framework in September 2015, with national central banks assuming a greater role in ABS purchases. However, the pace of purchases remained low in the following months. Until December 2018, only € 27.52 billion of ABS were purchased by the ECB.

As for the TLTRO I, it was decided that the ECB would hold eight operations between September 2014 and June 2016, all maturing in September 2018 (i.e., operations would last between two and four years). The fees charged over banks would be 0.15% in the first two operations, dropping to the main refinancing rate in the following six operations (0.05% until December 2015, and 0% in March and June 2016). The idea was that banks could borrow funds respecting their initial limit (7% of their loan portfolio in the first two operations), which could be gradually expanded in the following operations if their loan portfolio directed to non-financial companies and households (except for house purchases) increased. However, there was no serious punitive mechanism for banks if the borrowed liquidity was not directed

towards lending to the real economy. The only “punishment” was that the resources had to be repaid two years earlier (September 2016, instead of September 2018).

In January 2015, with the sharp fall experienced by energy prices, Euro area’s inflation rate registered -0.6% YoY, deepening in the negative territory (reached in December 2014 with -0.2% YoY) and fueling fears of a deflationary spiral.

In this context, most economic analysts converged to a view that the deflationary concerns would not be contained only with the measures announced in September 2014, and a more incisive action by the monetary authority was necessary (i.e., an asset purchase program). This view was also shared by the majority of ECB Governing Council members, and tolerated by Germany, since the ultimate goal of ECB purchases would not be monetary financing of governments, but to ensure Euro area’s price stability in the medium/long run. The institution was then ready to follow the path of Quantitative Easing (QE) also adopted by other major global central banks: Fed (USA), BOE (UK), BOJ (Japan), although well after them.

3.3.3. Public Sector Purchase Program

It was at this scenario that in January 2015 the ECB announced it would start in March 2015 its QE program, called Public Sector Purchase Program - PSPP. Under this program, the ECB would make unsterilized purchases of bonds issued by governments, national agencies and EU’s supranational bodies, initially at least September 2016. Additionally, the ECB would continue the programs announced in September 2014 (CBPP 3, ABSPP and TLTROs). Together, they would promote an initial monthly expansion in ECB’s balance sheet of € 60 billion, which implied a net expansion in the institution’s balance sheet of over € 1 trillion, to levels observed in the middle of 2012. The focus was on achieving a sustained path in inflation towards the level of below, but close to, 2% over the medium term.

Here we perform a brief description of the main features of the PSPP, valid from March 2015 until December 2015⁸⁵. First, bond purchases were made by the Eurosystem (ECB or National Central Banks - NCBs) in the secondary market, not to incur in monetary financing of governments⁸⁶. Purchases were being divided in a way that the ECB bought 8% of the securities and NCBs the remaining 92%. Of this 92 %, NCBs acquired 12% from EU supranational bodies and 80% from their own government or national agencies. Thus, although the program comprised the entire Euro area, the mutualization of risks within the Eurosystem was low (only 20%), with 80% under each country's responsibility through its NCB. In terms of amounts acquired, they roughly followed the share of each country in ECB's capital key, so that the largest countries were responsible for most of the purchases. Germany, France, Italy, and Spain supplied around 80% of the securities bought by the PSPP (excluding supranational ones). In months when some countries bought less national bonds than established by their capital key, those deviations were usually compensated by the purchase of supranational bonds. The same was true for countries which did not have enough sovereign bonds trading on markets (i.e., Estonia). In terms of ECB purchases, there was a limit of 33% per issuer country, in order to prevent the ECB to concentrate its purchases in a single nation. There was also a 33% limit per bond issued, to avoid that ECB purchases eventually distorted the negotiation of a specific bond in the market. Assets purchased needed to have a minimum investment-grade rating (BBB- or equivalent). Greece and Cyprus, which were below this threshold, would have to fulfill additional conditionalities in order to participate. Hence, the purchase of Greek bonds was not authorized by ECB, and of Cyprus bonds, the authorization lasted just for a limited time period⁸⁷. However, their National

⁸⁵ Subsequent changes in PSPP's features are described in section 3.4.

⁸⁶ Violation of article 123 - Treaty of Functioning of the European Union.

⁸⁷ The ECB granted a waiver for the Central Bank of Cyprus to buy sovereign bonds while the country was during Troika assistance and fulfilling program's conditionalities properly (between July/ November 2015). After the assistance program ended in March 2016, and Cyprus bonds continued to be rated below investment grade, their purchases were suspended.

Central Banks operated in the program buying supranational bonds, in accordance with their ECB capital key. If it turned out necessary to restructure a sovereign bond in the program, the ECB would receive *pari passu* (not senior) treatment with private creditors. Regarding the maturity of securities, short and long-term bonds (between 2 and 30 years) were being purchased. ECB/NCBs could buy bonds including ones with negative yields, provided that they were not below the deposit rate.

3.3.4. APPs Concerns and Modifications

Since the beginning of APPs, several concerns related to the implementation of programs emerged, related to the following issues: (i) Time period - too short or too long, so as to calibrate their effects on inflation/ inflation expectations; (ii) Availability of assets to be purchased - scarcity of bonds in markets due to ECB purchases and (iii) Yields' level - too low, undermining agents' interest rate returns and causing financial stability problems. Therefore, important modifications were introduced in APPs in order to face some of those concerns, and try to increase their effectiveness.

In the December 2015 meeting, ECB implemented the first round of changes. It was announced that APPs would remain at least until March 2017, which meant an extension of 6 months from the original date of September 2016. Furthermore, main refinancing operations and 3 month-LTROs would remain as fixed rate tender procedures with full allotment (FRFA) until at least the end of 2017. Moreover, securities bought under APPs would have their principal payments reinvested as they matured, which meant the ECB would maintain an expanded balance sheet for as long as it considered adequate for its monetary policy objectives. In addition, it also lowered the deposit rate from -0.2% to -0.3%, so more bonds with negative yields could be bought. Moreover, it included regional and local government bonds in the list of eligible assets for the PSPP program⁸⁸.

⁸⁸ In July 2015, the ECB added 13 new national agencies in the list of agencies whose securities were eligible for the PSPP.

In the March 2016 meeting, more incisive modifications were taken. First, not only the deposit rate was lowered 10 bps (from -0.3% to -0.4%), but also the main refinancing and marginal rates were lowered 5 bps (to 0% and 0.25%, respectively). The schedule of APPs was kept at least until March 2017, but the volume of monthly purchases was increased from € 60 to € 80 billion per month. The availability of assets to be purchased was also increased in the following ways: (i) Lowering the yield floor for purchases, with the deposit rate cut; (ii) In the PSPP, increasing the issuer and issue limit of bonds purchased from international organizations and multilateral development banks from 33% to 50% (although the share of those securities in total purchases would fall from 12% to 10%, and ECB purchases would be increased from 8% to 10%); (iii) Including investment-grade non-financial corporate bonds in the list of eligible assets to be purchased from June 2016 onwards, with the introduction of the Corporate Sector Purchase Program (CSPP). Under the CSPP, the ECB purchased corporate bonds denominated in euros in primary and secondary markets, with maturities from 6 months until 30 years, and issue limit of 70%. This program was conducted by six central banks (Germany, France, Italy, Spain, Belgium, Finland), in coordination with the ECB. Until December 2018, the ECB bought € 178.05 billion in corporate bonds under the CSPP, around 82% in secondary markets. Issuer companies were mostly from the four largest Euro area economies, with the most significant amounts destined to the following sectors: utilities, infrastructure/transportation, automotive and parts, telecommunication, energy, and basic resources. The distribution of ECB purchases according to country, sector and bond rating was not discretionary. They broadly followed the availability of corporate bonds in Euro area markets. iv) The intention to increase the availability of funds to the real economy was strengthened not only through this decision to buy corporate bonds, but also through the announcement of a new round of TLTROs. TLTRO II was a series of four quarterly operations, from June 2016 up to March 2017. Banks could borrow money for four years,

with the possibility of early repayment in two years, but no mandatory requirement for early repayment if the loan benchmark was not achieved, as it was the case of TLTRO I (so banks could roll from TLTRO I to TLTRO II). The limit for each counterparty to borrow would be up to 30% of the stock of eligible loans, as of the end of January 2016 (higher than the 7% limit required in TLTRO I). However, the main change was the incentive introduced for banks to provide credit to the real economy, enabling the ones which lent more to non-financial corporations and households (except for house purchases) to have lower rates. For each operation, the interest rate would be the main refinancing operation prevailing at that time (i.e., 0%). Yet, for banks which achieved their loan benchmark to the real economy, the interest rate could be as low as the deposit rate (-0.4%)⁸⁹.

In the December 2016 meeting, a third round of modifications came into place. The main ones were: i) Extension of programs until the end of December 2017, or beyond if necessary; ii) Reduction in the monthly amount of ECB asset purchases from € 80 billion to € 60 billion, starting from April 2017 to December 2017; iii) Allowing PSPP purchases below the deposit rate “to the extent necessary”, so as to overcome availability constraints on bond purchases posed by the former yield floor on deposit rates; iv) Broadening the maturity range of the PSPP, by decreasing the minimum maturity of bond purchases from two years to one year; v) Allowing APPs securities lending for banks against cash collateral, up to the limit of € 50 billion.

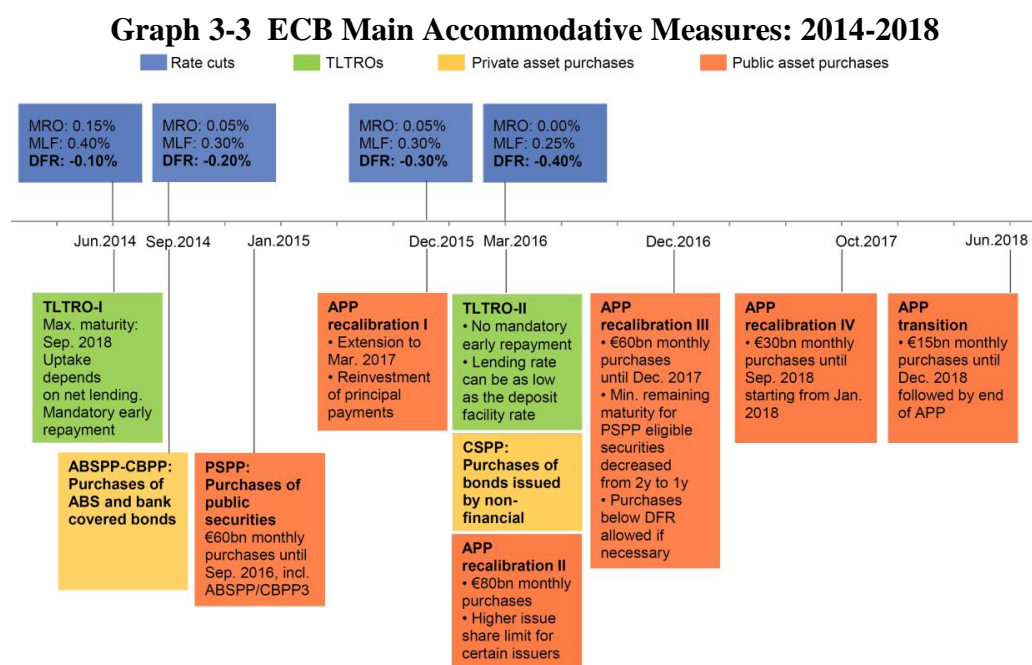
In the October 2017 meeting, a fourth set of changes was announced. The more important one was the reduction in the monthly amount of asset purchases from € 60 billion to € 30 billion, from January to at least September 2018. Moreover, the ECB made a

⁸⁹ To have the right to get funding at the lowest rate, the ECB adopted two different benchmarks. For banks that were previously expanding their balance sheets, it was requested that their level of loans to the real economy in January 2018 was at least 2.5% higher than January 2016. For banks whose balance sheets were previously shrinking due to restructuring, it was requested that between January 2016 and January 2018, they eased their pace of contraction of loans to the real economy by at least 2.5%. For banks that improved their lending to the real economy but below the benchmark, the level of the interest rate would stay in a range between 0% and -0.4%, following linear graduation according to the proportion of the improvement.

commitment to: i) Reinvest the principal payments from maturing securities purchased under APPs for an extended time period after the end of its net asset purchases; ii) Conduct main refinancing operations and 3 month-LTROs as fixed rate tender procedures with full allotment (FRFA) for at least until the end of 2019.

In the June 2018 meeting, a fifth round of modifications was announced. Net asset purchases were extended from October to December 2018, with a lower amount of € 15 billion per month, and then come to an end. Second, interest rates were expected to be kept at their current levels until at least the summer of 2019. Third, ECB would continue reinvesting the principal payments from maturing securities purchased under APPs for an extended time period. In the December 2018 meeting, those commitments were confirmed, and forward guidance on reinvestments was clarified, with the statement that reinvestments will continue to occur for an extended period, well past the date key ECB interest rates start to be raised again. In this sense, although the ECB has confirmed its time frame for the end of APP net asset purchases (December 2018), and opened the door for an interest rate hike after the summer of 2019, the institution intended to keep an accommodative monetary stance, by continuing the reinvestments for an extended period. Moreover, these announcements were date and state-dependent (interest rates kept at low historical levels at least until summer 2019, and as long as necessary to ensure that the evolution of inflation remains aligned with expectations of a sustained adjustment path; reinvestments will occur for an extended period after key ECB interest rates start to be raised, and as long as necessary to maintain favorable liquidity conditions and an ample degree of monetary accommodation). This way, the ECB can maintain some margin of maneuver, in case occurs an unwarranted tightening in financial/economic conditions.

As a summary, we provide in graph 3-3 a timeline with the main accommodative measures announced by the ECB during 2014-2018, not only APPs but also TLTROs and nominal interest rate cuts.



Note: The dates provided in the timeline are the ones of the announcement of measures and not the ones of implementation of measures (which are also mentioned in the text). The abbreviations used for interest rates are the following: MRO - (Main Refinancing Operations); MLF - (Marginal Lending Facility); DFR- (Deposit Facility Rate). Source: Valla (2018).

3.3.5. APPs and TLTROs Features

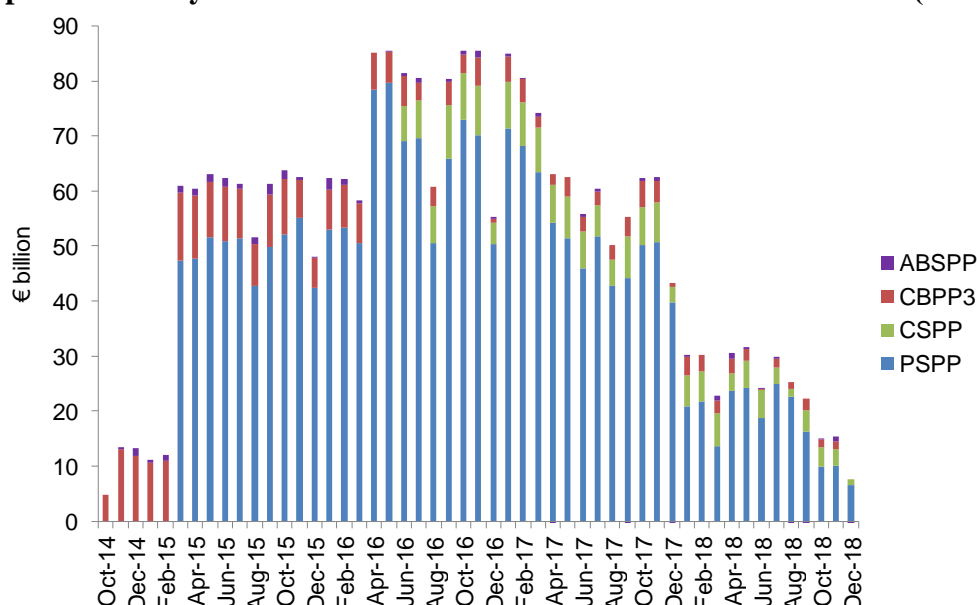
3.3.5.1. APP Features

We begin the description of ECB APPs features with an analysis of the flow of ECB net asset purchases between 2014 and 2018, as it can be seen in graph 3-4 in the sequence.

Observing the flow of purchases, we can see that between October 2014 and February 2015, when only CBPP 3 and ABSPP had started, the amounts were very small. Only after the beginning of the PSPP in March 2015, the amounts rose to substantial levels. One can see that between March 2015 and March 2016, the monthly target of € 60 billion was largely met (except in August and December 2015, but bond purchases were compensated in other months, so as to keep the monthly average of € 60 billion). The same can be said between April 2016 and March 2017, when the monthly target of bond purchases was increased to €

80 billion (except for August and December 2016). In April 2017, the monthly amount of purchases was reduced again to € 60 billion, and kept around this pace until December 2017. From January to September 2018, the monthly target of purchases was € 30 billion, and from October to December 2018, € 15 billion. Since it was created, PSPP was responsible for the largest flow of purchases, while ABSPP was always the smallest program. CBPP 3 was the second program in flows until June 2016 when CSPP was implemented, and the latter became the second more important in monthly flows.

Graph 3-4 Eurosystem Flow of Net Purchases under APPs:2014-2018 (€ billion)



Source: Author own elaboration, based on ECB data.

Next, we present in table 3-2 the net amount of bonds acquired by the Eurosystem during the asset purchase programs, from October 2014 until December 2018.

Table 3-2 Eurosystem Stock of Net Purchases under APPs after 2014 (€ billion)

Program	ABSPP	CSPP	CBPP 3	PSPP	Total
Date of Implementation	November 2014	June 2016	October 2014	March 2015	-
Cumulative amount (up to December 2018)	27.52	178.05	262.20	2102.05	2569.82

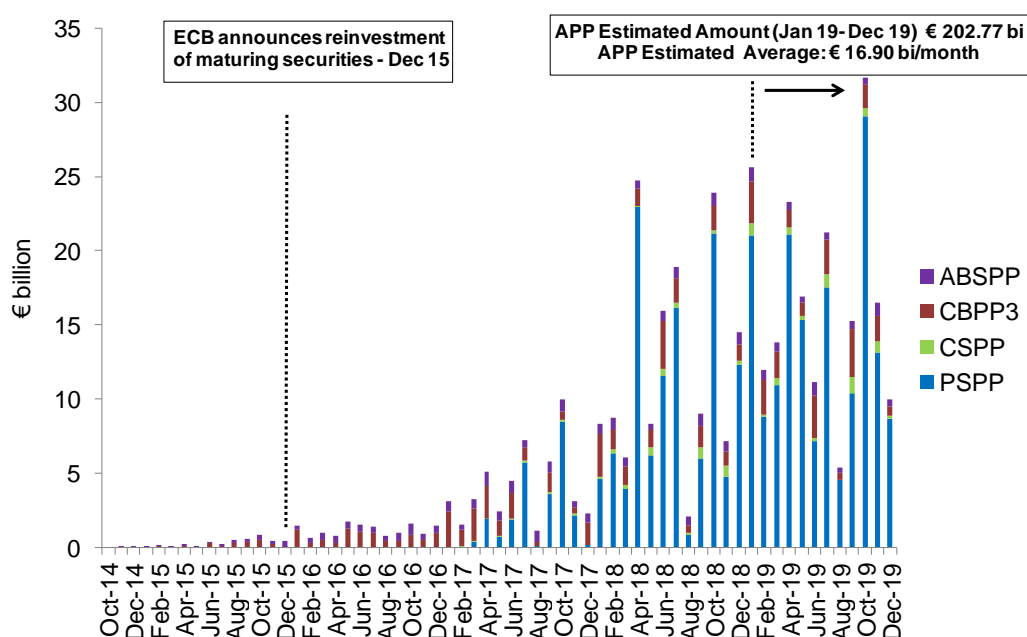
Note: Cumulative amounts take into account quarter-end amortization adjustments. Source: Author own elaboration, based on ECB data.

In terms of the stock of purchases, we observe the much higher amount of PSPP when compared to other contemporaneous programs. Even when compared with a former sovereign

bond purchase program which lasted for a considerable time (SMP, two years), securities purchased under the PSPP totaled € 2.10 trillion, around ten times the amount of the SMP. Considering all asset purchases since October 2014, a cumulative amount of € 2.57 trillion has been bought until December 2018. With this expansion, the consolidated balance sheet of the Eurosystem reached an amount of € 4.67 trillion in assets at the end of December 2018, which corresponds to around 40.2 % of Euro area GDP.

Moreover, with the commitments made by the ECB in October 2017 and December 2018 that it will continue to reinvest the principal payments from maturing securities purchased under APPs for an extended time period, the institution is determined to keep its balance sheet with a large size for a considerable time period. In fact, the reinvestment of maturing securities under APPs was already announced since December 2015. Yet, as the stocks of securities purchased were still low, the reinvestments represented small amounts. As the stock of securities purchased grew in time, those repurchase amounts became larger since 2017 and increasingly important since the October 2017 commitment. This October 2017 announcement marked a shift in the profile of ECB accommodative measures. They intend to be less reliant on flows (net asset purchases), and more based on stocks (reinvestment of securities) and forward guidance (low interest rates and large balance sheet for an “extended period”).

According to ECB data, the expected amount of bond redemptions from securities purchased under APPs from January 2019 for the following 12 months is around € 202.77 billion. This number implies an average monthly amount of € 16.9 billion in ECB reinvestments. However, those numbers vary considerably according to the month, as it can be seen in graph 3-5.

Graph 3-5 APP Bond Redemptions - Realized and Estimated

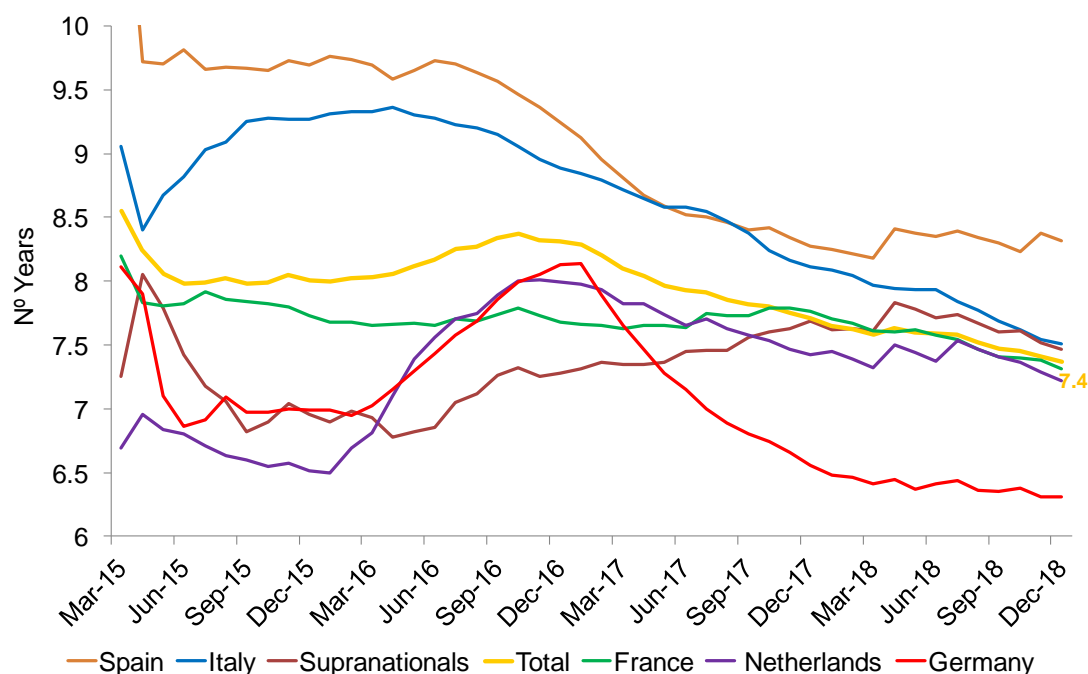
Source: Author own elaboration, based on ECB data.

Even so, in October 2019, month that ECB will have already ended its net asset purchases, the institution expects to repurchase € 31.67 billion. These facts suggest that the ECB intends to use those reinvestments as an alternative tool of monetary accommodation, offsetting to some extent the end of net asset purchases and other future measures that tighten the monetary stance.

Regarding the maturity of asset purchases under APPs, the ECB did not establish any limits for maturities under CBPP 3 and ABSPP. For the CSPP, maturities ranged from 6 months up to 30 years. For the PSPP, maturities went from 1 up to 30 years. The only program which the ECB discloses the remaining weighted average maturity (WAM) of its portfolio is the PSPP. Since the beginning of PSPP implementation in March 2015, WAM broadly decreased in the Euro area as a whole, from around 8.6 years to 7.4 years in December 2018. A negative point for a decrease in the maturity of asset purchases would be the lower impact of UMP's duration mechanism towards the whole spectrum of the yield curve, reducing its effectiveness. In fact, this Euro area average concealed a great degree of heterogeneity among countries. Graph 3-6 shows WAM of the five countries that accounted

for the largest share of purchases: Germany, France, Italy, Spain, and Netherlands (around 88%, including supranational bonds).

Graph 3-6 PSPP - Remaining Weighted Average Maturity of Bond Purchases



Source: Author own elaboration, based on ECB data.

In the graph, we can observe that countries which had a lower sovereign rating and a relatively larger amount of debt available in markets (Spain and Italy), WAM was above Euro area average. However, countries which had a higher sovereign rating, and the relative availability of debt in markets is not so large (Netherlands, Germany), WAM was below Euro area average.

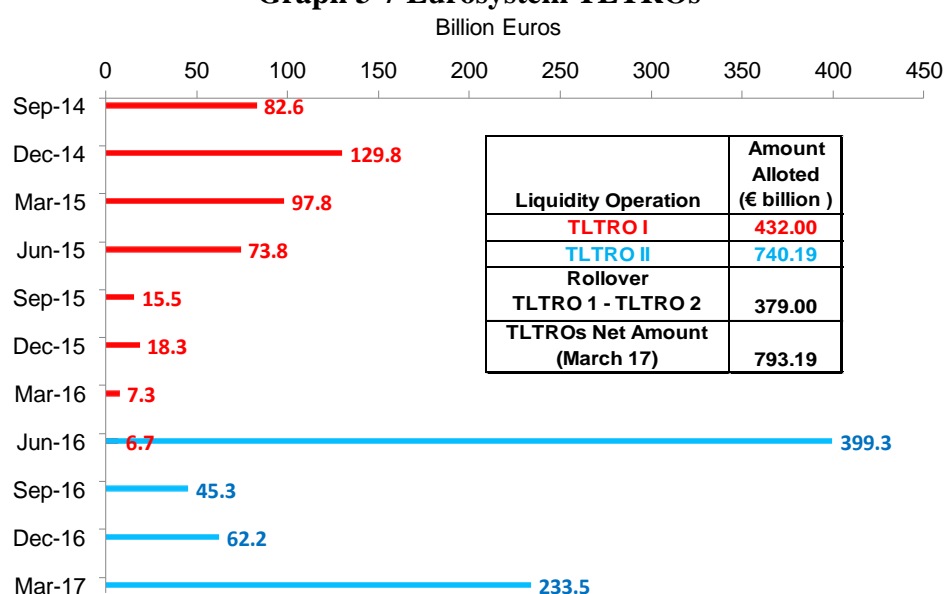
In fact, in some countries where the availability of sovereign debt in markets is lower (i.e., Finland, Portugal, Ireland, and Slovenia), the asset scarcity problem was significant. They had to substitute the purchase of national securities for supranational ones, in order to compensate their deviations from respective ECB capital keys. Asset scarcity was also a concern in top rating countries which net issuance has been negative in recent years (such as Germany and Netherlands). With the increase in the pace of ECB purchases to € 80 billion/month in April 2016, and a larger share of their bonds being traded with negative

yields, German and Dutch purchases were pushed towards medium/long-term maturities up to December 2016. Yet, since this date, the deposit rate yield floor was removed, and bonds of 1-year maturity were also included in the list of eligible securities. With those measures, we have observed a decrease in the WAM of those countries, especially in Germany. However, with the ECB slowing down the pace of asset purchases to € 30 billion/month from January to September 2018, and € 15 billion/month from October to December 2018, the availability limit for German bonds was not exceeded until December 2018. This fact has reduced these bond scarcity concerns in Germany and the Euro area, unless APPs net asset purchases needed to be restarted in the future.

3.3.5.2. TLTROs Features

The amounts and dates of TLTRO I and TLTRO II operations are shown in the graph 3-7. One can observe that the total amount of liquidity injected by the ECB on those operations, after deducting rollovers from previous operations (net amount), was around € 793 billion in March 2017. This outstanding amount declines gradually, as TLTROs repayments (anticipated or not) occur.

Graph 3-7 Eurosystem TLTROs



Source: Author own elaboration, based on ECB data.

Regarding TLTRO I, the ECB has offered a total amount of € 432 billion in eight operations. The amounts were relatively higher in the first four operations, but in the last four declined considerably. In any case, those values fell far short of ECB's own initial estimate, which was € 400 billion just for the first two operations (actual amount of € 212.4 billion in those operations). Several analysts sought to explain this lower than expected participation by banks. According to Merler (2014), the main reason was that banks feared to extend new loans to non-financial companies and households in a still uncertain scenario. In the initial operations, the institutions were merely swapping former three-year LTRO funds, which matured in February 2015 with a rate of 1%, for new TLTRO I funds with lower rates. In the following operations, banks already with available liquidity, but negative deposit rates and slow credit demand growth were possible reasons why the amounts declined.

As for TLTRO II, we could observe larger take-ups in the first and fourth operations, while the second and third operations presented much lower amounts. Those differences could be explained by the following reasons: i) 95% of the amount of the first TLTRO II operation was composed of banks rolling over TLTRO I with lower rates; ii) Regarding the fourth operation, it may be the case that banks were taking the "last chance" to lock in lower rates, once the ECB did not extend TLTRO II after March 2017, and reduced APPs monthly purchase levels from April 2017 onwards.

Both TLTRO I and II received several common criticisms, of not being really "targeted" towards the real economy, as mentioned by authors such as Gros *et al.* (2016). One of them is related with the point that institutions could form "groups", and the calculation of the TLTRO benchmark and borrowing allowances would be based on the group's aggregate loan data, instead of individual members' loan data. This fact allowed banks under the benchmark but inside a group to participate, benefiting from the positive net lending of others, and qualifying in any case for lower interest rates without raising loans. A second criticism

was the possibility that banks could “window dress” their loan book (i.e., grant a loan to a company at zero interest rates as “working capital”, but then require the company to put its proceeds into a blocked account as collateral).

One response from the ECB to these criticisms was presented at the May 2017 *Economic Bulletin*, which showed several positive aspects of TLTROs. In the publication (ECB 2017b), the institution affirms that these TLTROs, together with other UMPs, were efficient mechanisms to ensure the transmission of lower policy rates into better borrowing conditions for the Euro area non-financial private sector. They support this argument based on the following information: i) The rates on loans to non-financial corporations declined considerably right after the announcement of TLTRO I. The declines were sharper in countries where lending rates to non-financial corporations had been more elevated, hence allowing a reduction in cross-country dispersion of lending rates; ii) In “vulnerable” countries⁹⁰, banks that borrowed under TLTRO I reduced their rates by more than banks that abstained from bidding; iii) According to ECB *Bank Lending Surveys* - BLS (ECB, 2018b), banks have reported that the TLTROs have contributed to an easing of the terms and conditions on loans to enterprises and also easier credit standards (albeit to a lesser extent); iv) While lending by banks that did not participate in TLTROs appears to have remained largely unchanged afterward, the ones which bid in TLTROs went through an important change in their lending profile. In more “vulnerable” countries, banks have significantly reduced the pace at which they had been cutting lending to non-financial corporations. In “less vulnerable” countries, bidders seem to have increased intermediation volumes.

Furthermore, one has to recognize that the incentive in TLTRO II framework, when compared with TLTRO I - lower rates for banks that lend more towards the real economy - was one important factor to offset the compression of negative interest margins experienced

⁹⁰ According to this ECB publication, “vulnerable” countries would be Ireland, Greece, Spain, Italy, Cyprus, Portugal and Slovenia. “Less vulnerable” countries are the remaining Euro area countries.

by banks after the implementation of negative deposit rates. In fact, credit to households and firms recovered in the period those operations were implemented, although at modest rates, as it can be seen in more detail in the next subsection 3.3.6.1.

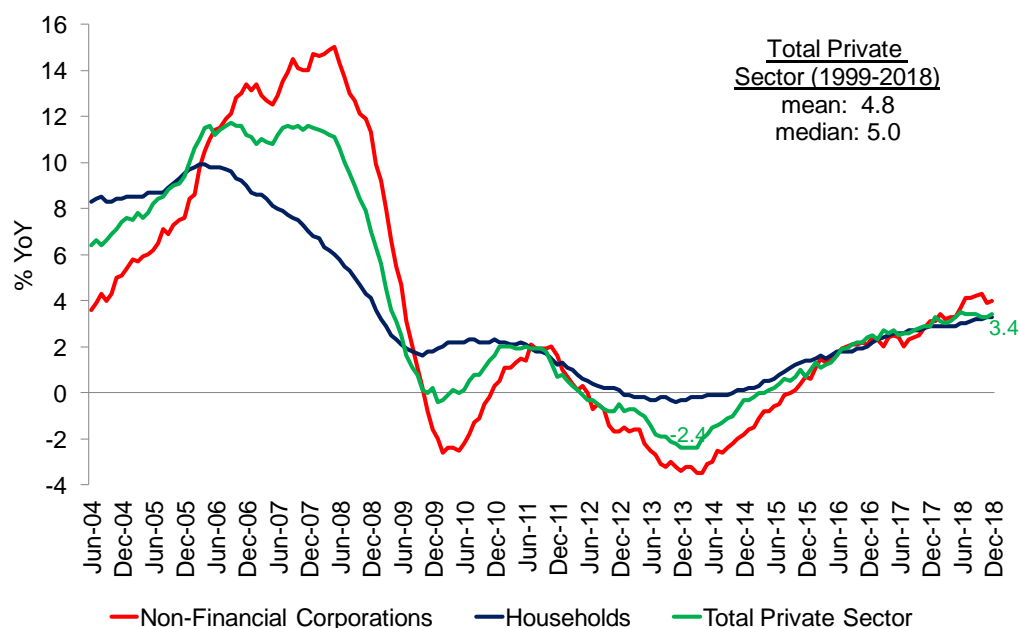
3.3.6. Macroeconomic Indicators during APPs and TLTROs

Now we continue our analysis focusing on the evolution of important macroeconomic indicators (credit, exchange rate, output, unemployment/wages, inflation, sovereign yields) while ECB asset purchase programs and TLTROs were taking place. Considering the initial period of APPs, most of these indicators had positive responses to the programs. Later they had more mixed developments, due to intra-Euro (e.g., financial volatility in bond markets, political instability in Greece) and extra-Euro area factors (i.e., price of oil, USA and China economic uncertainties).

3.3.6.1. Credit

Concerning credit, Euro area data pointed to a gradual recovery after the implementation of the APPs, as it can be seen in the graph 3-8 in the sequence.

Loans to total private sector had declining annual rates of growth since the end of 2011, which became negative in 2012, and only returned to positive territory in May 2015. This growth trend continued with some oscillation, up to 3.4% YoY in December 2018. Loans to non-financial corporations experienced a sharp fall in annual growth rates since the end of 2011, presenting negative or zero rates of growth until August 2015, but since then presenting positive growth, up to 4.0% in December 2018. On the other hand, loans to households traced a less volatile path, not experiencing such a sharp fall such as non-financial corporations. Loans to households' growth rates entered positive territory since November 2014, up to 3.3% YoY in December 2018. Despite this recovery, we can observe that private credit growth is still below its average during the existence of the euro.

Graph 3-8 Euro area - Loans to Total private sector - Growth Rate (% YoY)

Note: Data seasonally adjusted, loans adjusted for sales, securitization and cash-pooling. Total private sector includes households, non-financial corporations and non-monetary financial institutions (e.g., insurance corporations and pension funds). Source: Author own elaboration, based on ECB data.

Further information regarding current conditions and future credit expectations in the Euro area can be obtained in the quarterly ECB *Bank Lending Surveys* (ECB, 2018b). In general, the Surveys from 2015 Q1 until 2018 Q4 showed that, in terms of credit supply, there was a reduction in loan restrictions imposed by banks over non-financial companies and households (except in the 2018 Q4 Survey, when credit standards required by banks were unchanged). In terms of credit demand, there was an increase in households and non-financial companies. Nonetheless, in the case of non-financial companies, until 2017 Q1 this demand growth has been motivated by three main factors⁹¹: the low general level of interest rates; mergers and acquisitions transactions; debt refinancing needs. Inventories/working capital and fixed investments also had positive contributions to credit demand, but the role of the latter was very small, except from 2017 Q2 Surveys onwards⁹². Conversely, alternative sources of

⁹¹ This data is also shown in graph 2-2 (chapter 2).

⁹² In the BLS Surveys of 2017 Q2, 2017 Q4, 2018 Q1 and 2018 Q4, fixed investments was reported as having a role equal/ more important than other categories. Nevertheless, in 2017 Q3, 2018 Q2 and Q3, the general level of interest rates retook the lead from fixed investments as the main factor for the increase in demand for loans to enterprises.

financing (internal funds/ security issuance) had a negative contribution to demand growth, albeit small too. These results support the argument that, even if non-financial corporations presented a moderate recovery in credit growth recently, this was not fully translated into the real economy, as firms generally preferred to use the funds for financial purposes/pay debts, rather than to make new investments in a still uncertain scenario, at least until 2017 Q1, as the BLS data suggests.

Moreover, it is important to highlight that credit conditions are still heterogeneous inside the Euro area, either among countries (e.g., while in Greece access to finance is still the main problem for small and medium-sized enterprises –SMEs, for most other countries the main challenges are the availability of skilled labor – e.g., Germany, France – and finding customers – i.e., Italy, Spain) or within each country (SMEs pay interest rates on bank loans on average 170 bps higher than large non-financial corporations), as reported in ECB's *Survey on the Access to Finance of Enterprises in the Euro Area - SAFE*, April to September 2018 (ECB, 2018a).

3.3.6.2. Exchange Rate

The ECB does not have an official exchange rate policy, as the euro has a flexible exchange rate regime. However, in theory, asset purchase programs could play a significant role in the exchange rate, once an increase in APPs is usually associated with local currency depreciation. Maintaining the euro at a more depreciated level would be desired for the monetary union during its recovery stage, as it would enhance the competitiveness of its exports (supporting output growth) and bring a positive effect for inflation, by increasing the prices of imported goods (imported inflation).

In order to analyze the evolution of the euro exchange rate, and try to capture some influence of APPs on it, we cannot take into account only the rate euro *versus* dollar. The reason behind it is the end of the QE program by the Fed in October 2014 and the outlook of

monetary policy tightening stance in the USA from 2015 onwards. The “Fed effect” led to the appreciation of the dollar against most global currencies (including the euro), starting from the second half of 2014 onwards. However, whenever the USA disclosed weaker output data and/or the Fed gave signs it could delay its interest rate hikes, several global currencies (including the euro) partly recovered their losses against the dollar.

Therefore, in order to better analyze the euro exchange rate, and try to have a more clear view of the influence of APPs on it, we observe the evolution of the euro against the basket of 19 currencies which are most relevant to Euro area’s trade⁹³, measured through the effective exchange rate. Graph 3-9 expresses the evolution of nominal (NEER) and real (REER) effective exchange rates from 2008 to 2018.

Graph 3-9 Euro Nominal (NEER) and Real (REER) Effective Exchange Rate



Source: Author own elaboration, based on ECB data.

The graph shows that from January to April 2015, the euro’s NEER and REER had a significant depreciation. The latter was even more intense than the former, due to the low level of inflation in the Euro area at the beginning of 2015. Since then, those rates took a more volatile path. The euro NEER/REER experienced moments of appreciation (e.g., uncertainties

⁹³ Australia, Canada, Denmark, Hong Kong, Japan, Norway, Singapore, Korea, Sweden, Switzerland, United Kingdom, USA, Bulgaria, Czech Republic, Hungary, Poland, Romania, Croatia, and China.

in China and devaluation of the renminbi in August 2015), as well as moments of depreciation (October/November 2015).

Overall, we can infer that between January and April 2015, the announcement of PSPP and the beginning of its implementation had a depreciation effect on euro's NEER/REER. The "Fed effect" also had a role, but it could not be responsible alone for such sharp euro depreciation movement (once the dollar was appreciating at a strong pace since July 2014). However, between April 2015 and April 2017, it is more difficult to associate euro exchange rate movements with APPs directly, once NEER/REER did not present a clear trend, and several factors were at play at the same time. Nevertheless, the announcement by the ECB that the institution would start reducing the pace of its asset purchases in April 2017 (together with other elements, such as a more positive economic momentum in the Euro area) can be considered a factor that contributed to euro's appreciation between April and September 2017. After this month, euro's NEER/REER oscillated, presenting some periods of appreciation and others of depreciation.

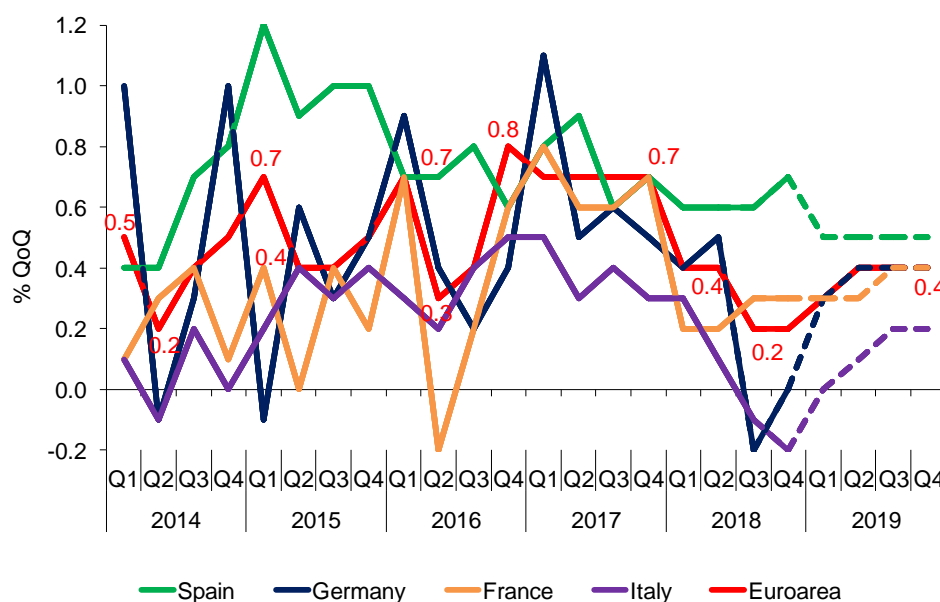
3.3.6.3. Output

Quarterly GDP results of the Euro area and its main countries between the period 2014 Q1-2018 Q4, as well as its current forecasts for 2019 Q1-2019 Q4, are presented in graph 3-10.

In terms of the Euro area, it can be seen that the period of the announcement/ initial implementation of APPs was an occasion when growth recovered (from 0.2% in Q2 2014 to 0.4% in Q3 2014), peaking at 0.7% in Q1 2015, quarter when the PSPP was announced/ implemented. In the following quarters, GDP growth oscillated between 0.3% and 0.7%, usually closer to the lower figures of this range. So after a good start in the quarter of PSPP announcement/ implementation, it took almost two years until GDP resumed growing on a more considerable level for a longer time period (around 0.8% and 0.7%, from Q4 2016 until Q4 2017). In 2018, growth was positive but lost some momentum (0.4% in Q1-Q2, and 0.2%

in Q3-Q4). In 2019, the European Commission forecasts a quarterly growth level not much higher (between 0.3% and 0.4% QoQ).

Graph 3-10 Euro area GDP Growth: 2014-2019 (% QoQ)



Note: Bold lines are actual values (2014 Q1- 2018 Q4). Dotted lines are forecasts (2019 Q1- 2019 Q4). Source: Author own elaboration, based on Eurostat (past data) and European Commission (2019) forecasts.

Besides the more accommodative monetary policy, other factors that have supported Euro area's growth in the period 2014-2018 were: i) Private consumption (drop in energy prices until 2016 and rise in employment⁹⁴ increased real household income and improved consumer confidence); ii) A more neutral fiscal stance (differing from the tightening that prevailed in previous years); iii) A modest recovery in investment. Despite the weaker exchange rate in historical terms that helped net exports growth in the first part of 2015, the slowdown of foreign demand in important trade partners (e.g., Russia, China) did not provide a great stimulus for Euro area's net exports on the following quarters (with the exception of some countries, like Spain). Overall, it was more a domestic-led than a foreign-led recovery.

On annual terms, after recording negative GDPs in 2012 and 2013, the Euro area returned to positive values in 2014 (1.4% YoY), then increasing to 2.1% in 2015, slowing to

⁹⁴ Starting to recover from 2014 onwards, the employment level has already reached its pre-2008 crisis level. However, broader measures of labor underutilization still remain quite high, as detailed in section 3.3.6.4.

2.0% in 2016 and recovering in 2017 (2.4%). The European Commission Winter 2019 forecast projects a slower pace in the following years: 2018 (1.9%), 2019 (1.3%), 2020 (1.6%). Although the Euro area has presented a moderate GDP recovery in recent years, several factors pose doubts to the continuation of this growth for a longer period. On regional terms, the concerns are mainly political: uncertain outcome of Brexit negotiations, greater influence of anti-establishment parties in some countries, immigration/refugee problems, security/terrorism issues. On international terms, the risks are political (i.e., protectionist measures, possible escalation of military conflicts), with impacts on both economic spheres: i) on the real side, a slowdown in global trade/output due to protectionism/sanctions/military conflicts; ii) on the financial side, an unwarranted disruption of global financial conditions and increased market volatility, led for events such as a faster than expected monetary tightening in USA, which may hit in particular emerging market economies. Those impacts on the international economy could bring negative spillovers that could derail Euro area's recovery. All those factors could contribute to an environment of greater uncertainty, which could hinder investment and growth.

3.3.6.4. Labor Market and Wages

After the 2008 crisis, unemployment levels were one of the indicators which took more time to begin their recovery. In fact, in the Euro area as a whole, unemployment levels increased from 7.3% in 2008 to a peak of 12.1% in February-July 2013. Then it started a very slow decline to 11.5% in June 2014, when it stagnated. The downward trend only resumed in December 2014 (11.3%), falling to 7.9% in December 2018. Nonetheless, those numbers varied substantially across countries, with countries in the periphery such as Greece and Spain reaching peaks of 27.9% and 26.3% of unemployment in July 2013, respectively. Groups which face more obstacles in the labor market (e.g., low skilled workers, youth) were particularly hit. For instance, youth unemployment in the Euro area achieved a peak of 24.8%

in the Euro area in February 2013, while in Greece and Spain it achieved the marks of 60% and 55.9% in the same year, respectively.

Despite the improvement in unemployment's headline number, broader measures of labor underutilization still remain quite high, around the double (16%)⁹⁵ of regular measures of unemployment, according to data available in the *EU Labor Force Survey* (Eurostat, 2018). Figures like the share of long-term unemployment (beyond 12 months) still around 50% of the total unemployed, and the high number of discouraged workers who gave up searching for work are worrisome.

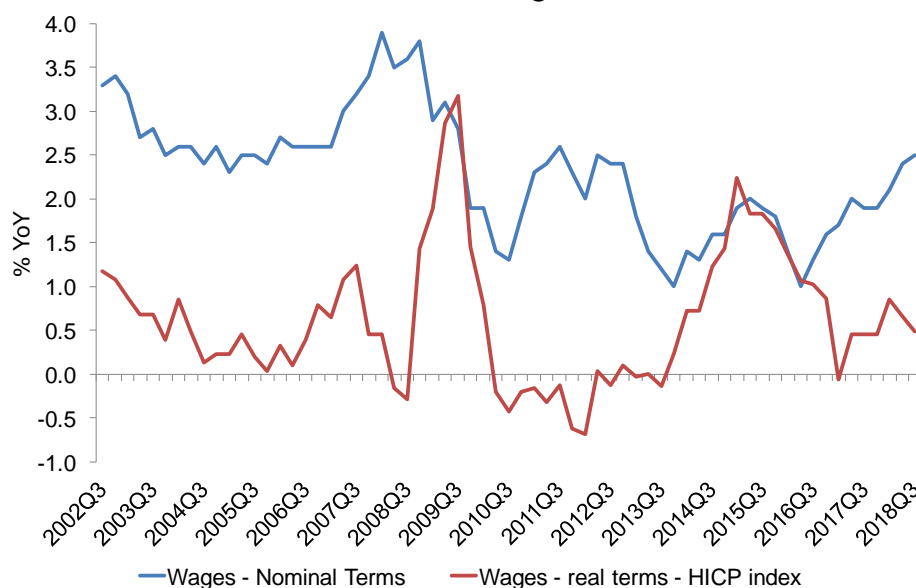
Other *EU Labor Force Survey* data also show that from the net employment created since the 2008 crisis, around a third has been for workers on temporary contracts, and around a quarter part-time. Furthermore, the share of involuntary part-time workers (unable to find full-time work) increased from 24.4% in 2007 to 30.4% in 2016. Those numbers allow us to infer that there was an increase in the precariousness of job creation in the period. Moreover, the increase in temporary or part-time employment as a share of total employment may have reduced the pressure for wage increases, since those workers have less union representation/bargaining power and more immediate objectives than wage increases (e.g., keeping their employment, increasing the number of hours worked, finding a full-time job).

Indeed, when we observe the evolution of Euro area annual wages/salaries growth in the business economy⁹⁶ in nominal and real terms, we note that it was modest, as it can be seen in graph 3-11.

⁹⁵ This figure is computed by expressing the numbers of unemployed with other three categories: i) underemployed (involuntary part-time workers); ii) individuals available for work but not seeking it (i.e., "discouraged workers"); iii) people seeking work but not available for it (e.g., students who want to work but have not completed their studies yet). This number is a percentage of the extended labor force (i.e., employed and unemployed, who comprise the active labor force, plus the "potential additional labor force", composed by ii and iii).

⁹⁶ According to Eurostat, the "business economy" category includes all workers in the private sector (i.e., industry, construction, services), excluding workers from public administration and social work. We used the "business economy" category because the time series is available since 2002, which allowed us to compare pre and post 2008 crisis trends. Conversely, the data series for the category which includes public administration and social work begins only in 2010. As the wages in this category usually grew on a slower pace than those of the

Graph 3-11 Euro area Wages/ salaries growth – Business Economy (%YoY) – 2002/2018 Q3



Note: “Wages/salaries” is one of the components of Eurostat Labor Cost Index (LCI). The other components of LCI are “social contributions paid by employers” and “other costs” (e.g., taxes on labor, training). Data seasonally adjusted. Source: Author own elaboration, based on Eurostat data.

Regarding nominal wage growth in the business economy, one can see that the average presented before the 2008 crisis (around 3%) was not restored. After the implementation of APPs, despite some recovery between the end of 2014 and the middle of 2015, at the end of 2015-2016, it was not sustained. Only from 2017 Q2 onwards, nominal wages sustained a more reasonable growth level (at least 2%). Observing real wage growth, the peaks in 2009 Q3 and 2015 Q1 were associated with occasions when the Euro area was into deflation (-0.4% and -0.3%, respectively). Furthermore, real wages have grown at a slower pace than nominal wages during more recent quarters, since headline inflation has gone up.

The ECB attributes this modest wage growth to several factors beyond the increase in the temporary/part-time job creation, such as backward-looking wage negotiations; technology and its impacts in labor displacement; rise of global value chains and delocalization of production. While some of those factors may disappear as the slack in the

private sector, when we observe the aggregate figures for the private and public/social sectors since 2010, the numbers are in most occasions lower than those reported for the “business economy” category.

labor market closes, others may stay for a long time (e.g., high share of long-term unemployment/discouraged workers due to labor market segmentation⁹⁷), weakening the case for more rapid wage increases, and therefore for a faster growth in core inflation/ domestic output in the medium-term.

3.3.6.5. Inflation

When it comes to inflation, we analyze first the developments in the headline HICP index, and after the core HICP index⁹⁸.

Regarding the headline HICP index, its dynamics was strongly influenced by energy prices. Energy prices on the Euro area presented negative values from July 2014 until November 2016 (mostly because of falling global oil prices). On its turn, headline HICP prices registered deflation in the Euro area between December 2014 and March 2015, 0% YoY in April 2015 and positive values in general after that. Yet, whenever the deflation in energy prices regained strength, headline HICP turned again into negative/null values (e.g., September 2015, February - May 2016). However, after a rapid increase in energy prices at the end of 2016/beginning of 2017 (coupled with a one-off rise in food prices), headline HICP increased from 0.6% in November 2016 to 2% in February 2017. A similar movement occurred in 2018, with energy prices pushing headline inflation from 1.2% in April to 2.2% in October, then moderating to 1.6% in December.

While the headline HICP traced a more volatile path, the core HICP index usually presented less sharp fluctuations. The core HICP index increased from 0.6% in January 2015 to 1.1% in October 2015, and then it slowly lost its previous gains until 0.7% in April 2017. Next, it presented some recovery, up to 1.2% in July 2017, oscillating to around 1.0% in December 2018.

⁹⁷ The rise in labor market segmentation (a fraction of workers achieving better opportunities in high paid jobs with open-ended contracts, while another significant share of workers remain excluded from those opportunities, in temporary/low paid jobs or long-term unemployment) is also a factor that contributed to a substantial increase in income inequality in several EU countries in recent years, as mentioned by Santos *et al.* (2017).

⁹⁸ The evolution of headline and core HICP indexes is shown in graph 3-1.

Therefore, the headline HICP presented some spikes in specific months, due to one-off increases in energy and food prices, but in general, this higher level was not expected to be sustained later⁹⁹. A similar argument can be made with core HICP, once two of its main components - service prices and non-energy industrial goods - presented only temporary increases (e.g., service prices at 1.8% in April 2017, due to Easter-related items), which were not sustained afterward.

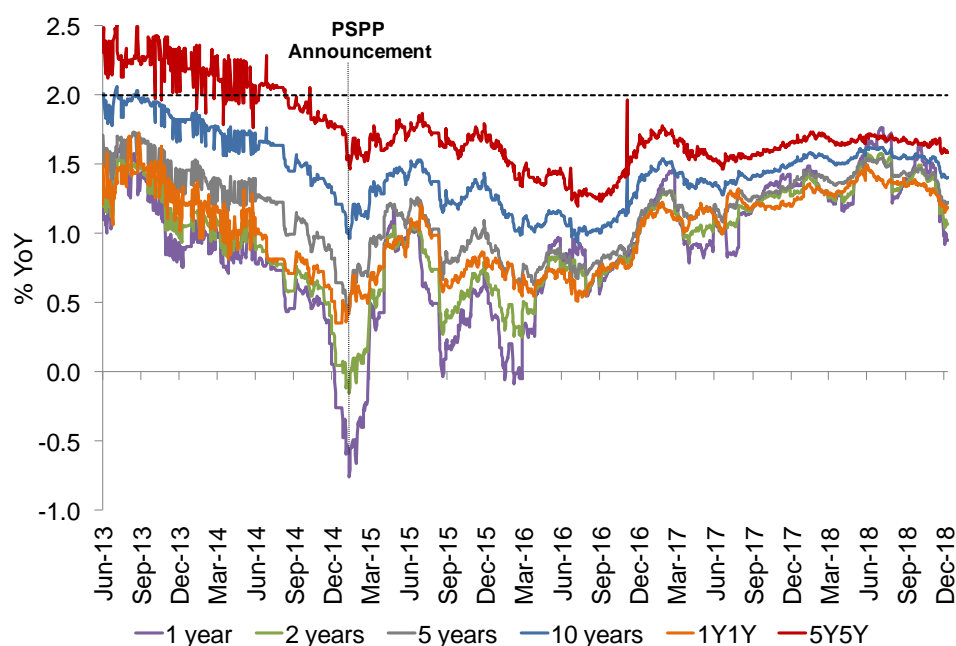
In terms of inflation projections, the European Commission Winter 2019 forecast points that headline HICP should present an average of 1.7% YoY in 2018, 1.4% in 2019 and 1.5% in 2020. According to the institution, headline inflation increased in 2018 due to energy price pressures (notably in Q2 and Q3), leading to an average of 1.7%. For 2019, the projection is smaller (1.4%), since energy prices will probably be lower (futures oil prices already started to decline in Q4 2018). For 2020, the forecast points to an average of 1.5%, due to a modest rise in core inflation, following a gradual pickup in nominal wages and still accommodative monetary conditions.

As for inflation expectations, they are usually measured through inflation swaps and forwards¹⁰⁰, as it can be seen in graph 3-12 in the sequence. We can see that since APPs announcement/implementation, inflation expectations have recovered most of their ground, especially after the PSPP announcement in January 2015. However, when we check the 1Y-1Y and 5Y-5Y forwards¹⁰¹, which would be less volatile references for inflation expectations over the medium term, we observe that they are still below the 2% objective.

⁹⁹ Except after ECB press conference of 14 June 2018. At this occasion, the ECB projected that energy price pressures that happened in Q2 2018 were likely to impact headline HICP for most of the following months of 2018.

¹⁰⁰ Inflation swaps and forwards are both financial instruments used for the purpose of hedging against future inflation. As measure of inflation expectations, the advantage of forward instruments would be that they are less volatile and sensitive to sudden changes in inflation expectations, as mentioned by the Bank of Finland (2016).

¹⁰¹ The 1Y-1Y forward measures the average expected inflation over the one year period that begins one year from today. The 5Y-5Y forward measures the average expected inflation over the five-year period that begins five years from today. So while the 1Y-1Y forward measures average inflation expectations for the period 1 to 2 years ahead, the 5Y-5Y forward measures average inflation expectations for the period 5 to 10 years ahead.

Graph 3-12 Inflation expectations: Swaps (1-10 years) and Forwards (1Y-1Y; 5Y-5Y)

Source: Author own elaboration, based on Thomson Reuters Datastream data.

Ultimately, we can say that the Euro area barely avoided deflation in 2015 (0%) /2016 (0.2%), and just in 2017 inflation started showing signs of recovery (1.5%).

During the course of 2017, the ECB Governing Council members began to state in their press conferences/speeches what the institution considered to be the necessary conditions to achieve the “sustained adjustment in the path of inflation” - SAPI. In other words, the conditions viewed by the ECB as necessary to provide a balanced growth level of inflation in the medium term, which would guide its policy decisions. The ECB would take its decisions based on three criteria: i) Convergence: headline inflation should be on course to the objective of below, but close to, 2% YoY over a medium-term horizon; ii) Confidence: sufficient confidence in a durable stabilization of inflation around these levels, in the sense that it is not transient/temporary ; iii) Resilience: A self-sustained convergence, which does not require all accommodative monetary measures that had been implemented to be maintained.

When confirming the end of net asset purchases in the December 2018 meeting, the ECB presented its reasons why it considered that the SAPI conditions had presented

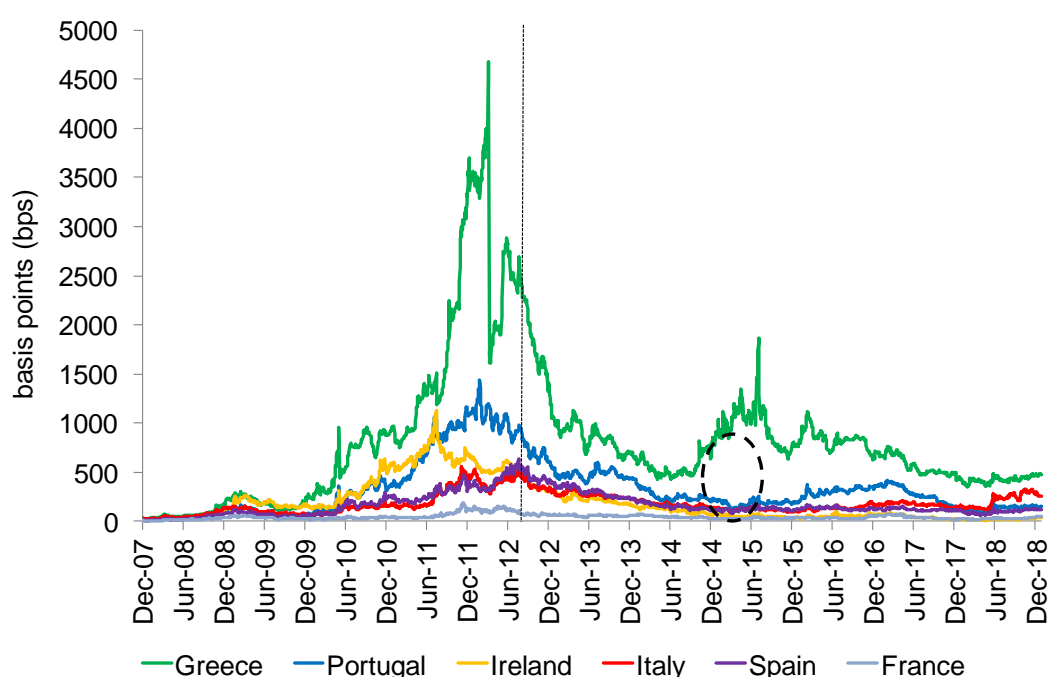
“substantial progress”. First, it claimed that convergence was observed, once its inflation projections presented considerable improvement in the recent period, and also that uncertainty had reduced and confidence intervals around the 2% objective were narrower. Second, the institution argued in favor of confidence, since inflation expectations measures (marked-based and *ECB Survey of Professional Forecasters*) showed signs to be converging towards the objective not on a temporary, but on a durable basis. Third, the ECB claimed to observe resilience, in the sense that deflationary risks had disappeared, inflation expectations were more anchored, and the gradual economic recovery did not require anymore the continuation of net asset purchases. However, the institution recognized the existence of downside (international and domestic) risk factors in place, which still justified an accommodative monetary stance, such as keeping interest rates at historical low levels for at least the summer of 2019, and continuing the reinvestment of principal payments from maturing securities purchased under APPs for an extended period, past the date key ECB interest rates start to be raised again.

3.3.6.6. Sovereign yields

Sovereign bond yields in the Euro area had very close levels between the beginning of the euro physical circulation in 2002 until the emergence of the global financial crisis in 2008. The idea that all countries within the monetary union were on a “convergent path” and exposed broadly to the same sovereign risks made possible that this sovereign yield convergence occurred. In fact, it fostered large lending flows from banks of core countries to the periphery, as discussed before in section 3.1. This scenario changed after the 2008 financial crisis, when periphery sovereign yields started to diverge from the core, and increased considerably between 2010 and 2012. This divergence could signal an intra-Euro area “flight to quality” episode, with capital flows from periphery to core countries (notably Germany). For periphery countries, this could lead to increasing difficulties in refinancing

their debt. Conversely, this would increase the trend towards negative sovereign yields in core countries like Germany. In the end, this fact increased considerably sovereign spreads between Euro area core and periphery countries. This divergence only began to be reversed by mid-2012, with the introduction of ECB's "verbal intervention" strategy and other financial stability/stabilization initiatives (banking union project, ESM), as it is highlighted by the dashed line of graph 3-13 in the sequence.

Graph 3-13 Euro area - 10 Year Sovereign Bond Spreads to German Bunds (bps)



Source: Author own elaboration, based on Thomson Reuters Datastream data.

The set of initiatives announced in September 2014 and especially the PSPP announcement in January 2015 (inside the dotted ellipse of graph 3-13) gave new impetus to yields' downward trend (with the exception of Greece, due to the political and economic turmoil experienced by this country). The reduction in yields was important for countries such as Ireland, Portugal, and Spain, once it diminished the cost of financing their sovereign debt and the burden over their fiscal accounts, since they had been struggling in recent years to reduce their debt and deficit levels.

Nevertheless, yields also dropped in core countries, which were already at very low levels. In particular, there was a reduction in the availability of German bonds in the market, since it was the security more often purchased by the ECB/Bundesbank (because of the higher German share on ECB's capital key), and the German Finance Agency did not change its issuing schedule substantially after the announcement of the PSPP, keeping its objective of not increasing the country's debt ratio. At the end of April 2015, the German sovereign bond yield curve had negative yields up to maturities of 7 years, and 10-year yields were hovering around 0.07%. In the date of April 29, 2015, the 10-year yield jumped from 0.16% to 0.28%, and in the first week of May, it was trading near 0.58%. This sudden volatility came to be known as "bund tantrum". Some analysts claimed it was caused by the release of macroeconomic indicators, which implied higher growth and inflation expectations for the Euro area (e.g., at the end of April 2015, the release of first Euro area HICP out of deflation after four months, coupled with higher oil prices). But a more proper analysis made by authors such as Sundaesan and Sushko (2015) and Domanski, Shin and Sushko (2017) observed that institutional investors (insurance/pension funds) tend to have in their balance sheets liabilities with longer duration than their assets. In an environment of continuous falling yields, their duration risk increases, and so their demand to hedge against possible interest rate changes. At that moment, there was a spike in institutional investors demand to receive fixed rate payments via swaps to hedge those positions, while at the same time there was a lack of counterparties willing to receive floating (pay fixed) rates amid the trend of continuous falling yields. The steeply rising euro hedging costs preceded the correction in yields, which resulted in the "bund tantrum".

In the following months, German and Euro area sovereign yields have experienced periods of higher volatility. When uncertainty rose (i.e., middle of 2015, with the problems in Greece, or in the second half of 2018, with the clash between Italy and the European

Commission on its budget), Euro area's yields restored their previous diverging trend: core yields decreased with risk aversion, while yields on those specific countries in the periphery increased, albeit still at much lower levels than back in 2011/2012. Also, in days when economic data pointed to higher future inflation, all sovereign yields rose due to higher inflation expectations. Nevertheless, yields are expected to continue at low levels as long as accommodative policies continue in place.

Even with the episodes of bond market volatility between April and June 2015, yield levels remained historically low. During PSPP implementation, yields of several countries were traded in negative territory, including mid-term maturities (e.g., Germany up to 10 years at certain occasions in 2016), some even below the deposit rate. Some of the concerns related to the very low/negative yield levels were: (i) Low bank profitability (squeeze in net interest margins, due to lower lending rates and stickiness in negative deposits for retail customers), leading to problems on their balance sheets; (ii) Institutional investors may also have problems in their balance sheets, with the increasing duration mismatch between liabilities and assets; (iii) Possible losses incurred by savers, as they see their long-term income in bank deposits shrink, and could even bear the costs of negative deposit rates if banks decided to pass them on to customers; (iv) Extremely low yield levels could feed new asset bubbles, with potential to generate financial stability distress and raise wealth inequality, once the gains in financial asset prices are unevenly concentrated in individuals with large net worth (asset owners).

With regard to those criticisms, the ECB has presented its own justifications. In terms of the issues in banks' balance sheets, it argued that Euro area's banks profitability so far has been resilient, since the squeeze in net interest margins was compensated by other alternative measures: i) Increased funding in wholesale markets at lower levels; ii) Expansion of loan volumes; iii) Higher non-interest income with fees and commissions; iv) Reliance in capital

gains or lower provisioning costs with an improvement in borrowers' balance sheets; v) Implementation of operational restructuring plans, seeking to raise efficiency and reduce costs. Furthermore, the banking supervisory framework already had a huge improvement since 2008, and the ECB remains ready to act if there is an unwarranted tightening of financial conditions or change in the inflation outlook. As for the potential losses for savers, it argued that due to competition, banks did not pass on negative interest rates to retail customers. When it comes to worries about new asset bubbles, the ECB claimed that, as credit growth is still moderate, it does not see any broad movement of "releveraging". If any specific sector starts presenting signs of overvaluation (e.g., real estate/housing prices in some big European cities), this will be addressed by proper macroprudential policies in those respective places. In broader terms, the ECB argued that low yields are due to the extraordinary financial conditions, and that the continuation of an accommodative stance is still justified to ensure that the path towards a sustained convergence of inflation to ECB's objective proceeds and is maintained even after the end of net asset purchases in December 2018.

Nevertheless, in the episode of "bund tantrum", important players in the market that were linked to it (e.g., insurance, pension, mutual and exchange-traded funds) are not under ECB direct supervision. Although they are all overseen by a common Euro area macroprudential body (the European Systemic Risk Board), the ESRB only issues warnings and recommendations to national macroprudential authorities but does not have enforcement powers to implement measures itself. The same happens with EU financial market supervision authorities for securities (ESMA) and insurance/pensions (EIOPA). Therefore, the "bund tantrum" experience and the possible problems in those agents' balance sheets associated with low interest rates suggest that financial regulation/supervision should continue to be strengthened. This strengthening is necessary not only in the banking sector (completing

the Banking Union), but also in those other EU non-bank financial market supervision and macroprudential authorities. Those entities could have more enforcement powers at EU level¹⁰², an element that would be very important to face a possible financial crisis with systemic implications in the EU. They should also improve their coordination with respective national authorities, in order to harmonize rules and avoid that sudden movements of agents under their oversight (e.g., institutional investors) provoke sharp volatility episodes, with potential to disrupt financial markets and the real economy.

3.4. Literature Review of Effects of ECB Unconventional Monetary Measures

3.4.1. Effects on Output and Inflation

In this subsection, we present a literature review on articles that evaluate the economic effects of ECB's unconventional monetary measures, focusing on output and inflation. As a reference, we only considered papers whose data samples begin from the global financial crisis (2007/2008) onwards, which gave us a number of 10 articles, whose main features are summarized in table 3-3 in appendix 3.1. From those papers, in just two the sample coverage does not encompass asset purchase programs started in September 2014, while in the other eight at least part of APPs are considered. In terms of methodology, they are broadly divided into two categories: VAR models (Structural, Panel or Global) and DSGE models (with financial frictions, and sometimes using Bayesian estimation techniques). As their methodologies are quite different, the studies are not directly comparable. The range of results (from very small effects, up to 1.1%), and the time the peak effect is achieved (from 1 quarter up to two years) are very diverse as well.

Still, we can affirm that, in general terms, the results point to positive effects on output and inflation, usually with stronger effects for output than for inflation. The studies argue that

¹⁰² The European Commission submitted a proposal in September 2017 to increase the autonomy of its supervisory agencies (EBA, EIOPA, ESMA), with the latter gaining more powers over certain sectors of EU capital markets. They also proposed some changes in the governance of the ESRB. However, even if those changes are implemented (after being approved by the European Parliament and the Council), these institutions will not have full enforcement powers at the EU level, even in occasions of crises.

those effects are generated by the following monetary policy transmission channels: portfolio rebalancing, signaling, credit/bank lending, exchange rate, inflation re-anchoring, although some of those channels are not mentioned, or considered weak in a few studies. Overall, the literature review points out that ECB UMPs had positive effects on output and inflation through several transmission mechanisms. Nevertheless, the wide dispersion of results does not allow us to affirm that those effects were strong or lasting enough, so as to promote a sustained output growth or convergence of inflation to its target.

3.4.2. Effects on Bond Yields

In this subsection, we present a literature review on articles that evaluate the effects of ECB's unconventional monetary measures on sovereign and corporate bond yields. As a reference, we considered a set of 13 papers (8 more focused on sovereign bond yields¹⁰³, and 5 focused on corporate bond yields¹⁰⁴), whose main features are summarized in table 3-4 in appendix 3.1.

In terms of data, the samples begin after the global financial crisis (2007/2008) in all of them. On the methodology, for the ones which focus in sovereign bond yields, the most common methodology is an “event study” analysis around the main program announcement/implementation dates, with 1-day or 2-day windows. Some of them prefer to rely not only on official announcements or implementation dates, but also on a broader range of information publicly available related to agents' expectations on ECB's announcements/measures (“market news”). For the ones focused on corporate bond yields, the methodology usually applied is regression analysis, in general under panel data frameworks. Regarding the programs covered, from the papers focused in sovereign bond yields, two are related to ECB programs implemented before APPs (SMP, LTROs, OMT), while other six cover APPs, or

¹⁰³ Among those papers, we only included the ones whose dependent variable is the 10-year sovereign bond yield. We did not include papers which use distinct dependent variables (i.e., sovereign spreads to German bunds), or different bond maturities, in order to keep the results on the same scale.

¹⁰⁴ The papers available in the literature which focus on this topic use as dependent variable the corporate yield spread to a certain risk-free benchmark (e.g., swap rate, OIS, Euribor, German bond).

previous programs and APPs. The five papers focused on corporate bond yields base their analysis on the CSPP.

Regarding the impacts on bond yields, they are not all directly comparable, since each study reports its results in a distinct way (1-day window, 2-day window, cumulative impact during a period of implementation). Still, we can make some general comments on the main findings. The great majority of studies report a fall in bond yields after program announcement/implementation dates. The exception is in pre-APP programs (SMP, OMT), on the yields of core countries, as shown by Fratzscher *et al.* (2016), Briciu and Lisi (2015), Varghesi and Zhang (2018). The fact that bond yields rose in core countries after the announcement/implementation of pre-APP programs was a signal that risk aversion decreased somewhat, and hence these countries' bonds received a lower safe-haven demand on those occasions.

Analyzing the impacts on sovereign bond yields with the announcement/implementation of APPs, the studies report a more intense reduction in yields from periphery countries (i.e., Spain) than from core ones (i.e., Germany). When comparing if the drops were larger in program announcement or implementation dates, the results are not conclusive. One could expect that the impact in a program announcement would be larger than in its implementation date, due to the surprise component of the announcement. However, Breckenfelder *et al.* (2016) find that the average impact in Euro area's bond yield on the occasion of PSPP implementation (March 2015) was slightly larger than in PSPP announcement (January 2015). The author attributes this result to the fact that new and relevant information (i.e., the maturity distribution of the purchases) became public only at the implementation date, and not before at the announcement.

Regarding the studies that focus on corporate bond yields, they find significant drops in yields both in the announcement and in the implementation of CSPP program. The largest

drops occurred in investment-grade bonds with a lower rating (BBB- or similar). As Abidi and Miquel-Flores (2018) show, the most significant falls occurred in bonds which are considered eligible for ECB purchases (BBB- in at least one rating agency), but not considered by many market participants as investment grade (once these bonds do not have the majority of their ratings above the BBB- threshold). In general, at the beginning of CSPP program implementation, the studies point to significant yield drops only in ECB-eligible bonds. As the program implementation continued through time, yields started to drop not only in ECB-eligible bonds but also in non-ECB-eligible bonds. As Zaghini (2017) argues, this would occur because once bond market conditions improve, there is a stimulus for investors' risk-taking, which would increase the demand also for non-ECB-eligible bonds, lowering their yields.

When it comes to the transmission channels of monetary policy, for the studies focused on sovereign bond yields including APP programs, Altavilla *et al.* (2015) and Breckenfelder *et al.* (2016) describe the channels which appear in the literature more regularly: portfolio rebalancing (with scarcity and duration mechanisms), signaling and credit, as well as inflation re-anchoring in the case of the Euro area. The studies focused on sovereign bond yields which perform their analysis on pre-APP programs identify distinct channels, once those programs were implemented in a more acute phase of the Euro area crisis, and had different objectives, as explained in section 3.2. Thus, Krishnamurthy *et al.* (2018) also identify the following channels: reduction in default risk, reduction in redenomination risk, reduction in market segmentation. Fratzscher *et al.* (2016) analyze the spillovers of UMPs to other economies and hence identify the following channels: international portfolio balance, bank credit risk, sovereign credit risk, confidence. For the studies focused on corporate bond yields, the portfolio rebalancing channel would have an important role, especially its scarcity mechanism, increasing the demand first of ECB-eligible

and later also of non-ECB-eligible bonds, as described by Zaghini (2017). Nonetheless, authors such as Arce *et al.* (2017) and Grosse-Rueschkamp *et al.* (2018) argue in favor of the existence of an additional channel, which they respectively call “credit reallocation” or “capital structure” channel. Those authors show evidence that the CSPP would induce companies which are eligible for ECB purchases to issue more bonds, and reduce to some extent bank loans¹⁰⁵, hence changing their funding structure from banks towards debt markets.

As Grosse-Rueschkamp *et al.* (2018, p. 39) state “*the announcement of ECB purchases reduces bond yields of firms whose bonds are eligible for these purchases. These firms substitute bank term loans with bond debt, which relaxes banks’ lending constraints. These banks can use their balance sheet capacity to provide credit to firms, which might previously have been constrained*”. Hence, these authors claim that this substitution *redirects banks’ lending capacity* to firms which do not have access to public capital markets or whose bonds are non-eligible for ECB purchases. We do not dispute the data provided by these authors, which show the change in ECB-eligible companies’ funding structure towards more bonds and fewer bank loans, and also an increase in bank loans to firms which are not eligible for ECB purchases. The great problem we see in this so-called “credit reallocation channel” is that it relies on an erroneous loanable funds theory logic, like the “bank lending channel” discussed in section 2.3. The credit reallocation channel supposes that banks have an *ex-ante* amount of reserves (“balance sheet capacity”), which if it is not used for granting loans to ECB-eligible firms, can automatically create loans to non-ECB-eligible firms. Instead, according to the widely recognized endogenous money framework¹⁰⁶, we know that this channel is wrong. If banks are increasing their loans to non-ECB-eligible firms, this is not because they have more available reserves. In fact, this is occurring because, as economic

¹⁰⁵ Grosse-Rueschkamp *et al.* (2018) show that this substitution would be particularly important for BBB rated firms. With a higher level of bond issuance and lower level of bank loans, their overall leverage was kept roughly the same. Conversely, AAA to A- firms increased bond issuance and reduced far less their level of bank loans, hence expanding their leverage.

¹⁰⁶ See further discussion of the endogenous money framework in section 2.3.5.2.

output is recovering to a certain extent in the Euro area, the demand for bank loans by these non-ECB-eligible firms is gradually picking up. Moreover, as financial conditions remain accommodative and liquidity preference reduces, banks have incentives to provide loans to those borrowers, who have a lower rating, but are now within banks' creditworthiness criteria.

Finally, we cannot agree in full with the views of authors such as De Santis *et al.* (2018a) that the CSPP: i) Allowed companies that issue bonds to boost their investment levels and ii) Helped SMEs indirectly, by allowing that banks substitute loans previously destined for bond issuing companies to SMEs. Related to the first point, Grosse-Rueschkamp *et al.* (2018) show that the largest shares of the new funds acquired by bond issuance were destined to merger and acquisition activities (in the case of AAA/ A- firms) or loan repayments (in the case of BBB firms). Arce *et al.* (2017) also find evidence that the funds were used more for repaying loans than for investment. Related to the second point, De Santis *et al.* (2018a) support their argument on the fact that the ECB *Survey on the Access to Finance of Enterprises in the Euro area* - SAFE showed a small increase in the willingness of banks to offer credit to SMEs in the Euro area in the first half of 2016 (period when CSPP was announced/started to be implemented). However, SAFE data (ECB, 2018a) points out that this increase was observed in some specific jurisdictions, such as France, while this willingness declined in other important countries (e.g., Germany, Spain). Indeed, using data for Spanish firms, Arce *et al.* (2017) find that the increase in bank loans observed after the CSPP was more destined for large non-ECB-eligible companies than for SMEs. Therefore, those arguments support our views that: i) The increase in the availability of funding by firms was not primarily directed for investments, but mostly for other non-productive purposes; ii) Despite the modest credit recovery observed in the Euro area after 2014, conditions are still heterogeneous, and SMEs remain in a less favorable position, as previously discussed in subsection 3.3.6.1.

3.5. Asset Purchase Programs: Yield Curve Impacts

In this section, our objective is to analyze Euro area's sovereign and private yield curves' levels and differentials with ECB's main asset purchase programs announced/implemented from 2009 onwards. In each group of programs, by observing the outcomes in announcement and implementation dates, we compare the similarities/differences of results in core/periphery countries, and infer the importance of distinct UMP transmission channels (i.e., signaling and portfolio rebalancing) to achieve those outcomes. Our analysis is based on a one-day window¹⁰⁷ around each program announcement/implementation, considering that each program announcement/ implementation was the main event that influenced yield changes on its respective day¹⁰⁸. All graphs which base the analysis presented in this section are in appendix 3.2, at the end of this chapter.

3.5.1. Sovereign Bond Programs

Yield Curves: Cover 2, 5, 10, 30-year¹⁰⁹ sovereign bonds of 10 Euro area countries: 5 from the core (Germany, Netherlands, France, Belgium, Austria); 5 from the periphery (Italy, Spain, Portugal, Ireland, Greece).

¹⁰⁷ According to the widely used "event study" methodology, selecting the window length involves a trade-off between keeping the window narrow enough to make it unlikely to contain the release of other important information, and allowing sufficient time for revised expectations to become fully incorporated in asset prices. Several articles use two-day-windows, once this is a commonly used window in articles that analyze the U.S. experience. However, for the Euro area case, this might not be adequate, since important monetary policy announcements in ECB meetings (first Thursday of the month) were followed by the announcement of U.S. payroll report in the following day (first Friday of the month), as argued by Altavilla *et al.* (2015). Furthermore, our data source (Bloomberg) could not provide historical data of yield levels on an intraday (hourly) basis. For those reasons, we opted for a one-day window.

¹⁰⁸ For each date of UMP program announcement/implementation, we observed the major macroeconomic indicators disclosed on the same day by Eurostat, and the indicator's surprise component (actual value - expected value) according to Reuters poll. We found coincidences between UMP program announcements/implementations and major macroeconomic indicators on the following dates: i) CBPP 1 implementation (02/07/2009) and Euro area unemployment May 2009; ii) OMT announcement (06/09/2012) and second estimate of Euro Area GDP Q2 2012; iii) PSPP implementation (09/03/2015) and second estimate of Euro Area GDP Q4 2014. In all of them, the surprise component was zero. This fact supports our assumption that the UMP program announcement/implementation was the main event that influenced yield changes on its respective day. Besides this fact, other authors in the literature have used the same assumption when performing their studies, such as Gagnon *et al.* (2011).

¹⁰⁹ When those maturities are not available, the closest available maturity is presented (e.g., 3 months instead of 2 years in the case of Greece; 9 instead of 10 years and 15 instead of 30 years in the case of Ireland).

3.5.1.1. Securities Markets Programme (SMP)

Levels: Line graphs compare yield curve levels in four dates: date of the implementation of SMP first phase¹¹⁰ (10/05/2010); trading day before the implementation of SMP first phase (07/05/2010); date of implementation of SMP second phase (08/08/2011); trading day before the implementation of SMP second phase (05/08/2011).

Differentials: Column graphs compare yield curve differentials in two occasions: date of implementation of SMP first phase (10/05/2010) and trading day before the implementation of SMP first phase (07/05/2010); date of implementation of SMP second phase (08/08/2011) and trading day before the implementation of SMP second phase (05/08/2011).

Analysis:

Observing periphery countries, one can see that in the first phase, yields fell more in Portugal, Ireland and Greece (which were the countries targeted at this phase). It is worth noting the highly dysfunctional (inverted) yield curve of Portugal, Ireland, and Greece, pricing more risk at shorter maturities. On the second phase, yields fell with more strength on Italy and Spain (the countries targeted at this phase). On both phases, the larger impacts were on shorter maturities (SMP's purchases average maturity was 4.3 years).

Core yields were not targeted on the SMP, but their movements usually were a sign of “risk-off” (lower risk propensity, lower core yields) or “risk-on” flows (higher risk propensity, higher core yields). In the first phase, the usual response of increase in core yields meant a “risk-on” movement, narrowing spreads between core and periphery. In the second phase, lower core yields possibly meant “risk-off” flows, with spreads between core and periphery narrowing less, and showing signs that SMP was not managing to tackle the

¹¹⁰ SMP officially did not have two phases. Nonetheless, in order to allow an analysis of different moments of the program, we called “Phase 1” the date it was announced purchases of sovereign bonds from Greece, Portugal and Ireland, while “Phase 2” referred to the date when bond purchases from Italy and Spain were also included in the program.

problem of huge fragmentation between periphery and core bond yield curves, that undermined the transmission of monetary policy.

3.5.1.2. Verbal Intervention

Levels: Line graphs compare yield curve levels in six dates: date of Mario Draghi's speech "whatever it takes to save the euro" (26/07/2012); trading day before the speech (25/07/2012); date of the announcement of detailed features of Outright Monetary Transactions Program – OMT (06/09/2012); trading day before OMT announcement (05/09/2012); date of ECB first announcement of Forward Guidance - FG (04/07/2013); trading day before the first announcement of FG (03/07/2013).

Differentials: Column graphs compare yield curve differentials on three occasions: date of the "whatever it takes to save the euro" speech (26/07/2012) and trading day before the speech (25/07/2012); date of OMT detailed announcement (06/09/2012) and trading day before OMT announcement (05/09/2012); date of the first FG announcement (04/07/2013) and trading day before the first FG announcement (03/07/2013).

Analysis:

In core countries, we observed that yield curve levels gradually increased from 2012 until 2013 (in most countries, except for Belgium and the long end of Austria yield curve), which meant that the compression those yields were experiencing with safe haven flows gradually faded off. In terms of differentials, in the forward guidance, the announcement meant lower yields for nearly all maturities in all countries. However, in the other announcements, the impacts were different according to the country. German yields have risen both with "whatever it takes" and OMT, which implied a risk-on movement. For other core countries (France, Netherlands, Belgium, Austria), the movements were different on each occasion. While yields lowered in the "whatever it takes" speech (the crisis was escalating with such intensity by mid-2012 that those core countries "safe haven role" was

disrupted, and their yields were rising before the speech), yields have generally risen just after the OMT announcement (which might have been a sign that their “safe haven role” was beginning to be restored by September 2012).

In periphery countries, we observed that yield curves levels decreased from 2012 until 2013, as a result of lower spreads being charged over those countries bonds. In terms of differentials, changes were more intense than in core countries. The forward guidance was the announcement which in general provoked the smallest changes (maybe because FG announcement was more anticipated than “whatever it takes” or OMT announcements). Regarding these two latter announcements, the “whatever it takes” speech provoked larger yield drops in Italy, Spain, Ireland short-term maturity (2 years) and Greece long-term maturity (30 years). Conversely, at the OMT announcement yields fell more in Portugal and Ireland mid-term maturity (5 years). Although Portugal and Ireland were not eligible for the OMT when it was announced (OMT was designed for countries which had bonds regularly trading on the market), lower yields implied expectations that those countries would regain market access some time ahead, becoming eligible for this program too.

3.5.1.3. Public Sector Purchase Program (PSPP)

Levels: Line graphs compare yield curve levels in four dates: date of PSPP announcement (22/01/2015); trading day before PSPP announcement (21/01/2015); start of PSPP implementation (09/03/2015); trading day before the start of PSPP implementation (06/03/2015).

Differentials: Column graphs compare yield curve differentials in two occasions: dates of PSPP announcement (22/01/2015) and the trading day before the PSPP announcement (21/01/2015); start of PSPP implementation (09/03/2015) and trading day before the start of PSPP implementation (06/03/2015).

Analysis:

In core countries, yields fell a few percentage points, with the largest drops in long-term bonds (10 and 30 years). The differential was usually larger around the implementation date than around the announcement date. In periphery countries, yields fell several percentage points¹¹¹, with the largest drops in long-term bonds (10 and 30 years). The differential was larger around the announcement date than around the implementation date. Therefore, the graphs' analysis suggests that, at the beginning of the PSPP, unconventional monetary policies played a role mainly through different channels according to each group of countries. For core countries, UMPs portfolio rebalancing channel was more relevant, reducing asset yields by the mechanisms of scarcity and duration when asset purchases were implemented. For periphery countries, UMPs signaling channel was more important, reducing asset yields by committing to an accommodative stance for an extended period on announcement dates.

3.5.2. Private Bond Programs

In this section, our analysis is for Euro area's private yield curves as a whole. This is because our reference source for yield curves (Bloomberg) provides data for Euro area investment-grade (ECB-eligible) covered bonds and non-financial corporations bonds on an aggregate basis, not providing individual data for the ten countries presented before.

3.5.2.1. Covered Bond Purchase Program (CBPP)

Yield Curves: Cover 2, 5, 10, 20-year investment-grade covered bonds, issued by eligible credit institutions, on the program's three phases.

Levels: Line graphs compare yield curve levels in the following occasions:

CBPP 1: In two dates: date of the implementation of CBPP first phase (02/07/2009); trading day before the implementation of CBPP first phase (01/07/2009)¹¹²;

¹¹¹ With the exception of Greek bonds, which were not eligible for PSPP at that date, and yields went up on the day of the program's implementation for domestic reasons.

¹¹² Data of covered bond yields on CBPP 1 announcement date (07/05/2009) and the trading day before (06/05/2009) was not available.

CBPP 2: In four dates: date of the announcement of CBPP second phase (06/10/2011); trading day before the announcement of CBPP second phase (05/10/2011); date of the implementation of CBPP second phase (03/11/2011); trading day before the implementation of CBPP second phase (02/11/2011);

CBPP 3: In four dates: date of the announcement of CBPP third phase (04/09/2014); trading day before the announcement of CBPP third phase (03/09/2014); date of the implementation of CBPP third phase (20/10/2014); trading day before the implementation of CBPP third phase (17/10/2014).

Differentials: Column graphs compare yield curve differentials in the following occasions:

CBPP 1: Date of the implementation of CBPP first phase (02/07/2009) and trading day before the implementation (01/07/2009);

CBPP 2: Date of the announcement of CBPP second phase (06/10/2011) and trading day before the announcement (05/10/2011); date of the implementation of CBPP second phase (03/11/2011) and trading day before the implementation (02/11/2011);

CBPP 3: date of the announcement of CBPP third phase (04/09/2014) and trading day before the announcement (03/09/2014); date of the implementation of CBPP third phase (20/10/2014) and trading day before the implementation (17/10/2014).

Analysis:

Observing CBPP 1, we can see that in the day of the program's implementation, yields have fallen in all maturities, mainly in short-term bonds (which were the ones being purchased by the ECB). However, in CBPP 2 results were mixed: bond yields actually increased in most maturities after the program's announcement, and after the program's implementation yields also increased in longer maturities (10/20 years), while only decreased in shorter maturities (2/5 years). Those results show that, while CBPP 1 implementation managed to reduce the whole covered bond yield curve level, CBPP 2 implementation only

reduced the yield curve in shorter maturities. Those results in the implementation date might have influenced subsequent ECB purchases. While in CBPP 1 ECB fulfilled the volume of covered bond purchases previously expected (€ 60 billion), in CBPP 2 the institution did not reach the volume of covered bond purchases previously intended (€ 16.4 billion *versus* € 40 billion). Regarding CBPP 3, we can observe that the impacts in the announcement and in the implementation dates were broadly of decreasing yields, with a larger impact on the announcement date in shorter maturities.

3.5.2.2. Corporate Sector Purchase Program (CSPP)

Yield Curves: Cover 2, 5, 10, 30-year investment-grade bonds, issued by eligible non-financial corporations.

Levels: Line graphs compare yield curve levels in eight dates: date of CSPP first announcement (10/03/2016); trading day before CSPP first announcement (09/03/2016); date of CSPP second announcement – “program details” - (21/04/2016); trading day before CSPP second announcement (20/04/2016); date of CSPP third announcement – “remaining program details” - (02/06/2016); trading day before CSPP third announcement (01/06/2016); date of CSPP implementation (08/06/2016); trading day before CSPP implementation (07/06/2016).

Differentials: Column graphs compare yield curve differentials in the following occasions: date of CSPP first announcement (10/03/2016) and trading day before the first announcement (09/03/2016); date of CSPP second announcement (21/04/2016) and trading day before the second announcement (20/04/2016); date of CSPP third announcement (02/06/2016) and trading day before the third announcement (01/06/2016); date of CSPP implementation (08/06/2016) and trading day before the implementation (07/06/2016).

Analysis:

Observing the graph related to CSPP levels, we can see that, after a brief increase on the same day the program was first announced, yields tended to decrease considerably after this first announcement. This decline in yields is one of the factors that might have fostered corporate bond issuance in the Euro area at the beginning of 2016. However, when we observe the graph related to CSPP differentials, we realize that yields actually increased both on the first and second announcements, when compared to their respective previous trading days. On those two announcements, the full details regarding the functioning of the program had not yet been disclosed by the ECB, and investors probably reacted on an adverse way on those specific days. Conversely, after the third announcement (when the ECB disclosed the remaining details about issuer's eligibility) and on the day of CSPP implementation, corporate yields declined, mainly on long-term maturities. The analysis of corporate yield performance with CSPP announcements/implementation shows the significant role of central bank's communication has on markets. When it is not done in a clear and complete way, investors may react on an unexpected/opposite sense of the one intended by the monetary authority. Nevertheless, when it is done in a proper tone, providing relevant information in a transparent way, the communication provides the right guidance to investors, usually leading to reactions according to the previously intended objectives.

3.5.3. Yield Curve Impacts - Section Summary

Making a comparison among all the programs taking into account only the graphs presented is not our objective, once each announcement/program had very particular and different features. Nevertheless, taking an overall perspective of the analysis presented in this section allows us to observe some interesting results. Regarding sovereign bond programs, unlike other programs, we can see that PSPP initial announcement and implementation led to lower yields across almost all countries (with the exception of Greece, that was not eligible).

Furthermore, PSPP led to more intense yield drops in periphery countries (mainly in the announcement date, implying a stronger role for the signaling channel of unconventional monetary policy), whereas in core countries yield drops were smaller, but more significant in the implementation date, implying a stronger role for the portfolio rebalancing channel of unconventional monetary policy. Those facts implied a reduction in the cost of borrowing of almost all nations, and reduced sovereign spreads between periphery and core countries, which were one of the main problems during the region's crisis (disrupted mechanism of monetary policy transmission within the Euro area). These results are roughly in line with other studies that make an assessment of PSPP, previously mentioned in subsection 3.3.4.2. We also underline the importance of the way central banks communicate their announcements, and how they achieve better results when they do it in a more proper way, improving the effects of their guidance over markets (e.g., UMPs signaling channel). This fact was observed on sovereign bond programs "verbal intervention" announcements, as well as in private bond programs, with the CSPP experience.

3.6. Conclusions

In this chapter, we described the path experienced by the Euro area economy after the 2008 crisis, with a special focus on ECB's unconventional monetary policies. Measures initially implemented by Euro area authorities after the collapse of Lehman Brothers in September 2008 avoided that the U.S. financial crash had more drastic consequences on the monetary union's financial system. However, after the turmoil in USA, financial and credit conditions in the Euro area became more restrictive. Nevertheless, the U.S. episode only aggravated a crisis which had earlier roots within the region itself. The Euro crisis, which became more acute after 2009, had its origins in an export-driven and debt-driven growth model, which resulted in a rapid increase in current account imbalances and private debt ratios in periphery countries, leading to a banking and sovereign crisis with contagious features.

Since then, a number of conventional and unconventional measures were taken by the ECB. Some of the actions taken in 2010 and 2011 (such as the SMP, the interest rate hikes in April and July 2011, and the three-year LTROs) received strong criticisms for not fighting adequately or even aggravating the situation of the banking and sovereign crisis, and fostering financial contagion among countries. This crisis only began to show signs of softening in the second half of 2012, with the implementation of the “verbal intervention” strategy by the ECB (e.g., OMT), together with other actions by the EU (permanent stability mechanism - ESM and Banking Union project). However, in 2013 and 2014 the output continued to present a sluggish recovery, and fears of deflation began to increase towards the end of 2014. Therefore, the ECB implemented negative deposit rates in June 2014, and announced new stimulus programs in September 2014 (TLTROs, CBPP 3, ABSPP), which were complemented by a massive public sector bond purchase program (PSPP) in March 2015 and a corporate sector bond purchase program (CSPP) in June 2016.

During the course of UMPs implementation, one can say that ECB measures have been gradually enhanced, based on its own former programs and experiences from other central banks. Related to ECB’s own former programs, we can mention the following experiences: i) Correction of previous problems in the SMP (ECB senior when compared to other investors in case of default, and sterilized bond purchases) in the OMT (ECB *pari passu* with other investors in case of default) and in the PSPP (ECB *pari passu* and unsterilized bond purchases); ii) Correction of previous problems in LTROs (large amount of liquidity lent to banks not generating new loans to the real economy) with TLTROs (ECB liquidity operations started to offer incentive for banks to create new loans for firms and households, except for house purchases). The quantity incentive introduced in TLTRO I (banks which lent more than a certain threshold to the real economy could borrow more liquidity from the ECB) was extended in TLTRO II for a price incentive (banks which lent more than a certain

threshold to the real economy could borrow cheaper from the ECB, at the deposit rate instead of the main refinancing rate). When it comes to the influence of other central banks' experiences on ECB measures, we could mention: i) ECB TLTROs in 2014-2017 were also inspired by BOE Funding for Lending Scheme - FLS, program that started in 2012 and had some similarities with TLTROs (allowed the central bank to offer more funding for banks which increased their loans to the real economy); ii) ECB CSPP adopted in 2016 was inspired by Bank of Japan corporate bond purchases, which were part of BOJ's framework since 2010; iii) ECB forward guidance on low interest rates for an extended period in July 2013 was a sign to markets that Euro area monetary stance clearly differed from USA, where the Fed had just announced in May 2013 that it intended to withdraw its monetary stimulus, surprising financial markets and generating adverse effects ("taper tantrum"). ECB forward guidance was also open-ended, which has proven to be a more flexible option than the date-based or the quantitative-based forward guidance previously introduced by the Fed and the BOE in certain occasions; iv) ECB PSPP in March 2015 followed other unsterilized public bond purchase programs implemented by the Fed, BOE, and BOJ. However, the ECB had to create its own rules, since it was purchasing bonds from all Euro area eligible countries, and not from a single Treasury, like other central banks. Therefore, one can say that the ECB had to do several modifications during the course of UMPs implementation, adapting measures according to its own former programs ("learning by doing") and to other central banks experiences ("learning by observing"), in order to improve its framework. In other terms, some of the main features of ECB's measures after the 2008 crisis were pragmatism, flexibility, and capacity to innovate, as mentioned by Le Heron (2016).

When we analyze the performance of main macroeconomic indicators (credit, exchange rate, output, inflation, sovereign yields) during the announcement/implementation period of asset purchase programs and TLTROs, we observe positive effects at their initial

stage, in general close to the announcement/implementation of the main program (PSPP, January/March 2015). After that, those indicators became more volatile, and the effects were more mixed, due to reasons related to the own Euro area (e.g., bond market financial volatility, tensions in Greece) and other countries (i.e., uncertainties surrounding USA and China economies). In the case of credit, we have observed improvements in growth rates, although those rates are below long-term averages, and there is evidence that non-financial companies have directed funds more for financial purposes than for the real economy (at least until 2017 Q1, according to ECB BLS data). In terms of output, the improvement in growth rates (increase in GDP growth and reduction in unemployment) may not be sustained, because of several downside political and economic/financial risk factors (regional and international). Regarding inflation, despite some recovery in the headline index and in medium-term expectations, the core index is still below a level considered adequate by the ECB. Due to the previously mentioned shortcomings, and also concerns on negative effects over agents' balance sheets/financial stability problems, the ECB has received a number of criticisms about the programs, to which the institution has presented its justifications. Nevertheless, one should have in mind that these ECB programs could not be a unique solution to the various problems experienced by the Euro area.

From the point of view of private agents, non-financial companies and households' debt levels have reduced since the crisis, but are still high. It will take some more years for the deleveraging process to be completed. High levels of non-performing loans are still a concern in some places, especially in the periphery, posing challenges to the banking systems of those countries. In the case of non-financial companies, the frequent destination of debt funds more towards financial purposes, instead of investments in the real economy, is worrisome. From the point of view of public accounts, several countries remain with high levels of public debt. At times when PSPP manages to reduce sovereign yields, it allows lowering countries' debt

service costs. Nevertheless, critics to the PSPP argue that it stimulates moral hazard, by postponing the “necessary” fiscal adjustments in countries. On the other hand, other voices argue that what Euro area countries need in fact is to avoid procyclicality in fiscal policies (stricter austerity, deeper recessions). Instead, they should focus on meeting their fiscal targets over a medium/long-term basis, and increase public investment to resume growth.

This controversy is closely related to the intricate monetary union’s political framework, both inside countries, and within the Euro area/EU. The case of Greece is emblematic to show how the political game is complex within a union that has a common currency, but different sovereign countries with distinct development levels and independent fiscal policies. This complexity turns decision-making mechanisms extremely complicated, and in several times slower than requested by unexpected financial market reactions. Concerns over the outcome of Brexit negotiations, greater influence of anti-establishment parties in some countries, immigration/refugee problems, and security/terrorism issues are all political matters that raise uncertainty and pose downside risks to stability and growth in the area. Moreover, rising wealth inequality (with the concentration of financial asset gains in the hands of few individuals with large net worth) and income inequality (with job market segmentation, and increasing precarization) are social problems that become more acute year after year.

Summing up, unconventional monetary policies were necessary, and they have shown some efficacy in the Euro area: the ones in 2008/2009 avoided a financial collapse at the beginning of the crisis; actions taken in the second half of 2012 avoided a further escalation of the crisis, and the ones from 2014 onwards usually presented positive effects right after their announcement/implementation. Furthermore, we consider that the ECB strategy of ending net asset purchases, while still keeping a partly accommodative monetary stance (low interest rates and the reinvestment of the stock of bonds that were purchased in APPs for an extended

period) is appropriate, to avoid an undesired tightening of financial conditions on a recovery that is still incomplete. Financial stability risks deriving from such accommodation (i.e., eventual asset/house price excessive increases) should be dealt with proper macroprudential/regulatory measures.

Nevertheless, the Euro area cannot rely *only* on easy monetary policies to solve a crisis with such complex roots and try to sustain its growth. Hence, we understand that monetary policy measures should be complemented by several other initiatives aimed at improving Euro area economic, financial and institutional framework. In this sense, a large number of proposals have been presented or are currently under discussion in the region. For instance, two very influential proposals were presented by a group of French and German economists (Bénassy-Quéré *et al.*, 2018) and the IMF (Arnold *et al.*, 2018). These proposals have as a common point the creation of a central fiscal capacity for the Euro Area. However, in the delicate disputes between core and periphery countries in favor of risk reduction or risk sharing (respectively), these proposals still favor too much the core (risk reduction) side¹¹³. In a broader package of proposals presented by the European Commission in December 2017 named “Roadmap for Deepening Economic and Monetary Union”, the issue of a central fiscal capacity is also addressed. However, in the European Commission proposal (2017), the fiscal capacity would be limited for backstop/stabilization purposes, and not new common mechanisms to develop investment and growth within the Euro area. Nonetheless, the “Roadmap for Deepening Economic and Monetary Union” also presented other interesting measures, such as the ones aimed at strengthening EU financial regulatory/supervisory framework, but they were mostly on a medium-term basis.

¹¹³ In Bénassy-Quéré *et al.* (2018), countries more likely to draw on the central fiscal capacity would make higher contributions, penalizing weaker economies. In Arnold *et al.* (2018), countries would be entitled to use the central fiscal capacity resources only if they breached an automatic indicator (e.g., deviation from long-term unemployment level). The use of the resources would be capped at a certain level and repaid after the economy had recovered. Countries would also need to follow strict fiscal rules.

Therefore, we provide in the sequence a number of initiatives aimed at improving Euro area economic, financial and institutional framework. Under our view, they would not be a silver bullet to solve all complex problems in the Euro area. However, they would definitely not leave the European Central Bank as “the only game in town”, complementing the monetary policy efforts with other measures in order to restore the growth of inflation and output on a balanced path in the region in the medium/long term.

(i) Adopt a more coordinated fiscal policy among its countries. One way to do so would be to create a Euro area supranational institution that issued a common Euro area security, and the pool of resources conceded grants to countries to undertake public investments. Among other benefits, this would allow that Euro area’s fiscal and monetary policies could be effectively coordinated, and the ECB could assume a true role of Euro area “lender of last resort”, shielding the region against future sovereign crises¹¹⁴.

(ii) Implement national fiscal policies in a countercyclical way, to avoid economic stagnation or deepening downturns. Within the existing framework, EU evaluation procedures should allow that “automatic correction mechanisms” in national budgets are not applied in case the country is experiencing a period of economic stagnation or downturn, and not exempting the country only in exceptional cases of “severe” or “EU-wide” crises.

¹¹⁴ In the debate of the need for the Euro area to have a “safe asset”, there are several alternatives under discussion. According to Leandro and Zettelmeyer (2018), those alternatives would be broadly divided into four categories: i) National tranching, E-bonds, ESbies and Euro area budget. Taking into account these categories, the first three categories entail financial stability concerns (i.e., rely on mechanisms such as tranching and/or pooling of diversified sovereign debts, sometimes using securitized instruments to constitute the safe asset), among other drawbacks. Therefore, the category which we consider to be more adequate is the “Euro area budget”. Although in line to this category, our suggestion would be closer to the “Euro Treasury” proposal presented by Bibow (2015). According to this author, the Euro Treasury would neither involve fiscal transfers across states (grants according to GDP/ECB capital key), nor mutualization of previous debts (member states would continue responsible for their own existing debts). Euro area’s taxes would be levied only to fund common debt service expenditures. As governments would agree on the initial volume of common area-wide public investment spending and its annual growth rate after that, the Euro Treasury decisions would be based on rules, not on discretion. In addition, by reducing debt service costs, it would open up more fiscal space and provide a long-term basis for infrastructure investment and GDP growth in the area. Furthermore, the creation of a common safe asset would allow ECB-Euro Treasury to provide an “ultimate backstop” in occasions needed to handle systemic financial crises.

(iii) Actions towards reducing regional economic asymmetries, with less dynamic regions (usually in periphery countries) receiving more support from the European Investment Bank and other national development banks in key areas for development (infrastructure, innovation, energy/ecological transition, SMEs, “decent jobs” creation), while core countries with high external surpluses could focus their growth strategy more on domestic demand, strengthening wages/consumption and public/private investment.

(iv) Conducting institutional reforms that enhance countries competitiveness not by labor cost-cutting measures (e.g., wage reduction, precarization, layoffs), but by the development of technological capabilities that allow the differentiation of goods/services, increasing their value added and their attractiveness in local/foreign markets.

(v) In terms of Euro area’s financial system, enhance the framework in such a way that financial integration is increased in tandem with an improvement in financial regulation/supervision, so as to strengthen countries resilience to financial instability episodes. This enhancement could be done not only by completing the Banking Union with a proper European Deposit Insurance Scheme, but also by working towards an EU Capital Markets Union in which other EU authorities for financial market supervision (ESMA, EIOPA) and macroprudential issues (ESRB) would have increased powers. With proper enforcement powers, those entities would be better equipped to face potential financial crises with systemic impacts in the EU. Moreover, with adequate coordination with respective national authorities, those EU entities would have more tools to harmonize rules and avoid that sudden movements of agents under their oversight (e.g., institutional investors) provoke sharp volatility episodes, with potential to disrupt financial markets and the real economy.

Appendix 3.1 - Literature Review of Effects of ECB Unconventional Monetary Measures
Table 3-3 Impacts of ECB Unconventional Measures on Output and Inflation

Study	Measures or Time Period	Method	Impact output (peak)	Impact Inflation (peak)	Transmission Channels
Gambacorta <i>et al.</i> (2014)	01/2008-06/2011	Panel VAR with zero and sign restrictions	0.15 pp. in 3 months	0.10 pp. in 6 months	Not described
van den End, Pattipeilohy (2015)	01/2007-12/2014 Size and composition of ECB assets	Structural VAR with Cholesky decomposition (unrestricted)	Not statistically significant	From 0.04 to 0.1 pp. in 3 months	Exchange rate, signaling (weak), portfolio rebalancing (weak)
Rieth <i>et al.</i> (2016)	08/2007-01/2015	VAR considering exogenous variations of monetary policy	0.55 pp. in 18 months	0.18 pp. in 20 months	Bank lending, portfolio rebalancing, signaling
Buriel and Galesi (2016)	01/2007-09/2015 % growth in ECB assets	Global VAR with system of 19 VARs for euro nations and 1 VAR for Euro area	0.08% in 6 months	0.03% in 6 months	Portfolio rebalancing, exchange rate, credit (weak signaling channel)
Boeckx <i>et al.</i> (2017)	01/2007-12/2014 % growth in ECB assets	Structural VAR with zero and sign restrictions	0.10 pp. in 9 months	0.09 pp. in 9 months	Bank lending, portfolio rebalancing, exchange rate
Gambetti and Musso (2017)	APP	Estimated time parameter VAR model with stochastic volatility	0.18 pp. in 1 quarter	0.36 pp. in two years	Portfolio rebalancing, exchange rate, inflation re-anchoring, credit
Breckenfelder <i>et al.</i> (2016)	APP	DSGE with financial frictions and counterfactual without APP	1.1% in 2 years	0.4% in 2 years	Portfolio rebalancing, signaling, inflation re-anchoring
Sahuc (2016)	APP	DSGE with financial frictions	0.9 pp. in 1 year	0.6 pp. in 2 years	Portfolio rebalancing, Signaling
Mouabbi and Sahuc (2017)	APP	Bayesian DSGE with shadow EONIA rate and counterfactual without APP	0.86% in 18 months	0.4% in 18 months	Not described
Hohberger <i>et al.</i> (2017)	APP	Bayesian DSGE (including alternative with ZLB constraint)	0.4% (no ZLB) to 1% (with ZLB) in 18 months	0.5% (no ZLB) to 0.7% (with ZLB) in 18 months	Not described

Table 3-4 Impacts of ECB Unconventional Measures on Bond Yields

Study	Measures or Time Period	Method	Impact yield 10Y Sovereign Bonds (bp)	Impact yield Corporate Bonds (bp)	Transmission Channels
Focus in Sovereign Bonds Yields					
Fratzscher <i>et al.</i> (2016)	SMP, LTROs, OMT (May 07-Sep 12)	Event study (1-day window)	cumulative impact <u>Core</u> *: LTROs: -6 SMP: +10 OMT: +1 <u>Periphery</u> *: LTROs: -52 SMP: -121 OMT: -74	-	International portfolio balance, bank credit risk, sovereign credit risk, confidence
Krishnamurthy <i>et al.</i> (2018)	SMP LTRO OMT (2010-2012)	Kalman Filter augmented event study (2-day window)	<u>Spain</u> (cumulative amounts) SMP (2 dates): -149 OMT (3 dates): -129 3Y LTRO (2 dates):-26	<u>Spain</u> 4Y Barclays indices (cumulative amounts) SMP (2 dates): 0 OMT (3 dates): -91 3Y LTRO(2 dates): -23	Signaling, portfolio rebalancing; Reduction in default risk, in redenomination risk, in market segmentation
Briciu and Lisi (2015)	7 Balance sheet policy announcements (Oct 08 – Jan 15)	Event study (2-day window)	<u>Germany</u> (+89 on 5 announcements until OMT, -33 on 2 announcements after APP) <u>Spain</u> (-187 on 4 announcements SMP,OMT,APP, + 63 on 3 other announcements)	-	-
Altavilla <i>et al.</i> (2015)	APP (announcements Sep 14- Mar 15)	Term structure model with bond supply effects + event study with market news (1-day window)	- 29 (Euro area) -17 (Germany) -80 (Spain)	- 20 (5Y BBB bonds)	Portfolio rebalancing (scarcity, duration), credit, signaling
Breckenfelder <i>et al.</i> (2016)	APP announcement (Jan 15) and implementation (Mar 15)	Event study (1-day window)	-22 (Euro area Jan 15) -25(Euro area Mar 15)	-10 (7-10 Y AA bonds) -13 (7-10Y BBB bonds)	Portfolio rebalancing (duration, bank capital relief), signaling, inflation re-anchoring
De Santis (2016)	APP (cumulative impact Sep 14-Oct 15)	Panel error correction model with macro factors+ market news	- 63 (Euro area) - 43 (Germany) -75 (Spain)	-	-
Urbschat and Watza (2017)	10 APP announcements (Jun 14- Mar 16)	Event study with market news (2-day window)	<u>Cumulative impact</u> : Germany: -8.23 Spain: -61.45	-	Portfolio rebalancing**
Varghesi and Zhang (2018)	ECB UMP announcements (Jan 07-Jun 16)	OLS regression + Event study (2-day window)	<u>Pre-QE announcements</u> : Germany:+7 Spain:-29 <u>QE announcements</u> : Germany:-7 Spain:-15	-	Signaling, portfolio rebalancing

Focus in Corporate Bond Yields					
Zaghini (2017)	CSPP Euro area primary market (Mar 16- May 17)	Pooled panel estimation	-	<u>Yield spreads over asset swap contracts:</u> Announcement: -25 for both eligible and ineligible bonds Implementation: Q3 2016: -69; Q4 2016: -49 for eligible bonds 2017: -56 for both eligible and ineligible bonds	Portfolio rebalancing (esp. scarcity)
Arce <i>et al.</i> (2017)	CSPP Spanish firms (Feb 16 - Jul 16)	Regression with CSPP announcement, implementation, actual purchases as explanatory variables	-	<u>Yield spreads over OIS for eligible bonds:</u> From announcement to implementation: -46 on average First month of implementation: -7.6 on average	Credit reallocation
Grosse-Rueschkamp <i>et al.</i> (2018)	CSPP Euro area firms (Mar 15- Mar 17)	Yield spread = yield-to-maturity – maturity matched swap rate	-	<u>Yield spreads over swap rate (difference 4 Q before x 4 Q after announcement)</u> Eligible CSPP bonds: AAA to A: not significant BBB: - 40 Ineligible CSPP bonds: not significant	Bank lending channel (“credit reallocation channel”)
Abidi and Miquel-Flores (2018)	CSPP Euro area firms (Jan 13 – May 17)	Regression Discontinuity Design (RDD) framework	-	<u>Yield spreads over German sovereign bond yield after announcement:</u> -3 to - 26 (larger drop for bonds eligible by ECB, but not strictly investment grade in all rating agencies)	Portfolio rebalancing, liquidity
De Santis <i>et al.</i> (2018a)	CSPP Euro area firms (Mar 16– Dec 17)	Panel data model	-	<u>Yield spreads over Euribor within period:</u> Eligible CSPP bonds: -25; Ineligible CSPP bonds: -20	-

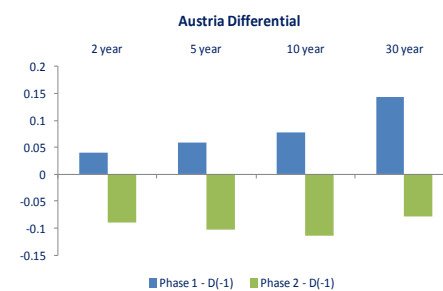
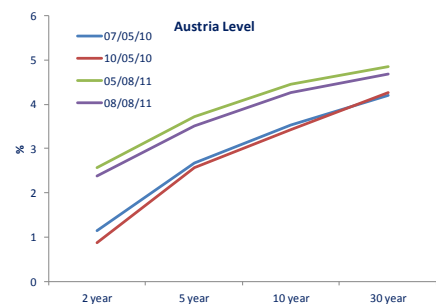
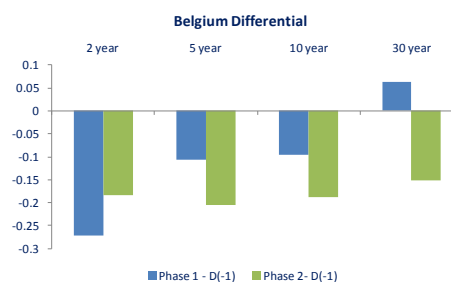
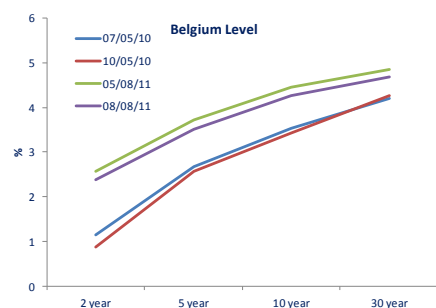
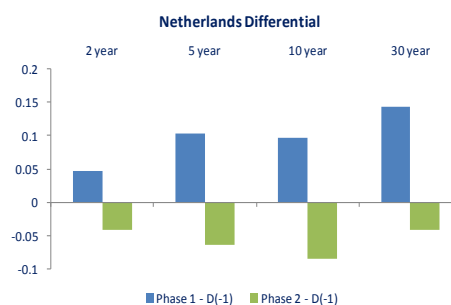
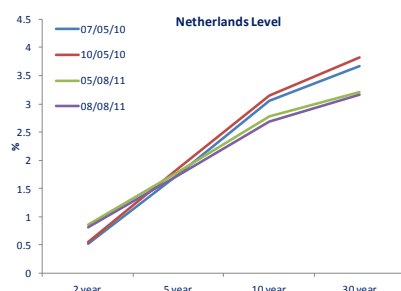
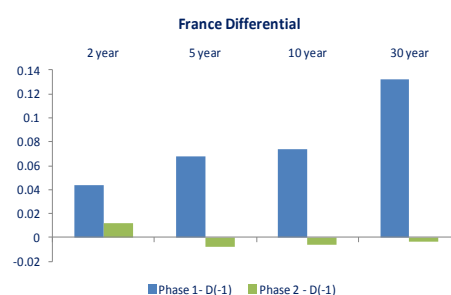
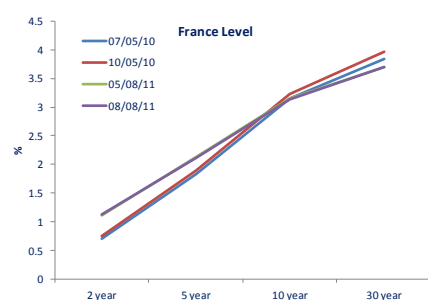
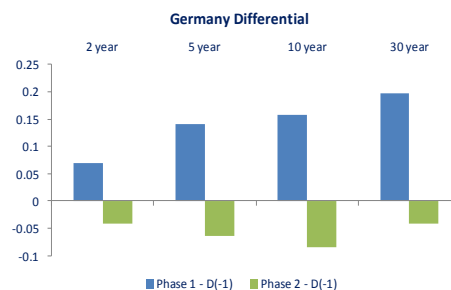
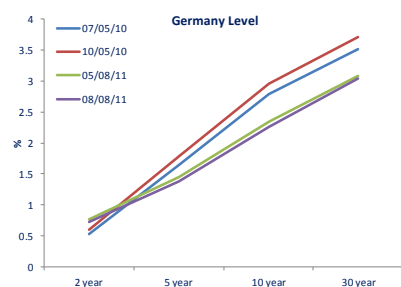
Note:

* Core: Germany, Austria, Netherlands, Finland; Periphery: Spain, Italy

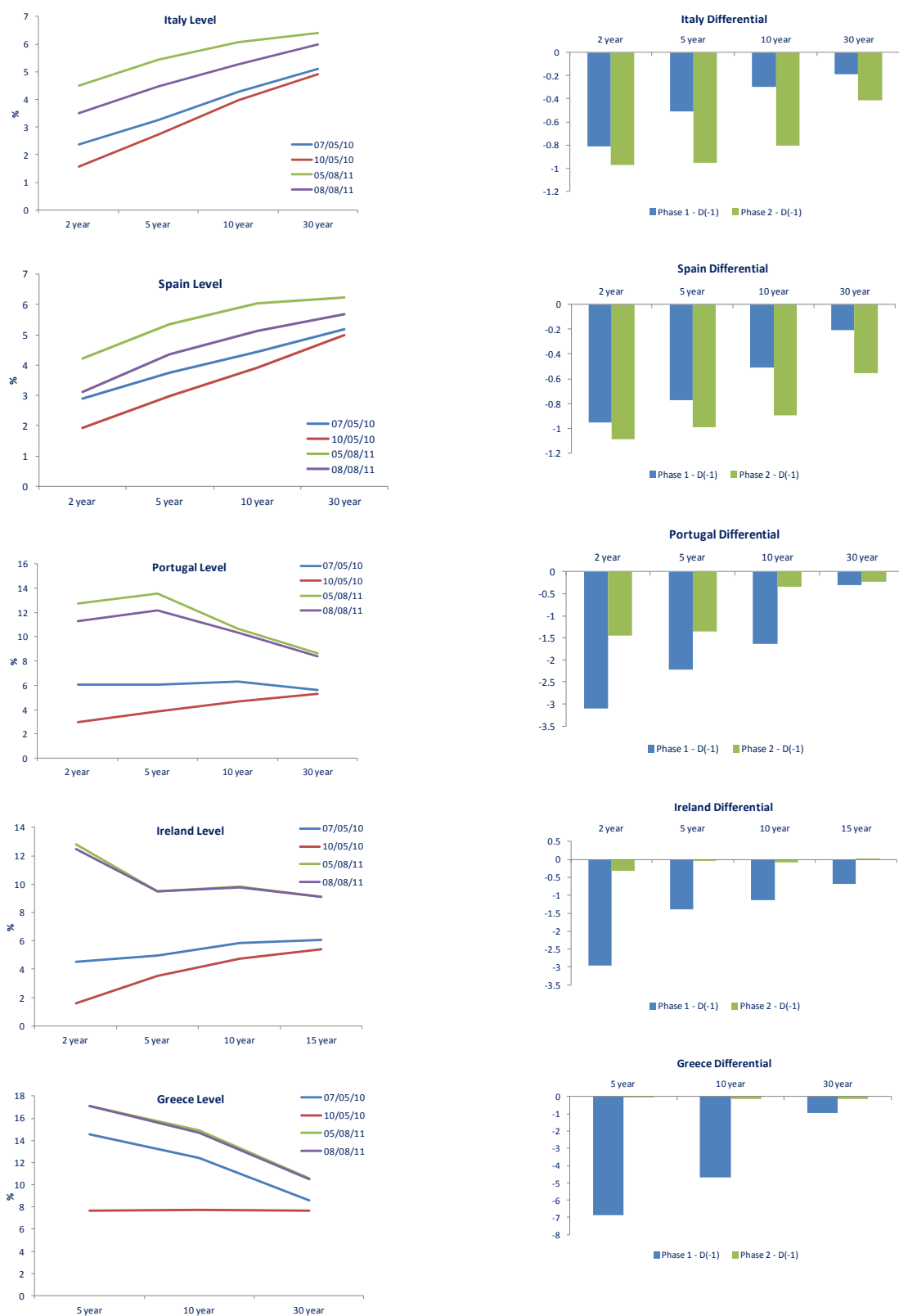
** An alternative specification considers effects from other transmission channels (signaling, liquidity, credit risk), but using as dependent variable the sovereign bond – OIS spread.

Appendix 3.2 - Euro area's Yield Curve Graphs

Graph 3-14 SMP - Core Countries

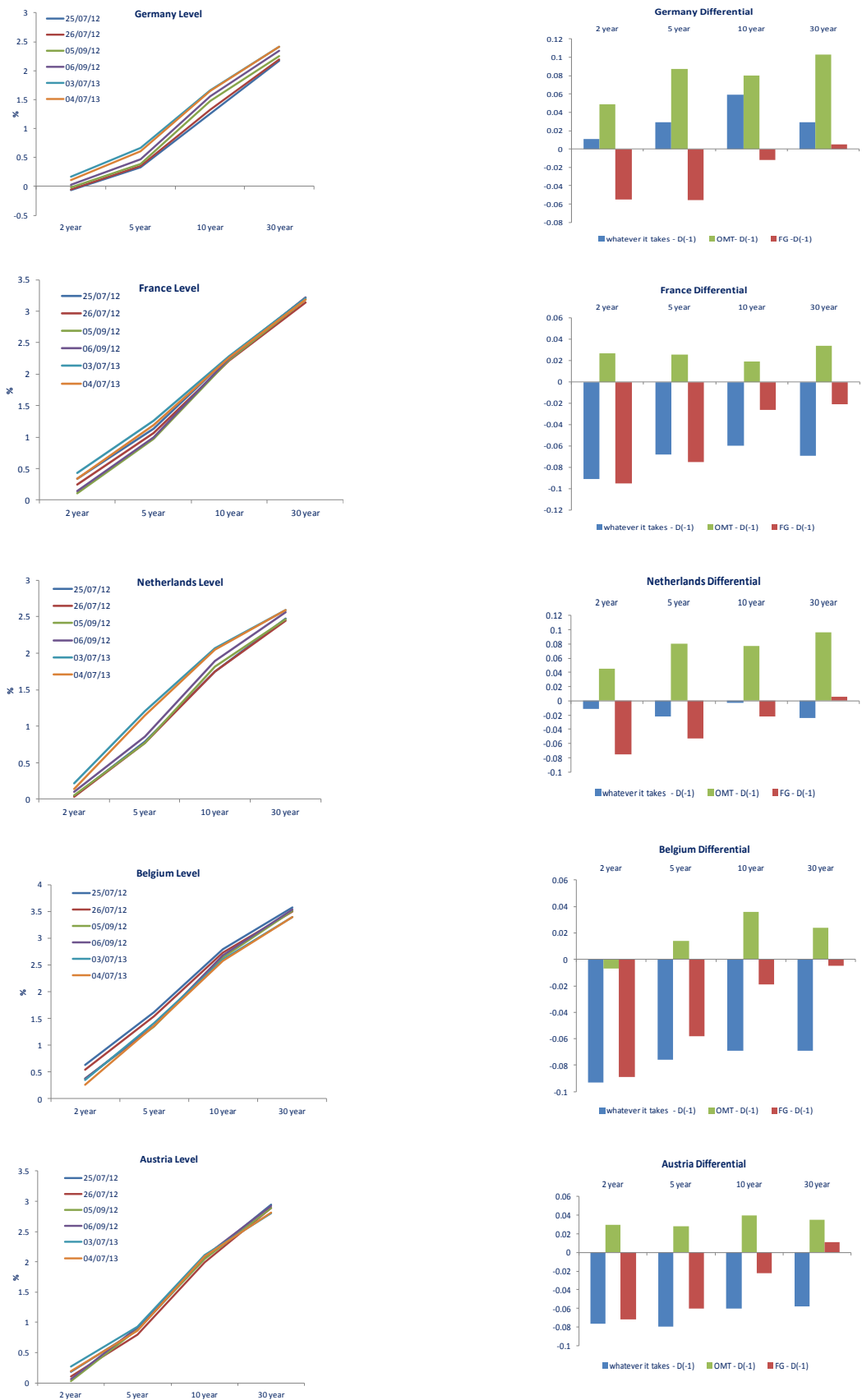


Graph 3-15 SMP - Periphery Countries

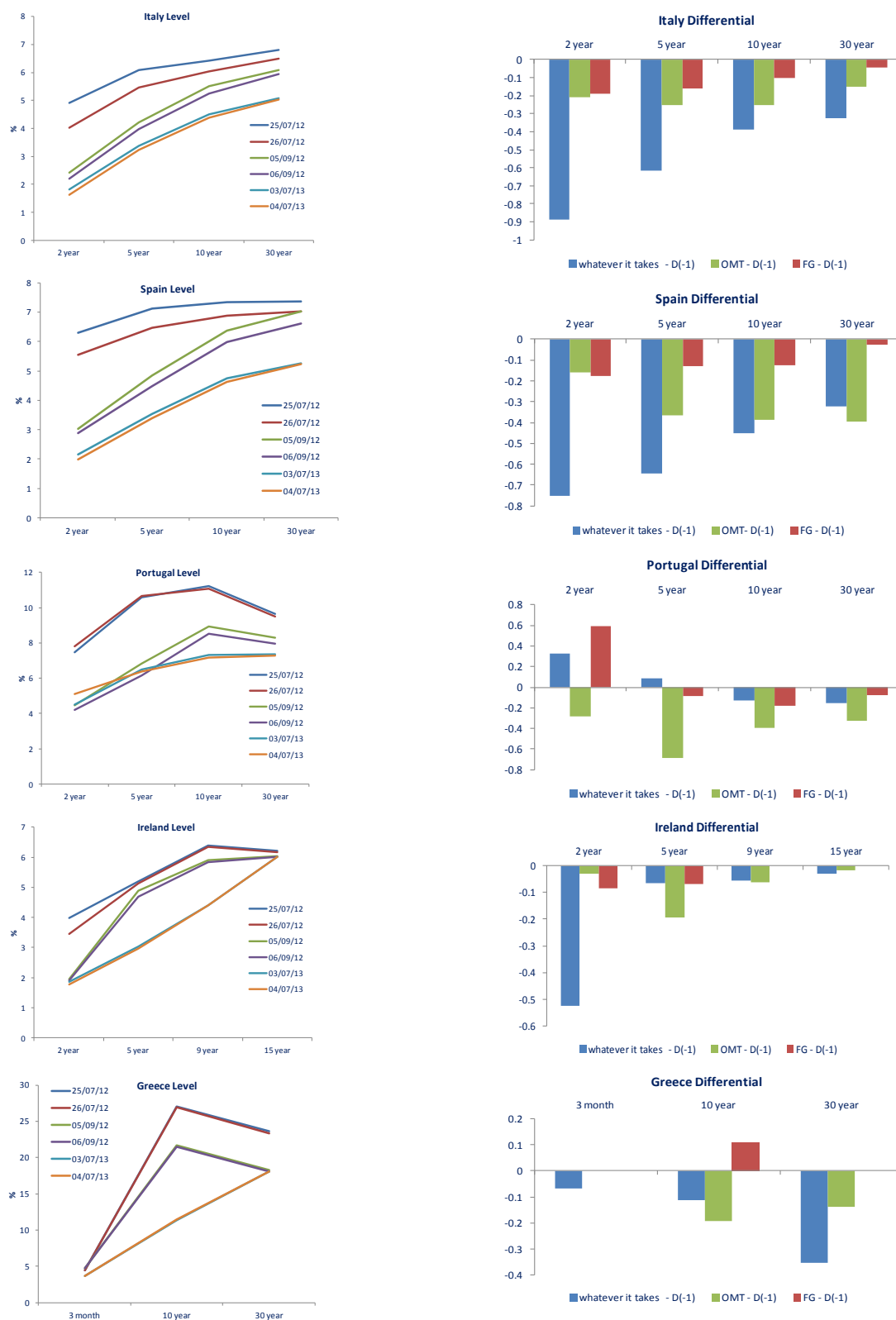


Note: The longest maturity available for Ireland was 15-year bonds. The shortest maturity available for Greece was 5-year bonds.

Graph 3-16 Verbal Intervention - Whatever it Takes, OMT, FG - Core Countries

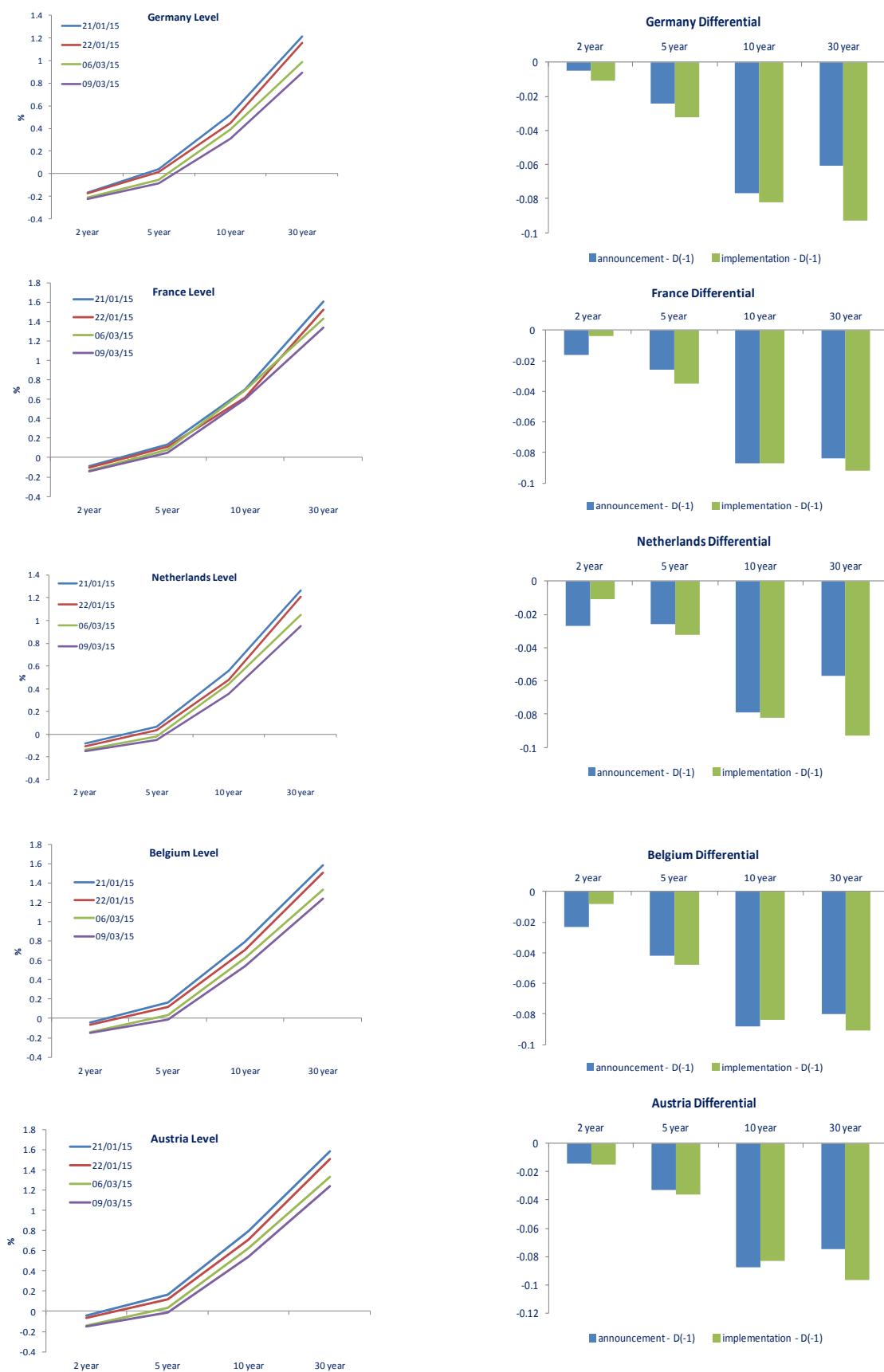


Graph 3-17 Verbal Intervention - Whatever it Takes, OMT, FG - Periphery Countries

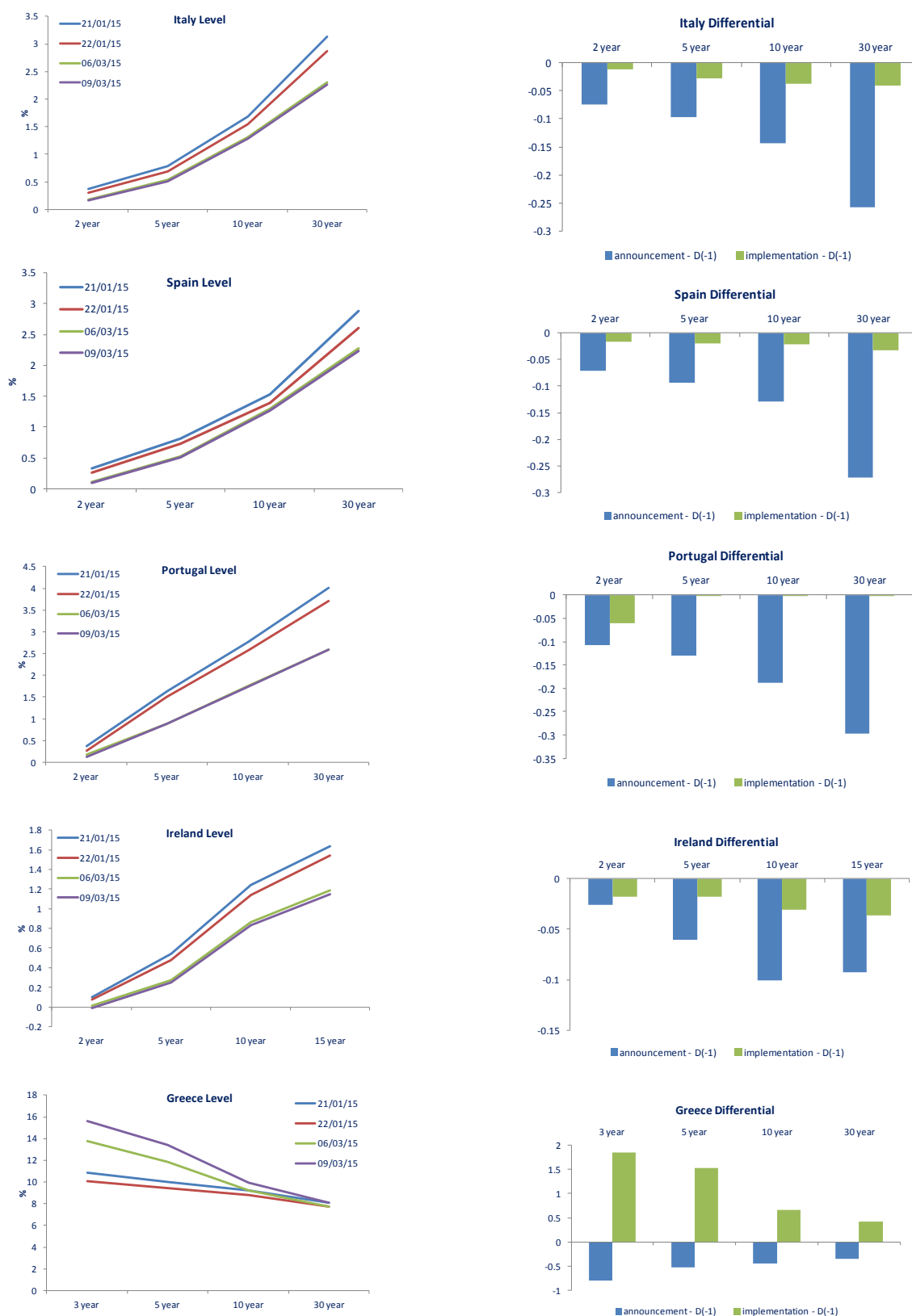


Note: The available maturities in Ireland were 9 years (instead of 10 years) and 15 years (instead of 30 years). The available maturities in Greece were 3 months, 10 years and 30 years.

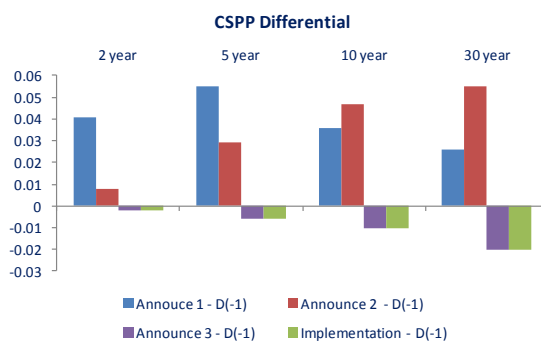
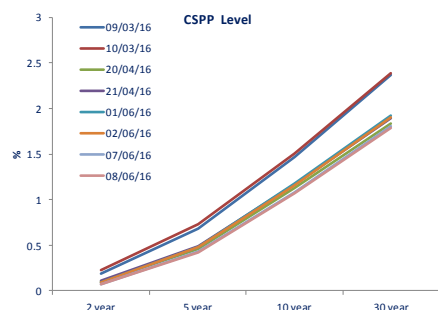
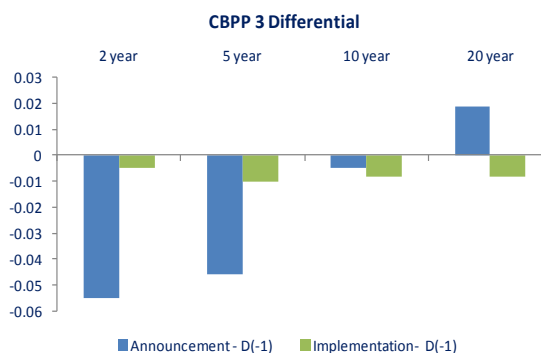
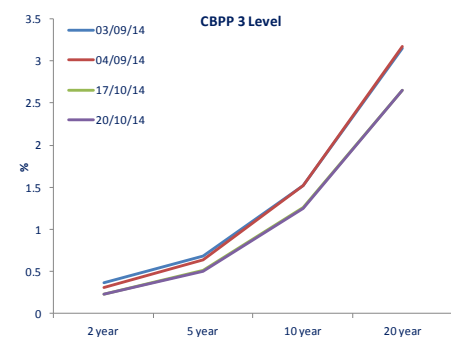
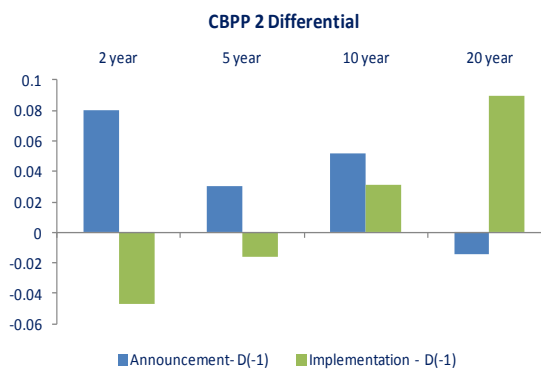
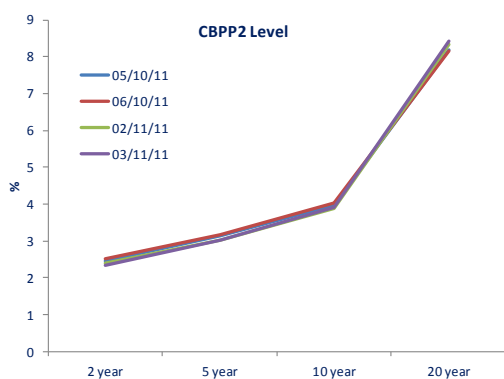
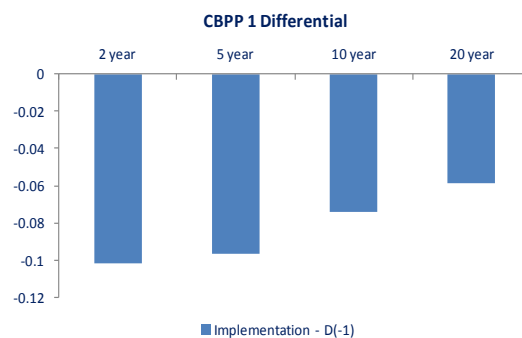
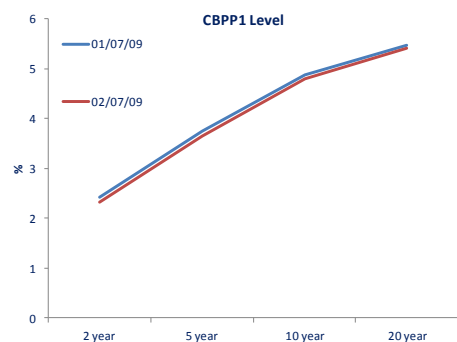
Graph 3-18 PSPP - Core Countries



Graph 3-19 PSPP - Periphery Countries



Note: The available maturities in Ireland were 15 years (instead of 30 years). The available maturities in Greece were 3 years (instead of 2 years).

Graph 3-20 CBPP and CSPP

Source: Author own elaboration, based on Bloomberg data.

Chapter 4. Effects of Unconventional Monetary Policies in Emerging Economies: Links with Corporate Debt and Policy Implications

4.1. Introduction

Private debt ratios, especially of non-financial firms, have grown considerably since the 2000s, in advanced (AEs) and emerging economies (EMEs). However, the 2008 global financial crisis marked a tipping point for both groups of countries. In advanced economies, corporate debt levels generally peaked in 2008. In the post-2008 period, after a limited downward adjustment, corporate debt ratios continued at high levels, and in some countries actually increased, according to OECD (2017). Conversely, emerging economies corporate debt levels increased since the 2000s from lower levels than AEs. Yet, the 2008 crisis did not interrupt this trend, with EMEs corporate debt levels continuing to increase up to 2016. The post-2008 crisis period was marked by a development of international debt markets, with bond issuance growth, coupled by an unprecedented monetary expansion in advanced economies, that eased international financial conditions, lowered risk spreads and increased search for yield, in particular for bonds of emerging countries.

However, this expansion in EMEs corporate debt started to be challenged by recurrent episodes of volatility in international debt markets: in 2013, the “taper tantrum” in USA; in 2014, the fall in commodity prices (especially oil and minerals); in 2015, uncertainties in China’s foreign exchange and stock markets; in 2016, after the election of the new U.S. president. Hence, the increase in EMEs corporate debt size (even after the 2008 crisis), the changes in its profile/determinants and the financial stability concerns associated to it raised attention to this issue, which deserves a deeper analysis.

Therefore, this chapter’s main objective is to discuss the increase in corporate debt in emerging countries after 2008, aiming to understand the changes in its profile, its

determinants, and its economic policy implications. The chapter is structured as follows. After this introduction, section 4.2 presents the main features related to the amount and profile of corporate debt in emerging economies. Some of the main features of this expansion in EMEs corporate debt were the increase in leverage, net foreign exchange exposure, later leading to a deterioration of debt repayment capacity in a significant share of firms.

In section 4.3 we do a literature review on theoretical approaches that underpin debt expansion in corporations and its features, including agents' procyclical behavior. We observe that those approaches that have been well described both in the mainstream and heterodox literature, related to concepts such as the risk-taking channel of monetary policy, herd behavior, animal spirits, Keynesian "beauty contest" and financial instability hypothesis. We also undertake a literature review on empirical articles that seek to understand the determinants of corporate debt in emerging economies.

In section 4.4, it is presented our own panel analysis to explain the main determinants that were behind this expansion in corporate debt. Our contributions to the literature are to investigate the determinants of EMEs corporate debt expansion by using a dataset which goes from 2000 Q1 up to a recent period (2016 Q4), and with subsamples before and after the 2008 crisis, so we identify the main changes in the factors that explain EMEs corporate debt expansion before and after this event. Most importantly, we identify a factor not previously used in the literature for that purpose: the interaction between higher commodity prices and more appreciated exchange rates. Our findings suggest that the exchange rate has been one of the most important determinants that explain EMEs companies' debt expansion through the period 2000-2016, and also in the period before the 2008 crisis. But after 2008, beyond some country-level factors (exchange rate, national GDP growth, firms' higher liquidity levels), other factors that have global origins (more accommodative monetary policy in USA, lower financial market volatility, global GDP growth, higher commodity prices and its interaction

with the exchange rate appreciation) have become increasingly important to explain emerging market corporate debt expansion.

Section 4.5 discusses the economic policy implications of this debt increase. First, we describe potential risks related to the uncertainty in international macroeconomic scenario in which emerging economies are involved. Next, we present additional challenges faced by emerging economies' firms: currency mismatch, firms' susceptibility to creditors'/banks'/institutional investors' interests, macroeconomic volatility, that raise financial stability concerns. In the sequence, we argue that those concerns would be better addressed if emerging countries and international institutions took additional initiatives, such as an improvement in regulatory frameworks, as well as implementing macro and micro-prudential measures (preferably on a coordinated way), in order to enhance these countries resilience against financial crises.

Section 4.6 closes the chapter with the final considerations and conclusions.

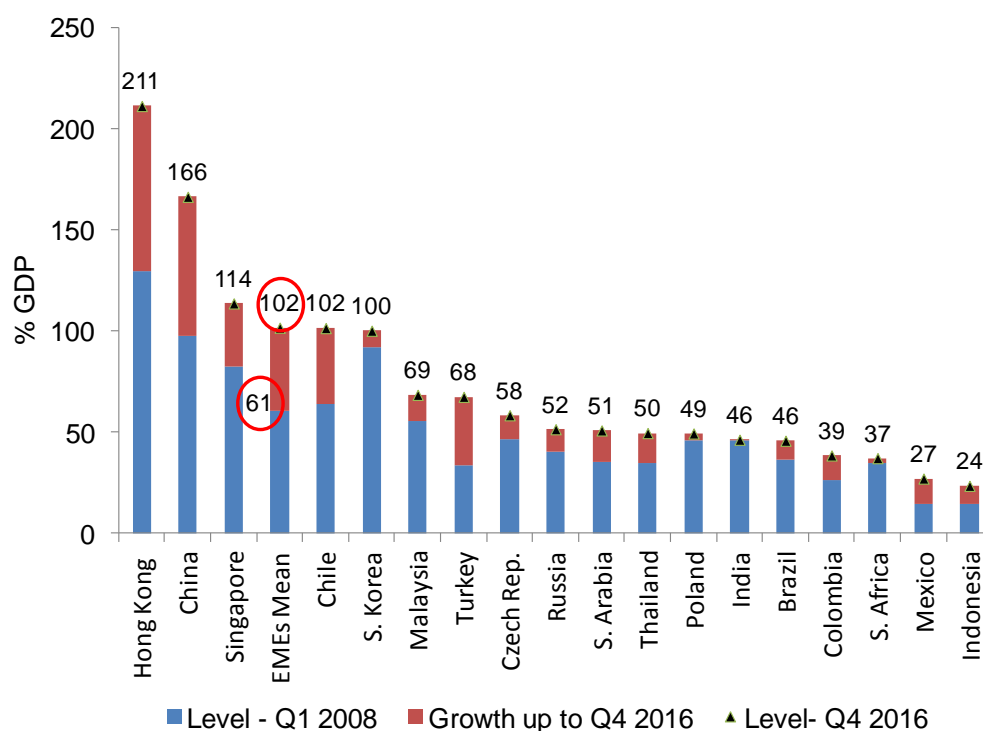
4.2. Features of Corporate Debt in Emerging Countries

This section presents the main features of the evolution of corporate debt in emerging economies in the recent period, with a special focus on non-financial companies.

Regarding the evolution of non-financial corporate debt in emerging countries, its amount rose from US\$ 9 trillion in March 2008 to US\$ 25.7 trillion in December 2016, according to BIS data (2017). Considering these values as percentages of countries' GDPs, the growth between March 2008 and December 2016 was on average 41 percentage points (pp.), from 61% to 102% of GDP. In geographical terms, this increase occurred in all major regions that group emerging countries: Asia, Latin America, Emerging Europe, Middle East, and Africa - EMEA. However, this expansion did not occur homogeneously: in Hong Kong and China, the increase in non-financial corporate debt in the period was 82 pp. and 69 pp. respectively, to levels above 166% of GDP. Chile, Turkey, and Singapore also had significant

increases of 38, 34 and 31 pp., respectively. In other emerging markets, the increase in non-financial corporate debt in the period was less than 30 pp., to levels generally below 100% of GDP, as can be seen in graph 4-1.

Graph 4-1 Credit to Non-financial Corporations - Q1/2008 to Q4/2016 (% GDP)



Source: Author own elaboration, based on BIS (2017) data.

In terms of economic sectors, the ones that experienced higher debt growth were construction, real estate and mining (especially the oil and gas sub-sector), according to IMF (2015a).

Concerning leverage, its degree can be measured using various indexes. Two indicators commonly used are: i) Total liabilities to total equity; ii) Total liabilities to earnings before taxes. Using a compilation of data from EMEs companies, both indicators had a significant expansion between 2007 and 2013: the first, by 88 pp. and the second, by 28 pp., according to IMF (2015a).

Regarding emerging companies' foreign debt, Mc Cauley *et al.* (2015a) estimate that the percentage of non-financial corporate debt denominated in U.S. dollars in Q2 2015

averaged 10%. However, these figures varied widely among countries (from 5% in China¹¹⁵ to 52% in Indonesia and 66% in Mexico). Nevertheless, these values are a simple estimate of the amount of EMEs firms' dollar-denominated debt and do not take into account financial and operational hedging instruments available.

An alternative measure of foreign exchange exposure is estimated in IMF (2015a), which draws a sample of 5000 firms in 31 emerging countries between 2001 and 2014, and calculates net values excluding financial and operational hedging mechanisms¹¹⁶. The study concluded that, with the exception of China, there was a significant expansion of net foreign exchange exposure of emerging companies in the period. The increase in net foreign exchange exposure level in EMEA was from 45% to 50% (5 pp.). In Latin America, it has increased from about 40% to 60% (20 pp.). In general, non-tradable sectors have higher net foreign exchange exposure, because non-tradables cannot rely on the alternative of operational hedging (available for tradable sectors). Still, this operational hedging might not be enough to protect balance sheets of tradable sectors, as they are also negatively affected in occasions when commodity prices fall and exports volumes decline, with a slowdown in international trade.

Regarding the profile of non-financial corporate debt in emerging countries, there was also a significant change in its composition in the post-2008 crisis period. Although most of the debt remained being funded by bank loans, an increasing share of EMEs firms' debt has been funded by bonds issued in capital markets (from 9% in 2007 to 17% in 2014, according to IMF 2015a). In absolute terms, the amount of annual non-financial corporate debt issuance

¹¹⁵ Despite the low percentage of corporate debt denominated in dollars in China, the significant increase of leverage in sectors such as real estate and construction in recent years has drawn attention to the level of non-financial corporate debt in this country.

¹¹⁶ Net foreign exchange exposure is estimated using the sensitivity of the company's share price to exchange rate fluctuations according to an augmented Capital Asset Pricing Model (CAPM). It incorporates a β coefficient, which represents the foreign exchange exposure of a firm, net of financial and operational ("natural") hedging mechanisms. A positive currency exposure means that the firm's share price falls when the exchange rate depreciates.

jumped from about US\$ 586 billion in 2007 to US\$ 3.025 trillion in 2014. In many countries, there was an increase in the concentration of debt issuance by major companies. In terms of sectors, the most relevant issuers were construction and oil/gas. Regarding the currency of issuance of these securities, domestic ones accounted for a larger share. However, there was an increase in the foreign share of non-financial corporate debt issuance in EMEs excluding China¹¹⁷, from about 40% between 2003 and 2007 to 45% between 2010 and 2014. The most used foreign currency was the dollar (usually over 80%), with the euro¹¹⁸, yen and other currencies composing a smaller share.

It is worth mentioning that using bonds as a source of funding has advantages and disadvantages for firms. The advantages are: i) Better financing conditions when compared to bank loans, such as lower costs and longer maturities¹¹⁹ and ii) Using capital markets as an alternative source of funding, even when banks are more restrictive. Among the disadvantages, it can be mentioned: i) The increasing reliance on funding from more volatile sources (i.e., institutional investors) and ii) Market investors are less stringent in monitoring firms' balance sheets than banks, which may encourage excessive leverage and risk-taking by firms.

Regarding the allocation of funds raised by companies through bonds, there is no consensus about their destination. On the one hand, Chui *et al.* (2014) mention the existence of studies showing a one-third increase in capital investments by 120 companies that issued bonds in EMEs between 2010 and 2013. However, the increased availability of resources for funding would have decreased entrepreneurs' minimum expected rate of return. This fact

¹¹⁷ If we consider the total of emerging countries including China, the share of issuance in foreign currency decreased after the crisis, given the high amount of issuance in this country, mostly denominated in renminbi.

¹¹⁸ Among foreign currencies of non-financial corporate bonds issued in EMEs, the dollar remained largely with the higher share. However, in 2015 and 2016, issuance in euros expanded their share (IIF, 2017c), with more favorable conditions posed by accommodative policies of the European Central Bank in the period.

¹¹⁹ Indeed, IMF data (2015a) shows that, in average, EMEs firms have managed to raise funds with yields 2 pp lower in 2014 (5%) than in 2007 (7%), and with a one year longer term (six years in 2014 *versus* five years in 2007). One of the factors that played a role for these favorable funding conditions was accommodative monetary policies prevailing in the global economy after the crisis.

would have removed constraints for the implementation of several new investment projects, including ones with lower profitability. In other words, the availability of funding would have allowed an increase in the volume of investments, but also the implementation of less profitable projects. Then, even with more favorable financing conditions, the growth in debt amounts and the fall in investments profitability led to a deterioration of EMEs firms' debt repayment capacity. In particular, a firm would present risk to be in arrears with interest payments when its interest coverage ratio is lower than 2. IMF data (2015a) shows that the percentage of EMEs firms whose interest coverage ratio was below 2 increased from 17% in 2007 to 36% in 2013. A more recent number regarding EMEs companies debt repayment capacity was published in IMF (2016), showing that the percentage of EMEs companies whose earnings were lower than interest expenses (interest coverage ratio below 1, a more critical situation) was of around 11 %, corresponding to US\$ 430 billion of "debt at risk".

On the other hand, several studies point that bond issuance resources were less used for new investments, and more destined towards refinancing debt or buying short-term financial assets. According to IMF (2015a), the allocation of funds raised by firms through bonds was higher for refinancing than for new investments¹²⁰. Moreover, Chui *et al.* (2014) mention that high interest rate differentials from domestic to international levels stimulated an intensification in carry trade activities by firms, which suggests the allocation of these resources for speculative purposes. A sign of those activities is the increase in companies' assets held as cash or bank deposits, which has grown significantly since 2009. The fact that this trend has not reversed after the crisis shows that the accumulation of financial resources by firms was not only a precautionary behavior immediately after the 2008 episode. Conversely, it was a strategy to increase financial returns, raising funds abroad with low

¹²⁰ This fact does not mean that firms have necessarily decreased their amount of investment. Instead, it means that firms have used a larger portion of bond issuance proceeds to refinance debt or to buy short-term assets, and may have increased their investments with other resources. However, with the decrease in minimum expected rates of return, the profitability of those new investments was lower.

interest rates and depositing in local banks or buying high yield assets from institutional investors. Indeed, Serena and Moreno (2016) point that the large destination of offshore bond proceeds towards short-term financial assets may accentuate the procyclicality of domestic financial systems and pose the risk of sudden reversals, which would raise financial stability concerns for EMEs.

Another factor associated with this process was the expansion of bond issuance through offshore subsidiaries, benefiting from jurisdictions that offer tax and regulatory advantages. The headquarters of these subsidiaries are located mainly in the following countries: China, Brazil, Russia, India, and South Africa. Mc Cauley *et al.* (2015a) estimated that in the second quarter of 2015, these offshore subsidiaries held a volume of bonds of US\$ 558 billion. With the funds obtained abroad, an offshore subsidiary of a non-financial company can transfer funds to their home country through three channels: i) Making a direct loan for its headquarters (within-company flows); ii) Providing credit to other non-financial companies (between-company flows) or iii) Making a cross-border deposit in a bank (corporate deposit flows). Based on an analysis of emerging countries' balance of payments data performed by Avdjiev *et al.* (2014), it was noted that capital flows to EMEs associated with all three mentioned channels grew considerably in the period between 2009 and 2014. As most of these flows were allocated for financial, rather than real activities, evidence suggests that offshore subsidiaries of emerging companies have acted in this period also as financial intermediaries, obtaining funds from global investors through bond issuance and remitting these resources to their home countries through those three different channels. Nonetheless, it is important to point that the increase in bond issuance abroad by EMEs firms was not only due to their own strategy to enlarge their investor base and raise funds with better conditions, but it was also a consequence of the interests and demands of international investors, seeking higher yields.

Overall, the features of corporate debt presented in this section showed that non-financial companies in emerging countries expanded their presence considerably in financial markets, searching for higher profits and often acting as financial intermediaries. They increased their degree of leverage and net foreign exchange exposure, especially in the post-2008 crisis period, and a significant share of them later presented deterioration in debt repayment capacity.

4.3. Literature Review

In this section, we present a literature review on theoretical approaches that underpin debt expansion in corporations and its features (subsection 4.3.1), and empirical articles that seek to understand the determinants of corporate debt in emerging economies (subsection 4.3.2).

4.3.1. Theoretical Approaches for Corporate Debt Expansion

The features of corporate debt described in section 4.2 (increase in leverage and net foreign exchange exposure, with later deterioration in debt repayment capacity) would have as a common point *agents' procyclical behavior*, being in accordance with theoretical approaches that have been well described both in the mainstream and heterodox literature.

In the mainstream literature, Bruno and Shin (2015) highlight the “risk-taking channel of monetary policy”¹²¹, and its impact on financial and real variables through bank leverage. These authors develop a model where looser international financial conditions (expansionary U.S. monetary policy) are associated with an increase in cross-border capital flows intermediated through higher leverage in the international banking system. The mechanism operates via stronger local borrower balance sheets as a result of local currency appreciation,

¹²¹ The “risk-taking channel of monetary policy” was an expression coined by Borio and Zhu (2008), who intended to convey the impact of monetary policy on the willingness of market participants to take on risk exposures, thus influencing financial conditions and real economic decisions. Further information on the risk-taking channel of monetary policy can be found on Adrian and Shin (2009), Gambacorta (2009) and Altunas *et al.* (2009).

allowing banks to lend more and take on more risk. Feyen *et al.* (2015) argue that this mechanism would also apply for corporate foreign bond issuance. Looser international financial conditions would be associated with a U.S. dollar real depreciation, increasing the propensity for emerging market corporations to issue abroad above their historical average volume. More specifically, when domestic currency appreciates, local companies' balance sheets strengthen. With stronger balance sheets, local companies would increase their external borrowing capacity, fostering higher cross-border inflows on EMEs by international investors who are willing to take on more risk. Conversely, tighter international financial conditions would lead to an appreciation of the U.S. dollar and cross border capital outflows from EMEs, with depreciation of domestic currencies, reducing companies' external borrowing capacity and weakening their balance sheets.

In the heterodox literature, descriptions of agents' procyclical behavior date back to Keynes' *General Theory* (1936). Assuming fundamental uncertainty and adaptive expectations, Keynes argued that each individual has the incentive to imitate other agents' average behavior (conventional behavior or Keynesian "beauty contest"- chapter 12 of the *General Theory*). Agents would act this way because: i) They imagine that other individuals may have information they do not have; ii) They prefer to lose when everyone loses, instead of losing alone. As long-term expectations are formed under a fragile basis, those expectations would be subject to sudden shifts, due to changes in entrepreneurs "animal spirits" that would influence their actions. It follows that levels of employment and income could decrease, once entrepreneurs' views shifted from optimistic to pessimistic. This change in entrepreneurs' views could spread through the market (herd behavior), triggering a "self-fulfilling prophecy": entrepreneurs' pessimism leads them to invest less, and thus the economy enters a downward trajectory, "confirming" the initial pessimism. A more in-depth analysis of firms' procyclical behavior was made by Hyman Minsky (1978; 1992) with his

“Financial Instability Hypothesis”. This author, when originally defined it, provided two central propositions: the first is that there are stable funding models and unstable ones; the second is that in prolonged periods of economic growth, stable financial relations may become unstable. In both, procyclical risk-taking tendencies are grounded in internal capitalist dynamics and in the system of institutions, interventions, and regulations, which were designed in an attempt to guide economic activities. So financial instability would be a process directly related to the structure of individual balance sheets together with the macroeconomic environment. Under this view, after an expansionary period with an increase in liquidity and credit, firms would take more speculative and Ponzi postures¹²², deteriorating their “safety margins” (i.e., debt repayment capacity) and weakening their balance sheet positions. It is important to highlight that Minsky viewed that generating instability and crises are features intrinsic or endogenous to capitalist dynamics. Hence, he believed that a financial crisis of great magnitude did not need to be necessarily triggered by a huge adverse (external or exogenous) shock. Conversely, a reversal of expectations caused by a one-off episode would be sufficient to modify refinancing conditions and, consequently, to push firms that were already under weak balance sheet conditions to a situation of illiquidity/insolvency.

4.3.2. Empirical Literature Review on the Determinants of Corporate Debt in Emerging Countries

The literature which investigates debts in emerging economies and their determinants is quite vast. It covers several episodes of crises, related to sovereign debt, banks, exchange

¹²² According to Minsky, three different financial postures may take place: hedge, speculative and Ponzi. The first posture - hedge - is characterized by a defensive behavior, in which expected gross income exceeds interest payments and amortization commitments in all future periods. Put differently, the agent has a safety margin that protects him from future fluctuations in interest rates. The second posture - speculative - is one in which agents' cash flow is sufficient to pay interest expenses, but not debt principal total amount. This agent usually takes funding with maturity lower than the financed project, hoping that in future periods his revenue increases in a way that would offset the initial situation of deficit. Thus, this agent operates with lower safety margins than hedge units, having to resort to periodic refinancing of its positions. The third posture - Ponzi - is one in which the agent does not have sufficient resources to cover even the interest expenses due. In this sense, the agent depends on refinancing a growing share of its debt, being more vulnerable than in previous cases against interest rates hikes, and can be taken to illiquidity and insolvency.

rate depreciation, as well as their interlinkages with important macroeconomics aspects, such as emerging countries' fiscal positions, current accounts, and capital flows. However, articles which try to deal specifically with the issue of the determinants of corporate debt in emerging economies in a global sense (not from a single country or regional perspective, as a consequence of a local/regional crisis) became more frequent only recently. This was the case especially after 2013, when macroeconomic conditions in EMEs in general deteriorated, and institutions such as the IMF and BIS started to highlight in their reports concerns related to the growth of corporate debt in those countries.

For instance, Mc Cauley *et al.* (2015b) center their analysis on the growth of U.S. dollar credit to non-residents on a sample of 22 countries (of which 14 emerging economies) through the period Q1 2000 - Q2 2014. In order to take into account the changes in the profile of credit (decrease in the share of loans and increase in the share of bonds), they use two different dependent variables: the log change in loan/GDP, and the log change in bonds/GDP. They also test alternative samples (2000-2014, before 2008, after 2008). They find that, prior to 2008, the determinants of U.S. dollar credit growth were more related to common drivers of international bank credit: bank leverage (as measured by financial commercial paper and broker-dealer repo), or low-cost leverage (as measured by the VIX). For longer time series (i.e., year over year, rather than quarterly growth rates), they find that the level of the Federal Funds rate mattered, especially in occasions when the effective Federal Funds rate was below the level prescribed by the Taylor rule.

Furthermore, Feyen *et al.* (2015) gather data of the universe of all foreign bonds issued by 71 emerging and developing economies (companies/governments) during the 2000-2014 period, and show that global factors had a powerful impact on primary activity in international bond markets by corporations and sovereign governments of emerging and developing economies. In particular, after conducting a panel regression analysis, these

authors found that a decrease in i) expected U.S. equity market/ interest rate volatility, ii) U.S. corporate credit spreads, iii) U.S. interbank funding costs and an increase in the Federal Reserve's balance sheet were associated to the following events: i) Higher probability that country-industry monthly external issuance volume is above its own historical average; ii) Lower yield-to-maturity spread of external bonds at the time of issuance (even after accounting for individual bond characteristics, such as volume, currency, riskiness, industry, type of issuer); iii) Higher maturity of non-perpetual external emerging and developing economies bonds at the time of issuance (after accounting for individual bond characteristics too).

In addition, Serena and Moreno (2016) analyze the determinants of U.S. dollar bonds issued offshore, for a sample of 41 countries (34 EMEs) from 2000 to 2015, on an industry-country-quarterly basis. They find that easier external financing conditions (proxied by a lower VIX) increase the amount issued in offshore bond markets, even when other control variables are taken into account. However, this impact is increased if countries present some of the following constraints: i) low onshore financial market depth (proxied by the sum of bank credit to the non-financial sector and non-financial corporate bonds outstanding); ii) presence of capital controls on local bond markets; iii) Presence of withholding taxes on corporate bond income. Hence, the authors show that, even if external financing costs fell, limited financing opportunities in domestic markets also played an important role in inducing EMEs firms to raise their offshore bond issuance.

Moreover, a study presented in IMF (2015a)¹²³ uses private databases of more than 1 million non-financial firms for 24 emerging market economies, during the period 2004–2013, totaling more than 1.3 million firm-year observations. They run a panel regression model where their dependent variable is the change in leverage (change of total liabilities/book

¹²³ An extended version of this study with alternative specifications was published later by Alter and Elekdag (2016).

equity), and their main explanatory variables are grouped into three categories: Firm Indicators (e.g., measures of size, profitability and asset tangibility), Country Macro Indicators (from the International Country Risk Guide), Global Indicators (price of oil, U.S. shadow interest rate, VIX, Global GDP), as well as some interactions among those variables and dummies for firm fixed effects. Their main result is that a decrease in the U.S. shadow rate is associated with faster leverage growth, with a more intense impact on the subsample 2010-2013.

4.4. Determinants of Corporate Debt Expansion in Emerging Countries

The objective of this section is to explain what factors were behind the expansion of corporate debt observed in emerging countries' companies in previous years. We undertake a panel analysis where we present a number of factors, with domestic and global origins, in order to check whether they were significant to explain corporate debt growth in EMEs corporations. In particular, we aim to identify the main changes in the explanatory factors of EMEs corporate debt expansion before and after the 2008 crisis.

4.4.1. Data

Our dataset gathers 15 emerging countries: Brazil, Chile, Czech Republic, China, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Russia, South Africa, South Korea, Thailand, Turkey. All those countries are emerging markets according to the BIS definition, and are listed on the MSCI EME index¹²⁴, which provides aggregate indicators for firms in each of those countries. Their geographical distribution is the following: Latin America (3 - Brazil, Chile, Mexico); Emerging Europe, Middle East and Africa (6 - Czech Republic, Hungary, Poland, Russia, South Africa, Turkey); Emerging Asia (6 - China, India, Indonesia, South Korea, Malaysia, Thailand).

¹²⁴ An index created by Morgan Stanley Capital International (MSCI) that is designed to measure equity market performance in global emerging markets. It captures large and mid-cap representations, covering about 85% of the market capitalization in each country.

The time period analyzed is 2000 Q1-2016 Q4, with quarterly data. We also compare sub-samples for periods before the 2008 financial crisis (2000 Q1-2007 Q4), and after the financial crisis (2009 Q1 - 2016 Q4). In our model, the dependent variable for corporate debt expansion - *Leverage* - is measured as companies' *Debt to Equity ratio*¹²⁵ in each of the countries, obtained from MSCI country indexes. The explanatory variables are divided into two big groups: *Country* and *Global* factors.

Country Factors: Represent factors that are linked with individual features in each country¹²⁶, whether microeconomic (firms' fundamentals) or macroeconomic (aggregate economic indicators).

Microeconomic Factors: Balance sheet indicators, based on reports from publicly traded companies, which are compiled by MSCI to compose indexes for each indicator in its respective country. They measure companies' main accounting aspects:

- i) Profitability: return on assets (ROA)
- ii) Solvency ratio: free cash flow per share /short and long term debt
- iii) Liquidity: current ratio (current assets/current liabilities)
- iv) Asset quality: tangible assets per share

Macroeconomic Factors: Main country indicators supposed to be relevant to companies' leverage

- i) Real GDP growth (% YoY). Our source for this data was the IMF International Financial Statistics (IFS) database.
- ii) Monetary Policy Rate (% YoY), obtained on the BIS statistics database.
- iii) Real Effective Exchange Rate (REER). Our source was the BIS statistics database.

¹²⁵ According to MSCI index methodology, their country-level measure of *debt to equity ratio* is obtained by dividing the total debt of firms listed in MSCI index of each country by the shareholder equity of those firms. Both debt and equity are on book value terms.

¹²⁶ Some of the country factors are both related to local and international components (i.e., REER). Still, they are classified as "country factors" because the international components reflect on each jurisdiction in a particular way, according to its local components, so that each nation will have its own country factor.

Global Factors: Include elements that have global implications, or are common for the world economy as a whole. They do not vary according to the jurisdiction, as country factors.

- i) Monetary policy rate of four main central banks (Fed, ECB, BOE, BOJ). Measured through the “Shadow Short Rate (SSR)”, based on the short-term policy interest rate, but accounting the stance and direction of monetary policy (level and slope), including the use of unconventional measures. The term structure of interest rates is used to find what policy rate would generate the observed yield curve if the policy rate could be taken to negative values. The “shadow rate” curve is obtained from calculating the value of a call option to hold cash at the ZLB and subtracting it from the actual yield curve. Our source for those rates was Kripnner (2016).
- ii) Real Global GDP growth (% YoY). Our source was the IMF IFS database.
- iii) Commodity price: All Commodity price index, compiled by the IMF. It is composed of weighted averages U.S. dollar prices (2005 = 100) of non-fuel (edible, industrial inputs) and energy commodities.
- iv) VIX: Index of expectations of U.S. stock market (S&P 500) volatility over the next 30-day period, calculated by the Chicago Board Option Exchange (CBOE). Proxy for market sentiment/global risk aversion, as described by several authors such as Rey (2015) and the ones mentioned in subsection 4.3.2.

4.4.2. Model Specification and Methodology

Regarding the model specification, our main panel regression is the following:

$$\Delta \log Leverage = c + \Delta \log CountryFactors + \Delta \log GlobalFactors + \varepsilon$$

This specification broadly follows the one used in IMF (2015a). The dependent and independent variables are all presented in quarterly log changes, and we also do proper stationarity tests to make sure there are no unit roots in the series. In order to control for omitted variable bias, we make the option to use first differences, as we aim to control for

unobserved heterogeneity among selected countries across time. To address a possible endogeneity problem on microeconomic factors (higher firm leverage influencing contemporaneous balance sheet indicators - profitability, liquidity, solvency, asset tangibility), the variables that measure them are lagged by one quarter, so that balance sheet indicators in the previous quarter will eventually explain leverage.

On an alternative specification, we also include an *interaction* term between two important variables, namely *Commodity Price Index* and the *Real Effective Exchange Rate*, so we can analyze how the introduction of this interaction term affects the model results.

$$\Delta \log Leverage = c + \Delta \log CountryFactors + \Delta \log GlobalFactors + \Delta \log Interaction + \varepsilon$$

The interaction term captures a singular relationship that exists between commodity prices and exchange rate movements, particularly in emerging commodity exporting countries. The idea is that an increase in global commodity prices would result in an improvement of commodity exporters' terms of trade, raising prospective currency inflows and leading to an appreciation of foreign exchange in those countries, therefore reinforcing easing borrowing conditions for firms, especially abroad. This special link between commodity prices and exchange rates is documented by Kohlscheen *et al.* (2017), who affirm this link goes beyond the global risk appetite (i.e., the one driven by the simultaneous movement of investors into/out of commodity markets and high-yielding currencies during risk-on/risk-off episodes), but do not use it with the purpose of explain the rise in corporate debt. The introduction of an interaction term between two explanatory variables could raise a question about the presence of multicollinearity in the model. However, multicollinearity is not considered an issue for the model as a whole when using interaction terms, once the *p*-value for the interaction is not affected by the multicollinearity, according to authors such as Goldberger (1991) and Allison (2012)¹²⁷.

¹²⁷ Those authors explain that, before creating the interactions, one can reduce the correlations by subtracting the means (centering) the variables. However, the *p*-value for the interaction will be exactly the same, whether or not

The methodology employed was a Feasible Generalized Least Squares (FGLS) estimation of the previous regressions. In the panel estimation, we add weights that follow the Cross Section Seemingly Unrelated Regression (SUR) method, to include robustness to groupwise heteroskedasticity, autocorrelation and cross-section dependence. On the coefficient covariance, we also use the Cross Section SUR method, but with a modified specification (Panel-Corrected Standard Errors PCSE), which has an increased accuracy in hypothesis testing¹²⁸.

In the sequence, we present in table 4-1 a summary of the expected signs of the relationships between the dependent variable with each one of the explanatory variables.

Regarding the expected signs addressing the relationship between microeconomic factors and leverage, they can be positive or negative, and depend on the theoretical approach adopted. There would be a positive correlation between the variable and leverage if one considers the trade-off theory, and a negative correlation if it is considered the pecking order theory¹²⁹. In general terms, the argument in favor of the trade-off theory supposes that firms

one centers the variables. Moreover, all the results for the other variables (including the R^2) will be the same in either case. So the multicollinearity has no adverse consequences in this situation. Furthermore, they explain that multicollinearity main problem is variance inflation, which implies high standard errors for the variables, and p -values less likely to be below a critical threshold. If confidence intervals are still small enough to have significant p -values despite sizable standard errors, then it is very likely that the actual effect of each variable is being isolated. That is what we observe in the results in the 2009-2016 sample, where each of the variables REER, Commodity Prices and *Commodity Prices*REER* have different coefficients, which are significant and whose values exceed the ones of the respective standard errors, supporting that individual coefficient effects are being properly isolated in the model.

¹²⁸ The Cross Section Seemingly Unrelated (SUR) method uses an error structure clustered by period. The method proceeds in two stages: (i) The model is estimated by OLS and the residuals are used to build a consistent estimator of the errors covariance matrix; (ii) Using this consistent estimator on the errors covariance matrix, one can implement a Feasible GLS estimation. The method is also known as Parks estimator, once the classic reference for this method is Parks (1967). On its turn, the Panel-Corrected Standard Errors (PCSE) was an alternative specification of the Parks estimator developed by Beck and Katz (1995), which preserves the weighting of observations for autocorrelation, but uses a sandwich estimator to incorporate cross-sectional dependence when calculating standard errors. Moundigbaye *et al.* (2017) show that the Parks estimator has the highest degree of efficiency in panel analysis when the ratio T/N is above 1.5 (case of our samples). In addition, the PCSE specification on the coefficient covariance improves the accuracy of hypothesis testing.

¹²⁹ Under the literature of Corporate Finance, two different approaches try to explain the determinants of corporate leverage, according to Adair and Adaskou (2015). On the one hand, the trade-off theory supposes that firms choose how to allocate their resources comparing the tax benefits of debt with the bankruptcy costs associated, targeting an optimal debt ratio. On the other hand, the pecking order theory assumes that firms prefer a sequential choice over funding sources. They avoid external financing if they have internal financing available and avoid new equity financing whenever they can engage in new debt financing. Debt funding would be

with higher levels of profitability, solvency, liquidity and asset tangibility face lower expected costs of financial distress and find interest tax deductions more valuable, thus having higher incentives to take on more debt. Conversely, the argument supported by the pecking order theory assumes that firms with higher levels of profitability, solvency, liquidity and asset tangibility dispose of more internal funds and may rely less on external funds, hence there would be less incentive to increase leverage.

Table 4-1 Expected sign for Relationship between Leverage and Explanatory Variables

Explanatory Variable	Expected Sign	Reference in Literature
Microeconomic Factors		
Profitability: Return on assets	Positive/ Negative	Adair and Adaskou (2015) IMF (2015a)
Solvency ratio: Free cash flow per share /Short and long term debt	Positive/ Negative	Adair and Adaskou (2015) IMF (2015a)
Liquidity: Current ratio	Positive/ Negative	IMF (2015a)
Asset Quality: Tangible assets per share	Positive/ Negative	Adair and Adaskou (2015) IMF (2015a)
Macroeconomic Factors		
Real GDP Growth	Positive	Feyen <i>et al.</i> (2015) IMF (2015a)
Monetary Policy Rate	Negative	IMF (2015a) Lo Duca <i>et al.</i> (2016)
Real Effective Exchange Rate	Positive	Feyen <i>et al.</i> (2015) IMF (2015a)
Global Factors		
Monetary policy rate of Fed, ECB, BOE, BOJ	Negative	Feyen <i>et al.</i> (2015) IMF (2015a) Lo Duca <i>et al.</i> (2016)
Real Global GDP Growth	Positive	Feyen <i>et al.</i> (2015) IMF (2015a)
Commodity Price	Positive	IMF (2015a) Kohlscheen <i>et al.</i> (2017)
VIX	Negative	Mc Cauley <i>et al.</i> (2015b) Serena and Moreno (2016)
Interaction		
Commodity Price*REER	Positive	-

preferred than equity funding because the cost of debt is usually lower, once it is a deductible expense. Additionally, although equity financing is less risky as regards cash flow commitments, it dilutes share ownership, control, and earnings. According to the authors, there is no consensus in the literature, with evidence supporting both theories, varying according to each different situation.

For macroeconomic factors, the expected signs are that higher levels of leverage would be associated with: a higher level of real GDP growth (higher domestic demand would foster an expansion in leverage); lower domestic monetary policy rate (lower policy rates would increase borrowing and leverage by firms); higher REER level (more appreciated exchange rate would allow higher leverage, especially in foreign currency).

When it comes to global factors, the expected signs are that higher levels of leverage would be associated with: a higher level of real global GDP growth (higher global demand would foster an expansion in leverage); higher commodity prices (higher commodity prices would incentivize more investments in this sector by EMEs companies and an increase in leverage); lower VIX (lower volatility in financial markets would encourage investors sentiment and an expansion in leverage); lower international interest rates. In particular, the transmission of a more accommodative stance by main central banks (including the implementation of quantitative easing programs - QEs) to an increase in corporate debt would occur through two ways: i) stock channel (QEs leading to lower risk premia and better financing conditions); flow channel (central bank asset purchases inducing portfolio rebalancing across countries, “crowding out” investors towards corporate bonds). According to Lo Duca *et al.* (2016), the channel which would be more relevant for EMEs companies would be the first one.

Regarding the interaction term, its expected sign is positive, once it is composed of the product of two terms with expected positive signs (commodity prices and REER).

4.4.3. Results

Table 4-2 summarizes our estimation output main results.

From a total of 14 independent variables included and one interaction term, we report in this table 4-2 the coefficients and robust standard errors of the variables in which were found statistical significance (1, 5 or 10 percent levels) in at least one of the three time periods

analyzed. Results for all variables and additional information on the samples are available in table 4-4 in appendix 4.1.

Table 4-2 Panel Estimation Output Main Results

Independent Variables	Dependent Variable: Debt to Equity					
	2000 Q1 - 2016 Q4		2000 Q1 - 2007 Q4		2009 Q1 - 2016 Q4	
	No Interaction	Interaction	No Interaction	Interaction	No Interaction	Interaction
Country						
Return on Assets (1 lag)	0.029*** (0.011)	0.029*** (0.011)	0.045*** (0.013)	0.048*** (0.013)	0.011 (0.010)	0.020** (0.010)
Free Cash Flow/Short Long Term Debt (1 lag)	0.002 (0.003)	0.002 (0.003)	0.010* (0.005)	0.009* (0.006)	0.002 (0.002)	0.003 (0.002)
Tangible Assets per share (1 lag)	0.024* (0.013)	0.024* (0.013)	0.006 (0.013)	0.005 (0.014)	0.028* (0.017)	0.024 (0.017)
Current ratio (1 lag)	0.109*** (0.023)	0.108*** (0.023)	0.038 (0.027)	0.037 (0.027)	0.188*** (0.021)	0.199*** (0.020)
Real GDP Growth	0.001 (0.004)	0.001 (0.004)	0.006 (0.007)	0.005 (0.007)	0.009*** (0.003)	0.007*** (0.002)
REER	0.396*** (0.068)	0.381*** (0.069)	0.591*** (0.095)	0.587*** (0.098)	0.131*** (0.047)	0.185*** (0.050)
Global						
US shadow short rate	-0.009* (0.005)	-0.009* (0.005)	-0.004 (0.033)	-0.002 (0.036)	-0.008*** (0.002)	-0.006*** (0.002)
UK shadow short rate	-0.000 (0.003)	-0.001 (0.003)	-0.300 (0.088)	-0.309 (0.094)	-0.003* (0.001)	-0.002* (0.001)
Global GDP Growth	0.008 (0.010)	0.009 (0.010)	0.022 (0.037)	0.014 (0.039)	0.004 (0.004)	0.008** (0.004)
Commodity price	0.065 (0.041)	0.003 (0.088)	0.109 (0.063)	0.106 (0.096)	0.020 (0.026)	0.335*** (0.049)
VIX	-0.034*** (0.009)	-0.033*** (0.010)	-0.068* (0.015)	-0.068* (0.016)	-0.024*** (0.005)	-0.024*** (0.004)
Interaction						
Commodity Price*REER	-	0.053 (0.062)	-	0.006 (0.067)	-	0.265*** (0.035)

Notes: All variables are measured in log changes. P values: *, **, ***, denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parenthesis.

Analyzing the results of the table as a whole, we observe that the signs of the coefficients are according to previously expected. For microeconomic factors, the signs are positive, hence in accordance with the trade-off theory. One of the main explanatory factors for leverage would be the real effective exchange rate (REER), once this variable is

significant in all specifications, and it has the largest coefficient in most samples (except 2009-2016). Its positive sign means an exchange rate appreciation in EMEs is linked to an increase in firms' debt/equity ratios.

Observing the full sample (2000 Q1-2016 Q4), we see that beyond the REER, other variables that presented statistical significance were: i) At the microeconomic level, the ones related to firms' profitability (return on assets), liquidity (current ratio) and asset tangibility (tangible assets per share), all positively related to leverage; ii) At the global level, the variable which represents USA monetary policy stance (U.S. shadow short rate) and the VIX (proxy for global risk aversion), both negatively related to leverage, meaning leverage tends to increase when those variables are lower.

In the sample 2000 Q1-2007 Q4, the most significant variables are at the country level: exchange rate (REER) and firms' profitability (return on assets). Other variables are also significant: at the micro level, firms' solvency ratio (free cash flow per share /short and long term debt); at the global level, the VIX. Even so, the degree of significance of those two last variables is lower (p -values closer to 10%).

In the sample 2009 Q1- 2016 Q4, several variables are significant: at the micro level, firms' liquidity and asset tangibility indexes; at the macro level, REER and real GDP growth; at the global level, the VIX and U.S. shadow short rates are strongly significant; the UK shadow short rate is also significant, albeit at a lower level¹³⁰. In the specification with the interaction term, also appear as significant firms' profitability at the micro level, and Global GDP growth at the global level. Most importantly, in this specification *Commodity Prices* and the interaction *Commodity Price*REER* are strongly significant and have the largest coefficients. Their positive signs mean an increase in commodity prices and the interaction

¹³⁰ The fact that Fed's accommodative policies have a higher impact on EMEs corporate debt and capital flows to emerging economies in general, when compared to other major central banks (BOE, BOJ, ECB) can be understood, among other factors, by the role of the dollar as a benchmark for offshore credit in most emerging markets and at a global level. This result is in accordance with other studies in the literature, such as Chen *et al.* (2017).

between higher commodity prices and exchange rate appreciation in EMEs are linked to an increase in firms' leverage. This finding is in accordance with data which shows that a considerable share of EMEs corporate debt after 2008 was taken by commodity sector industries, as was previously described in section 4.2.

In order to better analyze the changes in the determinants of corporate debt expansion between the time periods of the study, we perform Wald tests to check the joint significance of independent variables' coefficients. We divide the coefficients into two big groups: country coefficients and global coefficients. Country coefficients are then split into two smaller groups: Micro (firm factors) and Macro (aggregate economic factors). Global coefficients are also divided into two groups: one that gathers major central banks' monetary policy rates (U.S., Euro, UK and Japan shadow short rates), and a second that accounts for other global variables in the model (global GDP growth, commodity price index and VIX). In the specification that considers the interaction term *Commodity Price*REER*, the term was included in the group "country macro factors" (as the REER), due to its particular influence according to each country.

In order to verify the statistical significance of each coefficient block, we test two hypotheses: i) If the coefficients are different in the 15 countries; ii) If the coefficients are different from zero in the 15 countries. Thus, an answer "Yes" implies the joint coefficients have statistical significance as a group, while an answer "No" means they do not have joint statistical significance. The results are reported in Table 4-3.

Table 4-3 Joint Significance on Independent Variables' Coefficients (Wald Test)

Coefficient Group	2000 Q1 - 2016 Q4		2000 Q1 - 2007 Q4		2009 Q1 - 2016 Q4	
	No Interaction	Interaction	No Interaction	Interaction	No Interaction	Interaction
Domestic Microeconomic Factors						
Different in all countries	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Different from zero in all countries	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Domestic Macroeconomic Factors						
Different in all countries	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Different from zero in all countries	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Domestic Micro & Macro Factors						
Different in all countries	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Different from zero in all countries	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
US, UK, Euro Area, Japan Shadow Short Rates						
Different in all countries	Yes*	Yes*	No	No	Yes***	Yes***
Different from zero in all countries	No	No	No	No	Yes***	Yes***
World GDP, Commodity Price, VIX						
Different in all countries	Yes**	Yes**	Yes*	Yes*	Yes***	Yes***
Different from zero in all countries	Yes***	Yes***	Yes*	Yes*	Yes***	Yes***
All Global Factors						
Different in all countries	Yes***	Yes***	Yes*	Yes*	Yes***	Yes***
Different from zero in all countries	Yes***	Yes***	Yes*	Yes*	Yes***	Yes***

Note: P values: *, **, ***, denote statistical significance at the 10, 5 and 1 percent level, respectively.

The results in both specifications (without and with the interaction term) are broadly similar, and analyzing them one can reach the following conclusions. Before the 2008 crisis, the main determinants of debt expansion were in the group of *country* factors (as shown by the high significance of the return on assets in domestic microeconomic factors, and the REER in domestic macroeconomic factors). Conversely, after the 2008 crisis, while country factors remain important, factors in the *global* group also gain ground, both in the block related to international interest rates (e.g., U.S. shadow short rate), as well as in the block related to other global variables (VIX, commodity prices, Global GDP growth). Those results are consistent with other studies available in the literature previously mentioned in subsection 4.3.2.

As a robustness analysis, we removed China from the country sample, in order to test if its faster pace of credit growth when compared to other countries and its profile more reliant on local currency debt were introducing some bias on the results. However, the results kept broadly similar to the full country sample, with the same variables appearing as significant and in the same degree of significance, as reported in tables 4-5 (specification without interaction) and 4-6 (specification with interaction) in appendix 4.1.

Overall, our findings suggest that the exchange rate has been one of the most important determinants that explain the increase in EMEs companies' debt through the period 2000-2016, and also in the period before the 2008 crisis. But after 2008, beyond some country-level factors (exchange rate, national GDP growth, firms' higher liquidity levels), other factors that have global origins (more accommodative monetary policy in USA, lower financial market volatility, global GDP growth, higher commodity prices and its interaction with the exchange rate appreciation) have become increasingly important to explain emerging market corporate debt expansion.

Therefore, the analysis showed that the debt expansion in EMEs companies turned those firms more sensitive to the movements of the international economy. Hence, if firms are more sensitive to those movements, a reversal of international favorable conditions (i.e., monetary policy tightening in advanced economies, increase in risk aversion) may generate adverse effects in countries (e.g., currency depreciation, lower liquidity), increasing firms' borrowing costs and worsening their debt rollover conditions, turning their balance sheets weaker.

4.5. International Scenario, Challenges for Emerging Firms and Economic Policy

Implications

In this section, it will be discussed the implications of the increase in corporate debt in emerging economies, and their consequences for the weakening of firms' balance sheets, for EMEs macroeconomic conditions, and for the global economy. After a brief description of the international economic scenario for emerging economies after the 2008 crisis (subsection 4.5.1), the following subsections will examine the difficulties and challenges for firms arising from this scenario and the economic and financial framework in which they operate (subsection 4.5.2), as well as the implications for economic policies (subsection 4.5.3).

4.5.1. International Scenario for Emerging Economies

After the most critical period of the 2008 crisis in September, the economic and financial landscape that featured soon after was of a massive increase in liquidity by advanced countries' monetary authorities. They not only reduced official interest rates considerably, but also started to implement several unconventional measures (i.e., large scale liquidity provision operations, public and private asset purchases), trying to avoid a financial collapse and restore inflation/growth. This huge availability of liquidity in advanced economies not only lowered global lending costs, but also led to an increase in capital flows to emerging economies, where financial/real returns prospects for investments were higher. Those flows have brought

temporary economic benefits to those countries. However, they turned emerging markets more volatile and vulnerable to external shocks.

Since sovereign debt crises experienced over the 1990s, governments of emerging countries have implemented several protective and risk mitigation mechanisms, such as flexible exchange rates, accumulation of foreign reserves, currency swap agreements, development of local currency sovereign debt markets, some progress in the regulatory and macroprudential framework. All of them helped to reduce to some extent the dependence of government borrowing in foreign currency¹³¹. In this sense, financial risks in emerging countries were at first associated with corporate balance sheets, which have benefited from favorable international financial conditions to expand their debt in foreign currencies. Hence, an eventual movement of increase in uncertainty in the global economy, coupled with a rise in liquidity preference by investors, could increase the risk of EMEs corporations being unable to roll over their liabilities, especially if this movement is accompanied by a drop in profitability.

After the 2008 crisis, emerging countries were hit by their first sharp financial market setback in May 2013. Pointing to more positive output and employment data in USA, Fed Chairman Ben Bernanke announced that the Fed would start a gradual withdrawal of monetary stimulus in a few months ahead if economic data continued to improve. This mere signaling of a future tightening of the monetary policy stance caused a risk aversion movement that became known as “taper tantrum”. It generated a temporary run for “safe haven” assets (as U.S. Treasury bonds), dollar appreciation, capital outflows and depreciation of EMEs currencies. At the same time, emerging markets stocks and bonds prices began to decline, signaling a lower economic performance for these countries ahead. Another factor that helped to confirm the outlook of economic slowdown in emerging countries was the drop

¹³¹ However, those sovereign “lines of defense” against external crises also had numerous shortcomings, as further discussed in section 4.5.3.

in international commodity prices (especially oil), that started in the second half of 2014, largely due to resilient global oil supply and lower projections for Chinese growth. In 2015, emerging markets were hit by a new setback. China's slower economic output was confirmed, and signs that China and certain Asian countries were reducing their reliance on EMEs primary imports dragged down international trade as a whole. The Fed signaled an increase in interest rates, fact that only occurred in December 2015. However, international investors had already priced in this increase, requesting higher returns. The expectation of an interest rate hike in USA was one of the major factors behind the strong net capital outflows from emerging countries observed in 2015 (US\$ 690 billion), and also behind the currency depreciation that led to inflationary pressures in these countries (IIF, 2017a).

Another element of great importance to emerging economies economic outlook and capital flows destination is the pace of Chinese economic growth. IMF (2015b) and BIS (2015) reports argue that a deceleration in China's economic growth from double-digit levels is a consensus, leaving the question of whether this would be abrupt or smooth (hard landing or soft landing). So far, most analysts forecast that Chinese economic slowdown will be a gradual process (soft landing), due to a progressive transformation of the Chinese economic pattern, from a basis on investment in infrastructure/capital goods to a basis on domestic consumption/services. Nevertheless, two points on the Chinese economy, which directly impact other emerging countries, should be highlighted. First, the fact that China is aiming to reduce overcapacity in heavy industry and pollution levels could lead to lower demand for imports of certain commodities (such as industrial metals and fossil fuels) from other EMEs in the coming years. Second, the measures of gradual easing in Chinese exchange rate controls - implying a more flexible exchange rate in the future - have caused movements of high volatility in the renminbi (e.g., August 2015), which led to currency depreciation in several EMEs. Other episodes of volatility in the Chinese stock market (sharp losses after

prolonged high levels) also generated losses in global equity markets, especially in emerging Asian countries.

Coupled with the movement of deteriorating international financial conditions, firms that had debt in foreign currency were hit by two adverse effects in emerging markets that were observed until the beginning of 2016: i) Commodity prices drop, worsening their terms of trade; ii) Local currency depreciation, making the rollover of their debts more difficult, once a significant share of them is denominated in foreign currency. The decline in commodity prices (mainly of minerals/oil) turned several emerging economies which are exporters of those goods more vulnerable to current account imbalances and lower potential growth. Their currency depreciation could partly offset some of the losses on the terms of trade, by fostering an increase in export volumes. Nonetheless, currency depreciation also increased the burden of foreign currency denominated debt, exacerbating the deterioration of firms' balance sheets. Thus, in the face of upward pressures on loans' spreads, downward pressures on commodity prices and depreciation of local currencies, net issuance of bonds by emerging companies in international markets slowed in the second semester of 2015. According to BIS data (2017), EMEs non-financial corporate bond net issuance in international markets remained positive in 2015, but fell from a level of US\$ 71.6 billion in H1 2015 to US\$ 11.6 billion in H2 2015.

Therefore, after those uncertainty elements took the stage, firms started to face a worse condition for borrowing (both for finance and funding), pushing their bond yields upwards. Companies with weaker balance sheets could increase the risk of contagion to the banking system. This move could impact local banks through two channels. First, on the liabilities' side, if banks depend on companies' deposits as part of their funding. Deposits denominated in foreign currencies are recognized as procyclical when compared to those made in local currency and can lead to sudden withdrawals if corporate debt rollover risk increases. Second,

on the assets' side, banks can be affected by loans to companies¹³² and positions in derivatives, as well as losses in exposures to corporate bonds. Within this context, especially during the period from May 2013 to January 2016, emerging countries faced a difficult tradeoff between trying to expand their demand amid an economic slowdown and reduce their external vulnerability in a more uncertain international outlook.

In fact, from February 2016 until November 2016, emerging countries had a “relief” in international pressures, with some currency appreciation and commodity prices gains. This “relief” was due to more favorable signs of the Chinese economy and a cautious stance by the Fed with new interest rate hikes. EMEs non-financial corporate bond net issuance in international markets presented recovery from its H2 2015 weak levels (registering US\$ 43.9 billion in H1 2016 and US\$ 67.1 in H2 2016, according to BIS 2017). In November 2016, a new round of instability came in for emerging economies, with the election of President Donald Trump in the USA. His promises of higher growth and more expansionary fiscal policies for the USA may not bring benefits to other countries, since he also intends to apply protectionist trade measures and repatriate investments made by American firms abroad, with lower domestic corporate taxes. Both measures could mean lower commercial and financial flows to EMEs, but it is still to be seen to which extent those promises will be implemented, and their real repercussions in EMEs.

Overall, new episodes of international instability in systemic economies (USA, China, Europe) may occur, turning the future of emerging economies uncertain and leaving their firms more subject to financial vulnerabilities.

¹³² In particular, local banks tend to be more exposed, not only because loans to non-financial companies still represent a significant share of these banks' total credit portfolio, but also because they tend to increase their exposure to smaller firms (usually with lower repayment capacity), while larger firms can raise funds with international banks or by issuing bonds.

4.5.2. Challenges faced by Emerging Country Firms

Beyond the international scenario surrounded by uncertainties, other challenges faced by emerging country companies are: i) Currency mismatch problems; ii) Susceptibility to the interests of creditors, banks and institutional investors and iii) Macroeconomic volatility.

4.5.2.1. Currency Mismatch

Currency mismatch occurs when there is a discrepancy between agents' financial commitments and revenues denominated in foreign currency, due to uncertainty in the behavior of foreign exchange rates. According to Goldstein and Turner (2004), the concept of "currency mismatch" would comprise two components: a "stock" one, related to the sensitivity of an agent balance sheet (net worth) to exchange rate changes; a "flow" one, related to the sensitivity of an agent income statement (net income) to exchange rate fluctuations.

Taking into account the currency mismatch problem, companies could be in better financial health if they had enough *hedge* - funds in exchange for liabilities in foreign currency. It is known that many of them have "natural" hedges, once most of their revenues are denominated in foreign currencies, which in principle would make them less vulnerable to local currency depreciation. Another possibility would be to manage currency exposures through financial derivatives. However, it is difficult to measure the existing amount of those derivative instruments due to the lack of transparency of this information in many emerging economies. International data regarding non-financial companies' hedge is not disclosed in a clear and timely form, especially in EMEs¹³³. Indeed, many firms acquire loans through their

¹³³ BIS data compilation related to foreign exchange derivatives that includes emerging countries occurs every three years through the "Triennial Central Bank Survey of foreign exchange and derivatives market activity". Still, data disclosed does not segregate the amounts of non-financial companies' derivatives. It only discloses the total amount of "non-financial customers", a category that includes firms, households and government entities altogether. In addition, Borio, McCauley and Mc Guire (2017) estimate that the volume of dollars borrowed by non-banks outside the USA in FX derivatives markets was around US\$ 13-14 trillion at end March 2017. However, those estimates do not segregate either emerging countries (they consider developed and emerging countries as a whole), or corporations (consider governments and private non-bank agents in the total amount).

subsidiaries abroad, turning more difficult to know in which degree their net foreign exchange exposure is really found. Moreover, hedging guarantees are not static. In the case of exporting firms, there may be a drop in revenue due to a reduction in their products' price or in the amounts exported.

Furthermore, the hypothesis that having access to developed financial markets would ensure proper hedging ¹³⁴ can be refuted by the case of exporting companies from South Korea, Brazil, and Mexico. Those companies incurred in heavy losses in the 2008 financial crisis because they were involved in foreign exchange derivative transactions with the intention to speculate, as Chui *et al.* (2014) report. In fact, they made hedge contracts that had lower costs, but were more risky, once they would be forced to sell their dollars at below market prices if domestic currency depreciated. As these companies were betting on a continued appreciation of local currencies, they engaged in several of those contracts, but once their domestic currency depreciated after 2008, they were forced to execute their positions, incurring in losses. Thus, companies which adopt a strategy to increase balance sheet exposure to foreign currency, but hope that hedge contracts will provide full insurance, may be taking a risky step. This uncertainty occurs because future expectations may not be fulfilled, and on occasions of foreign exchange volatility, market liquidity shrinks, and it is more difficult to roll over hedge contracts. Therefore, the availability of funds for hedge is reduced at occasions they are most needed.

4.5.2.2. Susceptibility to the Interests of Creditors, Banks and Institutional Investors

Another critical element for emerging market companies is their susceptibility to creditors', banks' and institutional investors' interests. As discussed in section 4.2, non-

¹³⁴ This hypothesis refers to the assumption that firms with access to more developed domestic derivatives markets, or to international derivatives markets (e.g., Korea, Mexico, Brazil), would have a higher probability to hedge their foreign exchange exposures, when compared to other companies that do not have the same access to those markets.

financial corporate debt profile has changed over the last years: although bank loans remained the main source of funding, resources obtained through bond markets had a significant increase in their share. This fact adds more complexity to companies' decisions.

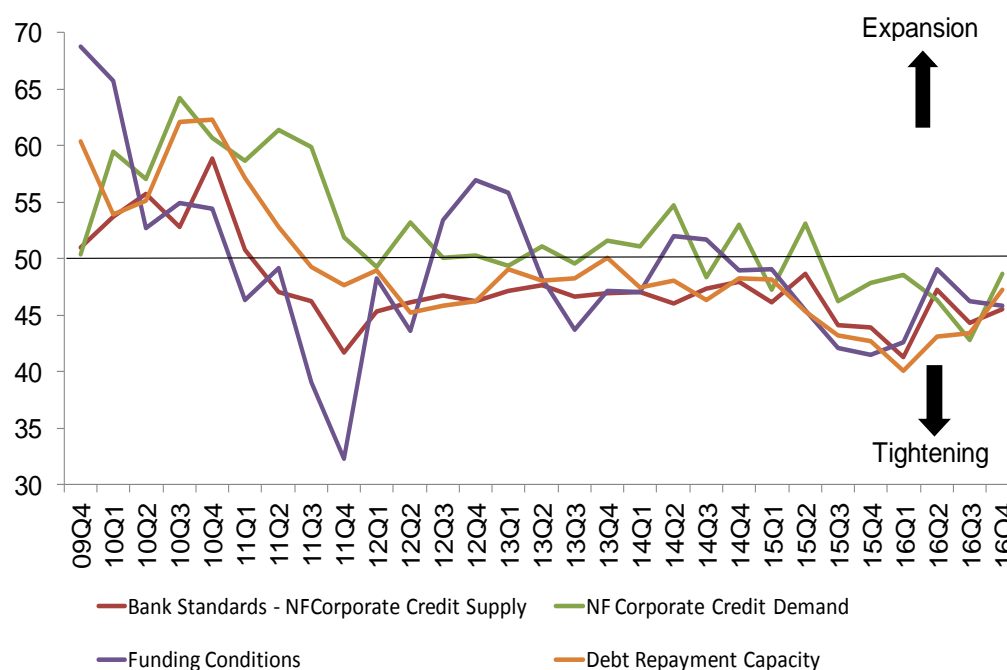
Concerning bank loans' funding, banks had to adapt to the new supervisory and regulatory framework after the 2008 crisis, which required, among other things, an increase in capital requirements. According to BIS (2015), banks' core tier 1 expanded on average from 7% in 2011 to 11% in 2014, mainly through retained earnings. However, the scenario of low global interest rates reduced net interest income over the period. In this context of increased capital requirements and downward pressure in profitability, banks, when observed an increase in emerging firms' default ratios, tended to tighten their lending conditions: reduced terms, increased interest rates, and rationed credit. This tightening would further aggravate the problems of indebtedness and defaults among companies.

In fact, when looking at data of the *Emerging Markets Bank Lending Conditions Survey*¹³⁵, we note that since 2011 up to Q1 2016, a perception of deterioration in firms' debt repayment capacity (increase in non-performing loans) was accompanied by a perception of tightening in corporate credit supply conditions. This trend became more acute in 2015, as it can be seen in graph 4-2.

From Q2 2016 to Q4 2016, there was some "relief" in the deterioration of both indicators, although they continued to be in a "tightening" territory. This close relationship between credit standards and non-performing loans was observed during most of the Survey coverage period, even if the perceptions for corporate credit demand and funding conditions oscillated between expansion and tightening.

¹³⁵ The *Emerging Markets Bank Lending Conditions Survey* - IIF (2017b) is a survey that gathers a sample of senior executives from 132 banks in emerging countries around the world. It evaluates their perceptions of credit supply and demand, funding conditions, non-performing loans and trade finance. From the answers to the questions, it produces a diffusion index, where 50 represents a neutral level, above 50 expansion (improvement) and below 50 tightening (worsening).

**Graph 4-2 Bank's Credit Conditions perception in Emerging countries:
Q4/2009 to Q4/2016**



Source: Author own elaboration, based on IIF (2017b) data.

About companies financing through bond market funding, its expansion in the period did not occur by accident. It is known that raising funds through bond markets has some advantages when compared to bank loans, among which the following: i) The possibility of issuing debt on better terms (longer maturities, lower interest rates, in some cases in domestic currency) and ii) A more diversified investor base. However, this form of financing has a particularly volatile nature, since it is characterized by: i) The influence of investors' procyclical behavior, which may induce herd effects in bond prices; ii) The presence of collective action problems, since it is more difficult to control capital outflows from a diversified scope of market investors than from a more limited and regulated set of international banks.

Additionally, it is worth mentioning that the rise of finance and institutional investors linked to non-financial corporations' portfolios has strongly influenced their behavior. Within

a broader movement of financialization¹³⁶ (observed since the 1970s but with increasing importance in more recent decades), it has been shaped a new framework for the structure and management of corporations, the shareholder value. The shareholder value framework changed the logic of capital growth, submitting corporate governance decisions to financial markets' purposes, and encouraging the exacerbation of risky positions by increasing speculation and leverage, according to Lazonick (2004). In the shareholder value framework, the fundamental objective is to maximize the wealth of shareholders. In this sense, companies are subordinated to the prices, evaluations, and interests determined by capital markets, which shape their resource allocation. Hence, stock investors react either reducing share prices (if they judge the company has taken bad decisions according to their interests), or increasing share prices (if they consider the opposite). Stock options and other types of incentive-based compensation plans were also implemented in order to align the interests of companies' shareholders and managers. Thus, complying with institutional investors' and CEO's requests for rapid gains and higher earnings in the short term, firms were encouraged to expand financial transactions and riskier operations. For instance, undertaking share buybacks, mergers/acquisitions, and dividend payouts, so they can boost their market value and fulfill shareholders' interests. They also operated with more complex and leveraged financial instruments, reducing safety margins in their cash flows, as mentioned by Palley (2014). They assumed positions in a wide variety of sectors, with a more aggressive and speculative profile, searching for higher profitability in an increasingly globalized and financialized world. This behavior has left firms more exposed to fluctuations in macroeconomic indicators, financial markets, and asset prices. Therefore, non-financial corporations have become increasingly linked to the interests of these investors.

¹³⁶ The concept of financialization is related to the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies (Epstein, 2005).

Most of the bonds issued by firms were acquired by institutional investors such as insurance funds, pension funds, hedge funds, mutual funds, usually controlled by asset management companies. In general, asset management companies' business models (i.e., the adoption of benchmarks and the importance given to market peers' performance), as well as the investment structures they offer (e.g., collective investment vehicles) encourage short-term behavior that may be disruptive in the face of adverse shocks¹³⁷. In the case of EMEs' asset management companies, this short-term bias is even more pronounced, since the funds they operate have a smaller number of benchmarks and a more correlated profile than their counterparts in advanced economies. As a result, financial shocks are more likely to affect a wide range of investors in EMEs funds simultaneously. Hence, one of the main risks for corporations would be a sudden withdrawal of those investors.

4.5.2.3. Macroeconomic Volatility

Regarding the adversities posed by macroeconomic volatility, it can be noted that emerging economies are more susceptible to shocks and instability, due to their structural characteristics.

First, it is clear that emerging firms have higher funding costs in international markets. BIS data (2016a) show that corporate spreads paid by emerging firms are consistently higher than those paid by U.S. and European companies when compared to their peers in high-yield and investment-grade markets. This fact is generally associated with their nations' sovereign spreads, which impose them a clear competitive disadvantage in international markets.

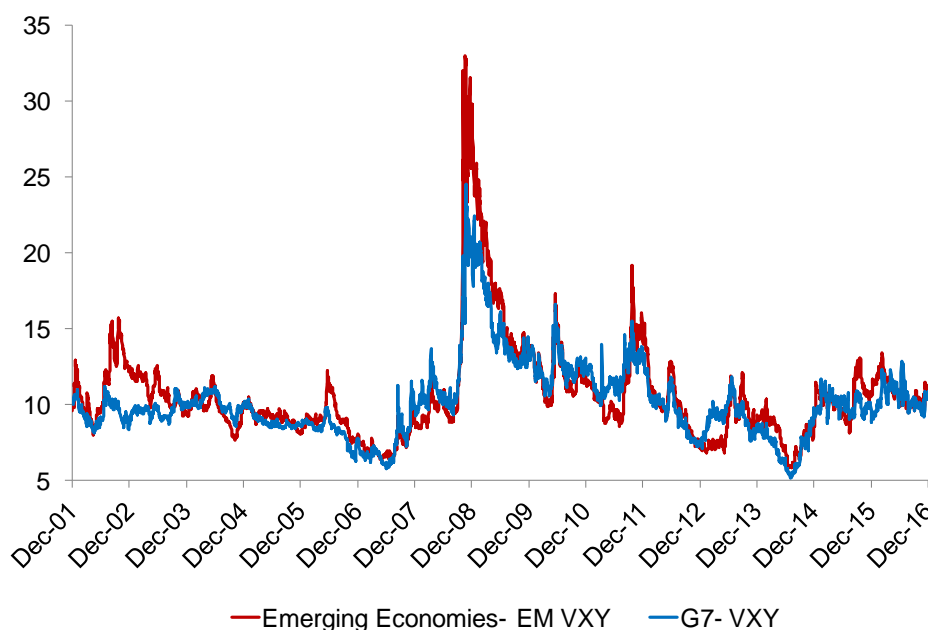
Another sign of deterioration in emerging countries firms' credit perspective is the increase in the number of downgrades performed by rating agencies in recent years. Data compiled by the Institute of International Finance - IIF (2017c) on non-financial companies in

¹³⁷ In some cases, asset management companies work with structures whose risks are borne ultimately by retail investors (e.g., defined contribution pension funds, rather than defined benefit pension funds), according to BIS (2015). In general, retail investors have smaller resources and lower risk tolerance, and therefore are less prepared to absorb losses.

14 emerging economies show that the index which accounts for upgrades net of downgrades in S&P credit rating agency (including credit watches) fell significantly, from -38 in 2013 to -69 in 2014, -98 in 2015 and -195 in 2016. Hence, the greater insertion of EMEs firms in financial markets turned them more exposed to fluctuations in yield spreads and credit rating scores. They may face higher losses because spreads/credit ratings of similar sectors/countries were negatively affected, even if their own conditions have not changed.

Actually, at a time of many uncertainties in the international economy, it is expected that emerging markets are more subject to large movements in capital flows and, consequently, to exchange rate volatility. It is important to mention that such scenario is riskier for emerging market companies, because it may increase their debts' amounts and service payments, and also affect loans' refinancing conditions. Graph 4-3 compares the exchange rate volatility of emerging countries and G7 countries since 2000.

It is worth noting that emerging countries' currencies have generally higher volatility than G7 currencies over the period. In recent years, the volatility index showed a growth trend between mid-2014 and early 2016, especially in emerging currencies. However, there was a period in the middle of 2016 which was an exception. At that time, G7 currency volatilities were affected by strong fluctuations in the pound due to the "Brexit" referendum, while emerging currencies had a lower oscillation, due to a more cautious stance by the Fed with new interest rate hikes in that occasion. However, EMEs currencies volatility outpaced G7 currencies volatility at the end of 2016, once initial "Brexit" concerns were not confirmed, and EMEs currencies were hit by a risk aversion movement after the election of Donald Trump for U.S. presidency in November 2016.

Graph 4-3 Foreign Exchange Volatility¹³⁸ : Emerging Countries x G-7

Source: Author own elaboration, based on Bloomberg data.

4.5.3. Economic Policy Implications

Since the financial crises experienced in the 1990s, emerging countries have sought to implement a number of defense mechanisms to prevent external crises. From companies' point of view, they expanded their amount of private assets held abroad¹³⁹. However, in times of instability, the main shortcoming of this mechanism is its low liquidity.

From governments' point of view, they have also made an effort to create a series of sovereign lines of defense against potential external macroeconomic and financial risks. One set of lines of defense that can be mentioned was the accumulation of foreign reserves - which increased as an average in EMEs from 10% of GDP in mid-1990s to 30% in 2014, according to BIS (2015) - as well as currency swap agreements between central banks and precautionary lines with multilateral institutions (e.g., IMF). However, there are problems with this set of mechanisms, especially with the use of foreign exchange reserves and IMF lines: i) The difficulty in directing official foreign exchange reserves to solve liquidity shortages in the

¹³⁸ VXY: Index calculated by JP Morgan Volatility Indices, which monitors aggregate currency volatility through a weighted average of the values, based on three-month at-the-money forward options.

¹³⁹ This amount increased from 30% of GDP in the mid-1990s to 45% of GDP in 2014, according to BIS data (2015).

private sector; ii) Governments' reluctance to use official reserves, for reasons of not wanting to convey wrong incentives to agents or to run out of tools in case of a deeper crisis; iii) Resistance to sign assistance programs with the IMF, once those programs are generally associated to tough conditionalities.

A second set of safeguards was a reform in the macroeconomic framework, which incorporated in many countries monetary policy with an inflation targeting regime, fiscal rules, and a flexible exchange rate regime. On the one hand, this new macroeconomic framework has turned emerging markets more solid under international investors' view, as they perceived emerging countries with more tools and flexibility to deal with problems arising from external shocks. Note that on such occasions, the usual policy recommendations would be: i) More restrictive monetary policy; ii) Countercyclical fiscal policy and iii) More flexible exchange rate regimes.

On the other hand, it is known that macroeconomic policies are only partial shields to crises episodes. In particular, in the case of monetary policy, although it can be tightened to prevent asset price booms and an increase in leverage, this tightening is not a good alternative when is done very quickly, because the forced contraction could result in losses in output/employment and a higher foreign debt level. Moreover, it can become ineffective in occasions of adverse international financial conditions and strong capital outflows, with the rise in interest rates turning indebted companies even more vulnerable. Regarding fiscal policy, emerging countries at the moment do not have the same "fiscal space" for countercyclical policies they had right after the 2008 crisis, as governments are dealing with issues related to the increase in public deficits/debts since then. Moreover, fiscal instruments usually have more obstacles to be implemented, once they require parliamentary approval. Nevertheless, some authors suggest changes in tax laws that may inhibit an excessive increase in agents' debt levels. First, removing tax incentives for companies to raise funds through

debt rather than equity, which exist in several countries (BIS, 2016b). Second, in times of economic growth, the imposition of higher tax rates for more leveraged companies and lower tax rates for less leveraged firms. The resources collected with such taxes should be destined to a fund that would serve as a liquidity buffer to be used in times of financial adversity (BIS, 2015). However, in this second case, the real effectiveness of this measure cannot be ensured, once it has not been tested yet.

Therefore, emerging countries have the challenge - beyond traditional macroeconomic policies to prevent external and domestic vulnerabilities – to adopt actions to mitigate currency mismatch and high leverage in their firms. These actions should be implemented not only through monetary and fiscal policies, but also with an improvement in regulatory frameworks, as well as macro and micro-prudential measures, preferably on a coordinated basis, as it will be argued in the sequence.

4.5.3.1. Improvement in Regulatory Frameworks

Recognizing the existence of regulatory shortcomings is a key factor to try to solve problems that became clear since the 2008 crisis. Regulatory actions adopted since then (i.e., Basel III rules¹⁴⁰) have not been able to properly address problems such as excessive leverage growth and procyclical behavior of the whole financial sector. In this sense, there is a demand for additional reforms on regulatory frameworks. In order to monitor systemic risks more appropriately, one has to consider the increasing interconnectedness between the various participants in the financial system. Hence, the potential range of regulation needs to be broadened to all financial activities, especially in the non-banking sector. As suggested by

¹⁴⁰ Basel III rules were adopted by the Basel Committee on Banking Supervision in January 2013, with gradual implementation until January 2019. Some of the major innovations introduced are described in the sequence. On the capital side, were adopted: higher *minimum capital requirements* (for core tier 1 and tier 1); a *conservation capital buffer* to protect against losses; a *countercyclical buffer* (macroprudential tool eventually triggered in occasions of excessive credit growth). For Global Systemically Important Banks (G-SIBs), additional requirements in terms of capital buffers and total loss absorption capacity also apply. On the liquidity side, two reference indexes were implemented: short-term (*liquidity coverage ratio*, a month under a simulated stress scenario); long-term (*net stable funding ratio*, a year with stable funding conditions). On the leverage side, it was imposed a limit for the *leverage ratio*.

Auvray, Dallery, and Rigot (2016)¹⁴¹, more regulation is needed over institutional investors (insurance companies, pension funds, hedge funds, mutual funds), generally controlled by asset management companies. For the case of asset management companies, it would be advisable to adopt the following measures, according to BIS (2015): i) Impose restrictions on fast redemptions and sudden changes in funds' portfolio composition, that would reduce liquidity risks and serve as stabilizers in temporary adverse shocks; ii) Establish limits on leverage, seeking to contain the amplification of shocks; iii) Encourage the extension of managers' investment horizon and the implementation of precautionary buffers, which would increase the capacity of these companies to absorb losses.

Another issue to be developed is the improvement of financial/ non-financial institutions' resolution schemes, in order to establish proper roles for public/private participation in such schemes, to mitigate financial stability risks and moral hazard with government support. Regulators need to be able to enforce restructuring or closure of institutions which face financial problems or bankruptcy. According to IMF (2015a), legal frameworks should be improved, so that regulatory agencies have mandates and tools consistent with their objectives. Their duties and responsibilities need to be clear for future accountability. Obviously, many corporate interests can be challenged in a reform of resolution frameworks, so that political lobbies may create obstacles for the implementation of the necessary reforms (i.e., limits for "too big to fail" institutions).

4.5.3.2. Macroprudential Actions

Macroprudential actions can be implemented with two primary objectives: enhancing the resilience of the financial sector (measures to avoid the buildup of financial imbalances and significant exposure against financial shocks), or smoothing the credit cycle

¹⁴¹ Besides the increase in the supervision of institutional investors, these authors propose an alternative structure for corporate governance, not based on shareholder value. On their proposal, decisions would be taken by a board composed of shareholders, managers, workers, and other company stakeholders, in which those members would have equal powers. This diverse board would try to avoid that financial interests always have the last word within companies' decision process.

(countercyclical actions to mitigate an expected credit boom or bust). There is a wide variety of macroprudential tools, but for each one of those objectives, there would be some set of measures that would be more appropriate. In the case of enhancing the resilience of financial sector, authors such as Claessens *et al.* (2014) and Boar *et al.* (2017) argue in favor of: i) capital-based instruments (countercyclical capital requirements, leverage restrictions, general or dynamic provisioning) and ii) liquidity-based requirements. When the goal is to smooth the credit cycle, those authors support: i) asset-side instruments (credit growth limits, maximum debt-service-to-income-ratios, limits to bank exposures to individual agents, such as maximum loan-to-value ratios); ii) changes in reserve requirements; and iii) currency instruments (limits on foreign exchange exposure, net open positions and differential treatment of deposit accounts in foreign currency).

Evidence in the literature is broadly in favor of the use of macroprudential policies, when implemented in a proper way. Boar *et al.* (2017) show that countries that implement macroprudential policies have stronger and less volatile GDP growth. Claessens *et al.* (2014) show that measures destined to control credit growth over borrowers (debt-to-income, loan-to-value ratios) and financial institutions (limits on credit growth, foreign currency lending) are effective on preventing excessive credit growth. Gambacorta and Murcia (2017) show that macroprudential policies are effective in stabilizing credit cycles, with propagation effects for measures aimed at smoothing the credit cycle (average of one quarter) more rapid than for measures aimed at enhancing the resilience of the financial sector (average of one year). However, those actions are not perfect and can generate distortions when not implemented in an adequate way. Still, one can affirm that when properly implemented, those policies are important tools for monitoring risks in the economy from a systemic point of view. They also turn companies' balance sheets more solid, as well as their interactions with banks and other agents of the economy.

As each country has its own institutional framework and economic condition, one cannot prescribe a “single book” of recommendations, valid for all countries at the same time, or even for emerging countries as a whole, due to their very diverse nature. However, some researchers such as the authors of IMF (2015a) point to a general set of guidelines for macroprudential initiatives that would be interesting to be taken by emerging countries on a preventive basis, in order to avoid excessive risk-taking by EMEs companies. In the short term, the proposed actions would be to limit corporate risks with leverage and foreign exchange exposure, and their impacts on other interrelated sectors, such as banks. For example, reserve requirements/risk weights over certain assets could be increased, as well as limits for leverage in real estate markets (debt-to-income / debt-service coverage ratios) and for foreign exchange positions could be introduced. Capital flow management measures, to deal with excessive flows that pose systemic financial risks, could also be considered. In the long term, other measures would be recommended, among which: i) Changes in tax codes, removing tax benefits in favor of excessive debt growth; ii) Promoting the development of local financial markets with proper regulation, and encouraging greater participation of domestic investors.

4.5.3.3. Microprudential Actions

At the microprudential level, supervisory authorities should improve data collection mechanisms from financial and non-financial companies. In particular, promote an improvement in the measurement and disclosure of data related to foreign exchange exposure, hedge and offshore issuances, which in many emerging countries are still inadequate. Monitoring should also include stress tests, where interest rate/ exchange rate volatility and currency mismatches are taken into account, according to IMF (2015a). Supervisory authorities should increase the accuracy of their tools of control and analysis, because as seen in the 2008 crisis, the opacity of balance sheets led to an increase in financial system's

instability. Those authorities need to consider in their analysis that liquidity risk can become insolvency risk for each individual institution. Aspect to be highlighted is that more attention needs to be given to tail risk. The 2008 crisis demonstrated that VaR (Value at Risk) models have failed to determine the magnitude of the losses observed, as argued by authors as Daníelsson (2008). In terms of incentives, there is a need to reduce stimulus to excessive borrowing/ lending of certain types. For instance, avoid incentives for companies in non-tradable sectors to borrow in foreign currency. In these situations, those companies have local currency revenues, but liabilities in foreign currency, which turn them more exposed to liquidity and default risks in occasions of domestic currency depreciation.

4.5.3.4. Coordinated Actions

Despite the efforts to improve the efficiency and reduce the asymmetries of the global financial regulatory framework, each country has its particular institutional arrangement and current economic situation, and hence implements its own set of regulations and macro/micro-prudential measures. Regarding macroprudential policies, one of the shortcomings they present is that, when adopted on an *ad-hoc* and temporary basis, to act on specific market segments, those policies allow agents to discover ways to evade/circumvent them, opening the doors for regulatory arbitrage. Moreover, their improper use can lead to distortions in other economic sectors in the same country or other countries.

Therefore, a first recommendation would be to seek greater coordination among countries' regulatory frameworks, in order to avoid loopholes, and that macroprudential policies targeted to a specific sector or country do not harm other sectors/countries. Second, instead of adopting macroprudential measures on a reactive, *ad-hoc* and temporary basis, choose to implement them preventively, jointly and on a medium/long-term basis. Thus, such measures could act on an *ex-ante* way (preventing imbalances), and be continuously

monitored and assessed to correct eventual distortions and ensure proper calibration, so that their overall objectives are achieved in the long term (IMF, 2013b).

Besides, due to the close relationship between macroprudential and financial supervision with antitrust, fiscal and monetary policies, it is advocated improvement in the coordination among those policies. In particular, with appropriate coordination between monetary and macroprudential policies, central banks and financial supervision authorities could take balanced decisions in the two spheres, being able to ensure macroeconomic and financial stability at the same time (BIS, 2016b). Another good example of properly coordinated actions would be the creation of mechanisms that drive companies' incentives to less short-term/speculative actions, and more towards medium-long term/ real investments. A way to do so would be to implement proper industrial policies, with the support of institutions such as national/multilateral development banks, which can provide more adequate conditions for financing development in the long term. Policies should target strategic sectors: infrastructure, health, education, SMEs, "decent jobs" creation, innovation/technology, energy/ecological transition. Such policies could reduce financial stability concerns, and at the same time foster more private and public investments in the real economy, towards sustained economic growth.

4.6. Conclusions

This chapter explored corporate debt expansion in emerging markets after the 2008 crisis, its profile, main determinants, the challenges faced by firms related to this issue, and discussed economic policy implications for those countries. Some of the main features of this expansion in EMEs corporate debt were the increase in leverage, net foreign exchange exposure, later leading to a deterioration of debt repayment capacity in a significant share of them. Those features would have as a common point agents' procyclical behavior, being in accordance with theoretical approaches that have been well described both in the mainstream

and heterodox literature, related to concepts such as the risk-taking channel of monetary policy, herd behavior, animal spirits, Keynesian “beauty contest” and financial instability hypothesis.

Our contributions to the literature are to investigate the determinants of EMEs corporate debt expansion by using a dataset which goes from 2000 Q1 up to a recent period (2016 Q4), and with subsamples before and after the 2008 crisis, so we identify the main changes in the factors that explain EMEs corporate debt expansion before and after this event. Most importantly, we identify a factor not previously used in the literature for that purpose: the interaction between higher commodity prices and more appreciated exchange rates. Our findings suggest that the exchange rate has been one of the most important determinants that explain the increase in EMEs companies’ debt through the period 2000-2016, and also in the period before the 2008 crisis. But after 2008, beyond some country-level factors (exchange rate, national GDP growth, firms’ higher liquidity levels), other factors that have global origins (more accommodative monetary policy in USA, lower financial market volatility, global GDP growth, higher commodity prices and its interaction with the exchange rate appreciation) have become increasingly important to explain emerging market corporate debt expansion.

Hence, if EMEs companies are more sensitive to the movements of the global economy, a reversal of international favorable conditions may generate adverse effects, increasing firms’ borrowing costs, worsening debt rollover conditions and weakening their balance sheets. In this context, difficulties posed by the international economic scenario - uncertainties in major economies (USA, China, Europe) as well as large swings in emerging currencies and commodity prices - together with problems related to currency mismatch; susceptibility to the interests of creditors/ institutional investors/ banks and macroeconomic volatility may put into question the financial sustainability of these companies. Moreover, it

was seen that, although in recent decades several macroeconomic lines of defense have been developed by EMEs governments to combat economic and financial crises, the capacity of such lines to fulfill private firms' needs in occasions of crises is uncertain, due to the mentioned problems.

Ultimately, we draw attention to the need for policies oriented not only to enhance macroeconomic fundamentals, but also to improve regulatory frameworks, as well as micro and macroprudential instruments. They should be implemented in a coordinated way, in order to strengthen the monitoring of individual and systemic risks, increasing balance sheets resilience. Therefore, emerging countries would have better tools to face new financial crises, attenuating the moments of greater instability, and could pursue better strategies towards sustainable growth in the medium/long-term.

Appendix 4.1 Table 4-4 Panel Estimation Output – Baseline Results for all variables

Dependent Variable: Debt to Equity						
Independent Variables	2000 Q1 - 2016 Q4		2000 Q1 - 2007 Q4		2009 Q1 - 2016 Q4	
	No Interaction	Interaction	No Interaction	Interaction	No Interaction	Interaction
Country						
Return on Assets (1 lag)	0.029*** (0.011)	0.029*** (0.011)	0.045*** (0.013)	0.048*** (0.013)	0.011 (0.010)	0.020** (0.010)
Free Cash Flow/Short Long Term Debt (1 lag)	0.002 (0.003)	0.002 (0.003)	0.010* (0.005)	0.009* (0.006)	0.002 (0.002)	0.003 (0.002)
Tangible Assets per share (1 lag)	0.024* (0.013)	0.024* (0.013)	0.006 (0.013)	0.005 (0.014)	0.028* (0.017)	0.024 (0.017)
Current ratio (1 lag)	0.109*** (0.023)	0.108*** (0.023)	0.038 (0.027)	0.037 (0.027)	0.188*** (0.021)	0.199*** (0.020)
Real GDP Growth	0.001 (0.004)	0.001 (0.004)	0.006 (0.007)	0.005 (0.007)	0.009*** (0.003)	0.007*** (0.002)
Monetary policy rate	-0.015 (0.018)	-0.015 (0.018)	-0.024 (0.023)	-0.027 (0.024)	-0.004 (0.016)	-0.001 (0.016)
REER	0.396*** (0.068)	0.381*** (0.069)	0.591*** (0.095)	0.587*** (0.098)	0.131*** (0.047)	0.185*** (0.050)
Global						
US shadow short rate	-0.009* (0.005)	-0.009* (0.005)	-0.004 (0.033)	-0.002 (0.036)	-0.008*** (0.002)	-0.006*** (0.002)
UK shadow short rate	-0.000 (0.003)	-0.001 (0.003)	-0.300 (0.088)	-0.309 (0.094)	-0.003* (0.001)	-0.002* (0.001)
EUR shadow short rate	-0.002 (0.012)	-0.002 (0.012)	-0.222 (0.085)	-0.236 (0.091)	-0.006 (0.005)	-0.009 (0.004)
Japan shadow short rate	-0.013 (0.007)	-0.013 (0.007)	-0.017 (0.006)	-0.017 (0.006)	-0.041 (0.008)	-0.054 (0.007)
Global GDP Growth	0.008 (0.010)	0.009 (0.010)	0.022 (0.037)	0.014 (0.039)	0.004 (0.004)	0.008** (0.004)
Commodity price	0.065 (0.041)	0.003 (0.088)	0.109 (0.063)	0.106 (0.096)	0.020 (0.026)	0.335*** (0.049)
VIX	-0.034*** (0.009)	-0.033*** (0.010)	-0.068* (0.015)	-0.068* (0.016)	-0.024*** (0.005)	-0.024*** (0.004)
Interaction						
Commodity Price*REER	-	0.053 (0.062)	-	0.006 (0.067)	-	0.265*** (0.035)
Other Information						
Number of quarters	66	66	30	30	32	32
Observations	913	913	373	373	480	480
R2 (GLS weighted)	0.092	0.094	0.204	0.196	0.316	0.401

Notes: All variables are measured in log changes. P values: *, **, ***, denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parenthesis.

**Table 4-5 Results for model with full country sample and model without China –
Specification Without Interaction**

Dependent Variable: Debt to Equity						
Independent Variables	2000 Q1 - 2016 Q4		2000 Q1 - 2007 Q4		2009 Q1 - 2016 Q4	
	Full Country Sample	Without China	Full Country Sample	Without China	Full Country Sample	Without China
Country						
Return on Assets (1 lag)	0.029*** (0.011)	0.024*** (0.012)	0.045*** (0.013)	0.049*** (0.014)	0.011 (0.010)	0.003 (0.012)
Free Cash Flow/Short Long Term Debt (1 lag)	0.002 (0.003)	0.001 (0.003)	0.010* (0.005)	0.010* (0.006)	0.002 (0.002)	0.001 (0.002)
Tangible Assets per share (1 lag)	0.024* (0.013)	0.037* (0.014)	0.006 (0.013)	0.023 (0.017)	0.028* (0.017)	0.039* (0.017)
Current ratio (1 lag)	0.109*** (0.023)	0.112*** (0.025)	0.038 (0.027)	0.018 (0.030)	0.188*** (0.021)	0.180*** (0.023)
Real GDP Growth	0.001 (0.004)	0.002 (0.004)	0.006 (0.007)	0.010 (0.007)	0.009*** (0.003)	0.005*** (0.003)
Monetary policy rate	-0.015 (0.018)	-0.015 (0.018)	-0.024 (0.023)	-0.015 (0.025)	-0.004 (0.016)	-0.017 (0.015)
REER	0.396*** (0.068)	0.421*** (0.071)	0.591*** (0.095)	0.568*** (0.107)	0.131*** (0.047)	0.181*** (0.058)
Global						
US shadow short rate	-0.009* (0.005)	-0.009* (0.005)	-0.004 (0.033)	-0.015 (0.040)	-0.008*** (0.002)	-0.007*** (0.002)
UK shadow short rate	-0.000 (0.003)	-0.001 (0.003)	-0.300 (0.088)	-0.224 (0.110)	-0.003* (0.001)	-0.002* (0.001)
EUR shadow short rate	-0.002 (0.012)	-0.008 (0.012)	-0.222 (0.085)	-0.227 (0.105)	-0.006 (0.005)	-0.003 (0.004)
Japan shadow short rate	-0.013 (0.007)	-0.016 (0.007)	-0.017 (0.006)	-0.013 (0.007)	-0.041 (0.008)	-0.033 (0.008)
Global GDP Growth	0.008 (0.010)	0.006 (0.010)	0.022 (0.037)	0.039 (0.045)	0.004 (0.004)	0.001 (0.004)
Commodity price	0.065 (0.041)	0.077 (0.043)	0.109 (0.063)	0.113 (0.079)	0.020 (0.026)	0.046 (0.026)
VIX	-0.034*** (0.009)	-0.027*** (0.010)	-0.068* (0.015)	-0.096* (0.018)	-0.024*** (0.005)	-0.018*** (0.004)
Other Information						
Number of quarters	66	66	30	30	32	32
Observations	913	847	373	343	480	448
R2 (GLS weighted)	0.092	0.098	0.204	0.209	0.316	0.275

Notes: All variables are measured in log changes. P values: *, **, ***, denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parenthesis.

**Table 4-6 Results for model with full country sample and model without China –
Specification With Interaction**

Independent Variables	Dependent Variable: Debt to Equity					
	2000 Q1 - 2016 Q4		2000 Q1 - 2007 Q4		2009 Q1 - 2016 Q4	
	Full Country Sample	Without China	Full Country Sample	Without China	Full Country Sample	Without China
Country						
Return on Assets (1 lag)	0.029*** (0.011)	0.027*** (0.012)	0.048*** (0.013)	0.077*** (0.013)	0.020** (0.010)	0.006** (0.012)
Free Cash Flow/Short Long Term Debt (1 lag)	0.002 (0.003)	0.001 (0.003)	0.009* (0.006)	0.009* (0.005)	0.003 (0.002)	0.001 (0.002)
Tangible Assets per share (1 lag)	0.024* (0.013)	0.036* (0.015)	0.005 (0.014)	0.027 (0.015)	0.024 (0.017)	0.039 (0.017)
Current ratio (1 lag)	0.108*** (0.023)	0.109*** (0.025)	0.037 (0.027)	0.025 (0.030)	0.199*** (0.020)	0.176*** (0.023)
Real GDP Growth	0.001 (0.004)	0.003 (0.004)	0.005 (0.007)	0.004 (0.005)	0.007*** (0.002)	0.006*** (0.002)
Monetary policy rate	-0.015 (0.018)	-0.018 (0.019)	-0.027 (0.024)	-0.041 (0.028)	-0.001 (0.016)	-0.014 (0.015)
REER	0.381*** (0.069)	0.330*** (0.095)	0.587*** (0.098)	0.380*** (0.116)	0.185*** (0.050)	0.107*** (0.071)
Global						
US shadow short rate	-0.009* (0.005)	-0.008* (0.005)	-0.002 (0.036)	-0.050 (0.039)	-0.006*** (0.002)	-0.005*** (0.002)
UK shadow short rate	-0.001 (0.003)	-0.009 (0.002)	-0.309 (0.094)	-0.028 (0.032)	-0.002* (0.001)	-0.001* (0.001)
EUR shadow short rate	-0.002 (0.012)	-0.008 (0.012)	-0.236 (0.091)	-0.012 (0.010)	-0.009 (0.004)	-0.003 (0.004)
Japan shadow short rate	-0.013 (0.007)	-0.011 (0.007)	-0.017 (0.006)	-0.015 (0.007)	-0.054 (0.007)	-0.028 (0.007)
Global GDP Growth	0.009 (0.010)	0.006 (0.010)	0.014 (0.039)	0.032 (0.041)	0.008** (0.004)	0.002** (0.004)
Commodity price	0.003 (0.088)	0.103 (0.044)	0.106 (0.096)	0.188 (0.079)	0.335*** (0.049)	0.229*** (0.047)
VIX	-0.033*** (0.010)	-0.022*** (0.010)	-0.068* (0.016)	-0.071* (0.017)	-0.024*** (0.004)	-0.017*** (0.004)
Interaction						
Commodity Price*REER	0.053 (0.062)	0.049 (0.059)	0.006 (0.067)	0.009 (0.071)	0.265*** (0.035)	0.068*** (0.025)
Other Information						
Number of quarters	66	66	30	30	32	32
Observations	913	847	373	343	480	448
R2 (GLS weighted)	0.094	0.095	0.196	0.269	0.401	0.294

Notes: All variables are measured in log changes. P values: *, **, ***, denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parenthesis.

Chapter 5. Unconventional Monetary Policies Exit and Future Monetary Policy Frameworks

5.1. Introduction

In countries that are implementing unconventional monetary policies, there is a great debate today regarding how long these policies should last. In places where they have already been broadly phased-out (i.e., USA), the current debate is what would be the appropriate pace of monetary policy tightening. In these jurisdictions, proponents of the continuation of monetary accommodation argue that economic growth is not rooted on a solid basis so that a faster monetary policy tightening could endanger the sustainability of the recovery. They also mention as a justification for the maintenance of accommodation a fear of private defaults (financial dominance) or rising sovereign debt costs (fiscal dominance). On the other hand, opponents claim that monetary conditions cannot remain extraordinarily accommodative for an indefinite time period, due to risks to financial stability and eventually inflation, which can be mitigated but not completely eliminated. In other terms, opponents of UMPs permanence affirm that they should not become “conventional” policies; otherwise, they could feed imbalances that would generate new economic and financial crises.

Therefore, the main topics of discussion in this chapter are: i) The exit from monetary policy accommodation implemented after 2008; ii) How will be shaped future monetary policy frameworks.

The discussion of the first topic is divided into several sections. In the beginning, we describe lessons from past experiences of exit from monetary policy accommodation (section 5.2) and current UMPs exit experiences (section 5.3). Next, there is the discussion of UMPs exit challenges (Section 5.4), sequencing (section 5.5), and central banks’ balance sheets sizes (section 5.6). Furthermore, we discuss issues related to UMPs exit spillovers (section 5.7) and coordination (section 5.8).

The second main topic of the chapter is the design of future monetary policy frameworks (section 5.9). In particular, whether in the post-2008 crisis scenario, to which extent policies previously classified as “unconventional” will be removed, or maintained (and considered as new tools available in monetary policy frameworks). In other terms, if there is going to be a “normalization” of monetary policies to pre-2008 crisis standards, or if it will be adopted a “new normal” for future monetary policy frameworks.

5.2. Exit From Accommodative Monetary Policies: Lessons From Past Experiences

In order to see how current UMPs exit process can be better conducted, it is important to check how the exit from past important monetary accommodation episodes have occurred, and to learn from policy mistakes and successes on these occasions. Some examples of these earlier episodes are: in USA, in 1994 and 2004-2006; In Japan, in 2000 and 2006-2008. According to IMF (2013c), some lessons could be drawn from these experiences.

First, a very quick exit from accommodation, without clear criteria, can be risky. For example, in Japan in August 2000, a fragile output recovery and negative inflation rate lead to an interruption of the monetary accommodation exit only six months after it was announced (February 2001).

Second, it is ideal to modulate central banks’ pace of balance sheet reduction to economic and market conditions. This fine tuning was done by the BOJ in 2007, when it carried out a program of sales of stocks purchased from banks during the QE, in accordance with market conditions. Stock sales were done through independent agents, to increase the impartiality of the program, and in a way that ensured there was no liquidity shortage.

Third, the process of balance sheet reduction becomes easier when central bank assets’ maturity profile is shorter. This was the case of Japan in 2006, where BOJ's average asset maturity was less than five months, allowing the institution to perform asset sales and reduce its balance sheet size by 20% in just four months without losses.

Fourth, the way the exit process is communicated is important to manage its impacts on the markets, with forward guidance playing a crucial role in avoiding an eventual overshooting. For example, in the USA in 1994, almost no forward guidance was given, which led to a strong and adverse reaction to the 275 bps monetary tightening that occurred from 3.25% in February 1994 to 6% in February 1995. Conversely, between 2004 and 2006, with the use of forward guidance and greater gradualism, market reaction was much smoother. Therefore, during a process of UMPs exit, one of the main strategies to contain financial markets volatility is adequate communication by monetary authorities. First, before the start of the process, it is important to discuss the costs and benefits of anticipating or postponing the exit transparently. Communicating these costs could bring some pessimism to financial markets, but not communicating them could generate a bigger problem, by possibly surprising agents. In addition, it is important to indicate the future path of interest rates sought by the central bank, in order to promote better alignment of agents' expectations in the short, medium and long term. Finally, the process of central bank balance sheet reduction should be done in a gradual manner, respecting market conditions, in order to avoid distortions in asset prices and liquidity problems among agents.

5.3. Exit From Accommodative Monetary Policies: Current Experiences

After the collapse of Lehman Brothers, symbol of the global financial crisis in September 2008, major central banks introduced numerous unconventional monetary measures in a roughly synchronized way (although measures differed in size and nature, according to each jurisdiction that implemented them). Nevertheless, one can say that the removal of these unconventional measures is occurring on a different timing and pace according to each jurisdiction specific business and financial cycle, and thus can be considered as asynchronous. In the sequence, we describe how it is occurring (or not) the exit from monetary

accommodation in the USA, UK, Japan, and Euro Area, based on press statements provided by monetary authorities of those jurisdictions.

The Fed was the first to start the UMP exit process. After severe disruptions in financial markets generated by the announcement that this institution intended to start reducing its accommodative monetary policies in May 2013 (“taper tantrum”), the Fed decided to proceed the exit in gradual steps, and in a more transparently communicated process. In September 2014, it outlined its “Policy Normalization Principles and Plans”. Net asset purchases were gradually tapered between January and October 2014. The first interest rate hike came in December 2015, and later rose in several occasions by 25 bps¹⁴², to a level of 2.25%-2.5% in December 2018. The level considered “neutral” by the majority of Federal Open Market Committee (FOMC) members is around 2.75% to 3%, as revealed by their forecasts (“dot plots”) published quarterly. However, uncertainties in the economic/ financial market scenario have pushed the Fed in January 2019 to drop its pledge of more interest rate hikes in the short-term, adopting a more flexible and data-dependent position for next meetings. Regarding Fed’s balance sheet size, it started to be reduced in October 2017, by letting securities expire in an amount of US\$ 10 billion per month, a number that increased in the following quarters until it reached US\$ 50 billion per month in October 2018. According to Fed’s statement in January 2019, this pace of reduction will be kept, but can be adjusted at any time needed. Hence, the total amount of balance sheet reduction from the previous maximum level of US\$ 4.5 trillion so far has not been announced. The only thing that it is known is that the reduction will not take Fed’s balance sheet to the same size as 2008 (US\$ 0.8 trillion), but to an intermediary level (“until the Fed is holding no more securities than necessary to implement monetary policy efficiently and effectively”, as stated in Fed’s Policy Normalization Principles and Plans).

¹⁴² This policy of gradualism (or “small steps”) is traditional at the Fed: it was standard in the Greenspan era (1987-2006). From a theoretical point of view, it is consistent with the concepts of expectations theory of the term structure and expectations management, further detailed in section 2.3.

When it comes to the Bank of England, with the uncertainties that emerged after the Brexit referendum in June 2016, the institution implemented a new asset purchase program from August 2016 until June 2017. Interest rates were lowered in June 2016 to 0.25% and returned to the level they were kept since 2008 (0.5%) in November 2017. In fact, only in August 2018 the BOE raised interest rates again to 0.75%, due to inflation pressures. However, the continuation of the tightening cycle is not clear, due to uncertainties related to the outcomes of Brexit negotiations and their impacts on UK macroeconomic conditions. Nevertheless, the securities purchased under previous asset purchase programs are being reinvested, so no plans for balance sheet reduction have been announced so far.

Regarding the European Central Bank, net asset purchases were gradually reduced until December 2018. However, interest rates will be kept at low historical levels at least until summer 2019. In addition, securities purchased under asset purchase programs will be reinvested in full for an extended time period, past the date when key ECB interest rates start to be raised. Hence, there are no plans for balance sheet reduction in the short-term.

Finally, the Bank of Japan is the major central bank which is keeping its monetary stance more accommodative. No prospects of interest rate hikes have been announced so far. Under the Yield Curve Control framework, the institution aims to keep the 10-year JGBs around 0%. Yet, since July 2018, it officially allowed 10-year JGBs to be traded on a range around zero (+/- 0.2 %), which can be adjusted over time (previously was informally at +/- 0.1%). The BOJ also states that it can intervene “promptly and appropriately” if yields spike. As far as balance sheet reduction, the BOJ has not officially disclosed a reduction in its annual target of asset purchases. Still, in July 2018, it has announced that purchases may be conducted on a “flexible manner”, opening the door for a reduction in the amounts of official purchases in practical terms, only according to the quantity necessary to keep 10-year JGBs within the allowed range. In any case, when the UMP exit appropriate time comes in the future, the

institution stated that the signal would come from an adjustment on monetary policy interest rate targets, and not on the amount of JGB purchases.

5.4. UMPs Exit: Challenges

In fact, current UMPs exit process is not simple. When compared to previous episodes of monetary tightening after periods of low interest rates, current UMPs exit process could be considered more challenging, for the reasons presented by authors such as IMF (2013c). First, the unknown economic and financial reactions if the pace of reduction of the large liquidity surplus available in the financial system is different from what is expected by market participants. For instance, constraints in forward guidance policies could lead to uncertainty in central banks' interest rate path. In other terms, promising to leave interest rates low for a prolonged period, and then signaling to hike them faster than agents forecast would lead to uncertainty in expectations. Second, the large sizes of central banks' balance sheets and possible complications in reducing their sizes. Eventual sales of central banks' assets may generate uncertainty in financial asset prices. For example, an eventual announcement by the central bank of an unexpected amount of assets to be sold may generate high volatility in the trading prices of those assets. This increased uncertainty and volatility in financial markets can lead to unintended consequences in the real economy as well, with output contraction and deterioration of firms/households debt repayment capacity.

5.5. UMPs Exit: Sequencing

These challenges in the exit process and episodes when high volatility materialized in adverse effects (e.g., “taper tantrum”) leave important lessons: i) The exit from UMPs should be on gradual steps, due to the uncertain effects of UMPs on financial markets and the real economy; ii) The design and sequencing of exit from UMPs should be underpinned by proper and transparent communication. This would be an important tool to guide markets and increase

monetary policy predictability, also avoiding market misinterpretations that could lead to the escalation of a new crisis¹⁴³.

The sequencing for this exit process would be composed of three steps, according to authors as Horvath (2017): i) Phase-out unconventional measures; ii) Start interest rate hikes (if in the jurisdiction negative deposit rates are implemented, they may be removed before raising target policy rates); iii) Start the reduction of central bank's balance sheet size.

There could be some simultaneity in some of those steps, according to the context (e.g., interest rate hikes and central bank's balance sheet reduction). Still, other steps should be kept apart (i.e., start raising interest rates only after net asset purchase programs have been tapered)¹⁴⁴. Otherwise, the mixed signals conveyed by the central bank could lead to adverse market reactions. It is important to mention that none of those steps are irreversible. If an unexpected event shifts the balance of risks and economic/financial conditions tighten, the exit process should be stopped or even reversed. In any case, the central bank should keep the course of its actions in a gradual and transparent way, by making a careful adjustment of the communication of its policies.

5.6. Central Banks' Balance Sheets Sizes

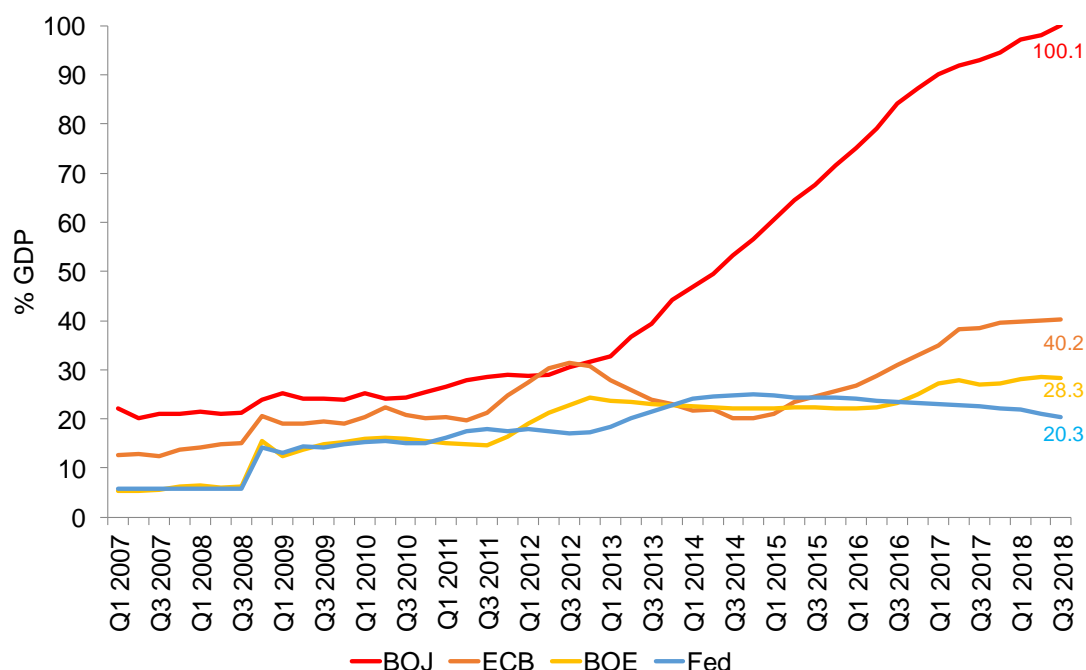
Major central banks' balance sheets have grown considerably after the 2008 crisis. In absolute numbers, if we sum the total assets of Fed, ECB, BOJ, and BOE converted into dollars, they have grown from around 3.5 US\$ trillion in 2007 to around 15 US\$ trillion in 2018. In relative terms, each central bank balance sheet has expanded around four to five times its pre-2008 crisis values, when measured as a percentage of local currency nominal GDP. The

¹⁴³ For instance, when financial stability risks are associated to political risks, central banks should avoid getting too involved in political risks' debate, once financial stability concerns could increase with this political involvement, instead of reducing.

¹⁴⁴ Japan could be an exception to this case, according to authors as Shirai (2018). She suggests that negative deposit rates could be gradually increased while BOJ net asset purchases are still ongoing at a slower pace, to avoid disruptions in JGBs trading. See further discussion of this topic in section 2.3.2.2.

most notable case was the BOJ, since its total assets have grown from around 20% of GDP in 2007 to 100% of GDP in 2018, as we can see in graph 5-1.

Graph 5-1 Fed, ECB, BOJ, BOE Total Assets: 2007-2018 Q3 (% GDP)



Source: Author own elaboration, based on Fed, ECB, BOJ and BOE data.

After the start of UMPs exit process, it is expected that main central banks' balance sheets will reduce from previous peaks during UMPs implementation, but will remain larger than pre-2008 levels. Their sizes will end up being determined by monetary authorities' views on the potential and actual effectiveness of central banks' balance sheets as instruments for implementing monetary policy and ensuring price and financial stability.

Reducing central banks' balance sheets to pre-crisis levels could be done in two ways: active sales of central banks' securities, or holding these securities until maturity. Active sales would be definitely the fastest way. Nevertheless, if the amounts are too high or are not properly communicated, sales may generate distortions in those assets' market prices. The negative impact in those prices could bring adverse effects to numerous agents: i) Governments, by raising the cost of public debt service; ii) Banks, by depreciating the book value of assets in their balance sheets; iii) Corporations, by raising private corporate bond

yields, so increasing firms' funding costs and discouraging investments. In the end, active sales of central banks' securities could lead to tighter financial conditions and hurt economic growth. That is why in the post-2008 period no central bank has announced reducing its balance sheet by active sales of its portfolio.

Conversely, holding bonds until maturity (i.e., letting them expire, and do not repurchase equivalent securities) is an option in which balance sheet reduction takes more time to be done. However, its gradual profile gives more predictability to agents, and avoids making decisions that could bring significant impacts to markets, such as in which specific date and amount the central bank sells the bonds in its portfolio. Nonetheless, the expiration of those bonds is not completely neutral and has impacts on markets. For instance, one possible drawback for a central bank to hold its bonds until maturity is that the effects of their expiration can push to an opposite direction of what current monetary policy stance intends (e.g., an excessive tightening in a downturn). Hence, the reduction of central banks' balance sheets or keeping them on a permanently large size is a sensible decision, which involves a careful analysis of respective advantages and drawbacks.

One can mention several arguments in favor of keeping a large central bank balance sheet, in which the institution may take advantage of its size and composition for the purposes presented in the sequence.

i) **Steer financial markets.** As financial markets functioning have clear inefficiencies and imperfections, there is a role for using balance sheet policies to correct financial market distortions by influencing risk and term premia. For instance, under the sovereign-bank “doom loop” in the Euro area, the implementation of balance sheet policies could break the vicious circle either by limiting the variation in sovereign bond prices, or taking the risk of default out of commercial banks' balance sheets, as argued by Blot *et al.* (2017).

ii) **Improve monetary policy transmission.** In periods of crises, monetary policy transmission channels may be found impaired, in a sense that banks may not be willing to fully pass on changes in the policy rate to other agents, such as individual borrowers/ depositors or non-bank financial institutions. Conversely, with unconventional programs and large central bank balance sheets providing a direct link between short-term policy rates and securities markets, central banks can rely less on the indirect transmission of monetary policy through the banking system. For instance, this is the case in the USA, where the Fed keeps a direct connection with non-bank financial institutions through the Reverse Repurchase Agreement Facility (RRP)¹⁴⁵, as suggested by Bernanke (2016b).

iii) **Safeguard financial stability.** In situations where there is a strong private demand for liquid and safe short-term assets, the central bank can be the provider of such assets (e.g., interest-bearing reserves for banks, short-term bills for non-bank counterparties). The availability of such instruments at the central bank balance sheet would reduce the liquidity premium on very short-term financing, partly avoiding risky private behavior and increasing financial stability, as mentioned by Bernanke (2016b).

iv) **Act as lender of last resort.** In situations of acute financial crises, central banks should assume the role of being the ultimate provider of liquidity in unlimited amounts on a sound collateral basis. With this action, central banks can play their traditional/historical role of replacing missing liquidity and calming the panic, containing adverse episodes of fire sales and bank runs. Moreover, in certain countries, some financial institutions may be reluctant to borrow directly from the central bank, as it can be perceived by other agents as a sign of

¹⁴⁵ In RRP operations, the Fed first sells a security to the non-bank financial institution, and later repurchases it. The difference between the sale price and the repurchase price, together with the length of time between the sale and purchase (one day to three months), implies a rate of interest paid by the Fed on the transaction to the institution.

weakness (stigma)¹⁴⁶. By maintaining significant levels of bank reserves and lending towards other agents, the monetary authority would reduce this stigma, enhancing central bank's ability to give a more effective response in an acute crisis, as argued by Blot *et al.* (2017).

v) **Enlarge central banks' toolkit to manage inflation and output.** Due to multiple factors (e.g., loss of bargaining power from labor unions and downward pressures on wages, technological innovations, global value chains, and increased international competition), inflation is likely to remain at low levels in the near future in advanced economies. Hence, there will not be much room to increase short-term interest rates. Therefore, in a context where short-term interest rates are more or less constrained, large balance sheets would be an additional tool that allows central banks to operate in longer horizons of the yield curve, stabilizing inflation and output. Moreover, by keeping large balance sheets (a saturated market for reserves), the central bank could count on a new instrument to control inflation: the level of interest rates paid on reserves, as suggested by Hall and Reis (2016)¹⁴⁷.

Nonetheless, central banks face several challenges if they intend to keep large balance sheets. Some of these challenges are described in deeper detail in the sequence.

i) **Financial Market Distortions.** Very large central bank balance sheets may impose excessive restrictions on the depth and breadth of certain assets in financial markets. By purchasing large amounts of specific (public or private) bonds and stocks, central banks may eventually bring problems to the trading of these assets, such as scarcity and price distortions. Furthermore, authors as Bindseil (2016) argue that central banks providing large amounts of liquidity for a prolonged time period would end up discouraging lending between banks, having

¹⁴⁶ This problem with stigma occurred for instance in the USA, once financial institutions did not borrow from the Fed on a regular basis before the 2008 crisis. Nevertheless, that was not the case of the Euro area, where banks already had large deposits and borrowings from the ECB before 2008.

¹⁴⁷ According to these authors, the essential idea would be to index payments on reserves to the price level and the price level target, in a way that a contractionary financial force (higher payment on reserves) is created if the price level is above the target and an expansionary force (lower payment on reserves) is below the target. Hence, by paying an appropriate rate on reserves, the central bank could pin the price level to a unique target, fulfilling its role of inflation stabilization.

adverse effects for interbank market functioning. Thus, it would be advisable for central banks to reduce (“lean”) their balance sheets to lower levels, in order to promote a more efficient financial intermediation by private agents. However, authors such as Blot *et al.* (2017) have the opposite opinion. Since financial markets are not efficient and are characterized by imperfections, balance sheet policies would not create distortions, but help to mitigate them (e.g., reduce financial fragmentation across certain market segments and countries).

ii) **Moral Hazard Problem.** By purchasing private assets, central banks may be blamed of favoring certain agents/ sectors (i.e., in the Euro area, the CSPP was accused of benefitting large corporations, instead of SMEs). Moreover, by providing backstop liquidity to the financial system in broader terms, central banks may reduce private agents’ incentives to manage their liquidity more efficiently. It is known that the role of central banks in providing lending to non-bank financial agents varies across jurisdictions (e.g., usually less restrictive in the Euro area than in USA). In the USA since September 2013, the role of the Fed in providing liquidity to non-bank financial institutions was increased through a specific tool, the Reverse Repurchase Agreement Facility (RRP). Some critics to this facility argue in favor of phasing it out, once they mention it could be destabilizing during an acute crisis. In their view, with the RRP in place on such occasions, investors would prefer to run to the Fed, instead of trading private short-term assets, generating a fire sale of these assets. Other authors, such as Bernanke (2016b), mention this “run to the Fed” problem could be mitigated if it was imposed a stricter limit in the amount offered by the RRP¹⁴⁸, or the rates offered by the RRP were kept low, even if private rates rose during stress events.

iii) **Fiscal Interference and Losses in Central Banks balance sheet:** By purchasing government bonds, central banks increase the links between monetary and fiscal policies. One

¹⁴⁸ There is a limit of US\$ 30 billion per eligible institution to access the overnight RRP. However, the previous aggregate limit of US\$ 300 billion was lifted in December 2015. Since then, the individual limit was maintained, but the RRP aggregated capacity is limited only by the value of Treasury securities held outright in Fed’s portfolio for open market operations (System Open Market Account - SOMA), currently around US\$ 2 trillion.

example of these links would be central bank asset purchases lowering the cost of sovereign debt service, reducing government budget constraint, thus allowing policy-makers to pursue an expansionary fiscal policy if desired (UMPs “fiscal channel”, described in section 2.3). Some critics argue that public asset purchase programs would be an indirect form of central banks to finance governments (similar to “monetary finance”, further discussed in section 2.5.2). This fact could lead to fiscal (government) interference in monetary decisions, which could undermine central bank independence and credibility, as mentioned by Horvath (2017).

Moreover, with large asset holdings, central banks may face an increase in the risk of financial losses. If the legal framework adopted by the country establishes that central bank’s losses should be ultimately borne by the Treasury¹⁴⁹, these losses can affect the government’s overall fiscal position. This fiscal impact could push the government to intervene in central bank’s decisions, threatening its policy independence. Thus, the supporters of this view argue that the risk of financial losses would be minimized if central banks’ balance sheets were reduced. However, other authors such as Bernanke (2016b) argue that the risks carried by central banks’ balance sheets depend more on their asset composition, rather than their asset quantity. If a significant share of central banks’ assets has a safe profile, with short maturities and limited duration risks, having a large balance sheet would not necessarily imply huge risks of financial losses. A suggestion of turning more transparent the relationship between a central bank with a large balance sheet and its corresponding national Treasury is given by Goodhart (2017). According to this author, all central banks that implemented asset purchase programs could follow the UK example, where the assets purchased by the central bank were placed in a separate subsidiary. In the UK, this subsidiary (the Asset Purchase Facility-APF) conducted asset purchases, based on short-term loans provided by the BOE, with rates at a small margin

¹⁴⁹ In the case of the Euro area, ECB losses would not be borne by a single Treasury. An eventual recapitalization of the ECB would need to be covered by contributions of all EU member states, according to their respective capital keys on ECB balance sheet.

over interest on excess reserves. The main difference is that the final decisions of managing APF size and composition are taken by the Ministry of Finance, with operations carried by the Treasury Department (Debt Management Office), after taking the advice of the BOE, and its views on the interest rate appropriate path. This structure turns the ultimate decision of managing the public debt in the APF to the authorities more linked to this subject (fiscal, not monetary). Moreover, by switching the responsibility of managing the APF to the Ministry of Finance/ Debt Management Office, the communications related to them tend to be less overrated than those of the central bank, avoiding sudden adverse market reactions.

iv) **Reduced scope of action in case of crisis.** Keeping a very loose monetary policy, with excessively large balance sheets, would leave central banks without further options for action in case of a new financial crisis. Hence, some reduction in central banks' balance sheets would be desired (even if they remain larger than pre-2008 levels). This reduction would open the door for a new balance sheet expansion if needed in the future, increasing the room for maneuver of central banks as an additional monetary tool to fight a possible crisis, as mentioned by Horvath (2017).

Another alternative is suggested by Goodhart (2017). This author also proposes that in the medium-term, central bank balance sheets should be reduced (being composed by minimal, non-interest bearing bank reserves), and revert to the previous "corridor" system of short-term interest rate determination. However, the composition of banks' balance sheets should be changed, containing a greater share of high-quality liquid assets - HQLA, mostly in the form of short-term government bonds. Besides, it should be designed a contingent scheme for swapping banks' less-liquid assets into HQLA, in such a way that it would be unattractive for banks to swap during normal times, but attractive during panics/crises.

The views of other authors on the discussion regarding the reduction of central banks' balance sheets sizes, or keeping them large are developed further in section 5.9.

5.7. UMPs Exit: Spillovers

Just as UMPs implementation has generated international spillovers (previously discussed in chapter 2, subsections 2.3.5.4.3 and 2.4.2), a process of exit from these policies by major central banks will also generate implications for other countries. The case for spillovers is strengthened in situations like the current experience of UMPs exit, due to its asynchronous profile.

In the case of advanced countries that do not exit and continue to implement UMPs, there may be increasing pressure on short-term interest rates (due to the high correlation with markets in UMPs exit countries) and their risk premia (due to increased economic/ political uncertainty), although this uncertainty can be partly mitigated by appropriate forward guidance from local authorities.

In the case of countries that have not implemented UMPs (in general EMEs), even if UMPs exit is well managed by foreign countries, it is possible that non-UMPs countries will suffer adverse effects, with greater volatility and eventual capital flow reversal. This capital flow reversal could trigger the following chain of events: domestic currency depreciation, increase in prices of imported goods and foreign currency debt, leading to an expansion in non-performing loans/defaults, followed by credit, consumption and investment contraction, leading to lower levels of output, income, and employment. On the one hand, advanced non-UMPs countries (e.g., Canada, Australia, New Zealand) would be less subject to these effects arising from sudden capital flow reversals. On the other hand, these effects could be amplified in emerging countries due to their higher level of financial market volatility, which turns them more susceptible to financial and macroeconomic crises.

In fact, there is no specific rule that “perfectly differentiates” non-UMPs countries and accurately measures their degree of vulnerability to spillover effects. These effects would depend on a number of factors, including the degree of exposure (likelihood of being affected)

and resilience (capacity to resist) of the non-UMP country to the UMPs exit abroad¹⁵⁰. In addition, if the non-UMP country that is affected by UMPs exit spillovers has systemic importance (e.g., China), an adverse event in this country may have global implications, also affecting UMPs exit countries. In this case, a negative spillover coming from a UMP exit country would turn against the own country of origin, feedback process known as “spillback” effect (IMF, 2014; Agénor and Pereira da Silva, 2018).

Faced with the possibility of adverse consequences, non-UMPs countries could adopt a series of measures that would be adequate to avoid or mitigate such effects, among which: i) In order to prevent financial crises, establishing limits for foreign currency debt exposure and households/companies leverage; ii) Allowing exchange rate adjustments according to market fundamentals, but intervene when there is strong volatility to avoid overshooting; iii) Reversing micro and macroprudential measures previously introduced during UMPs to limit inflows, so as to stimulate capital inflows (provided this does not threaten financial stability). However, controls on capital outflows should be considered only in extreme cases of outflows, due to the negative stigma effect for investors; iv) Monetary policy responses that take into account not only the international scenario, but also the country’s domestic context and its business cycle phase. At this point, it is important to stress the importance of an active communication strategy by the monetary authority in order to increase its credibility and ensure economic and financial stability.

¹⁵⁰ A suggestion of how the degrees of exposure and resilience of a non-UMP country could be estimated is presented by IMF (2013c). According to the authors, the degree of exposure could be estimated from indicators such as: sovereign rating, correlation of domestic bonds with securities from the country of UMPs exit, change of domestic bonds yields on the days of announcement of UMPs exit, capital outflow levels from the non-UMP country. By its turn, the degree of resilience could be estimated from several elements, such as: domestic financial market conditions (size, turnover, capacity of domestic investors to replace foreigners), dependence on external funding, room for maneuver through domestic policies (currency depreciation, volume of foreign reserves, increase in interest rates, fiscal adjustment to contain debt, banks’ degree of capitalization, capacity to support the financial system).

5.8. UMPs Exit: Coordination

As well as during UMPs implementation, in the process of UMPs exit, an optimal situation would be an improvement in the coordination of international economic policies, in order to minimize adverse effects and to take advantage of eventual positive externalities of UMPs exit.

First, this greater coordination could occur from a regulatory point of view, with the adoption of international regulations in order to increase financial system resilience to systemic shocks, to soften the effects of financial vulnerabilities developed over time and to reduce weaknesses in the institutional structure and in the interconnections between agents. Since the 2008 crisis, the international banking regulatory framework has already been overhauled (e.g., Basel III). However, some critics as Michel and Ligon (2014) argue that Basel III implementation does not address adequately issues such as the permanence of “too big to fail” institutions¹⁵¹. In other words, international regulation of banks and non-bank financial institutions that are not subject to Basel III could be both improved.

Second, there could be greater cooperation from authorities of countries which are in process of UMPs exit, so that non-UMPs countries could avoid or mitigate UMPs exit adverse spillovers. For example, the central bank conducting UMPs exit should have timely and transparent communication of its measures, so that authorities in other countries would not be surprised and would have adequate time to prepare for possible negative externalities. This monetary authority may also extend foreign exchange swap lines with non-UMPs nations. These lines in place would work not only in a preventive manner (by increasing agents’ confidence and by helping to reduce capital outflows in non-UMPs countries), but also as an effective buffer (providing foreign currency in times of need). Another form of possible

¹⁵¹ After the 2008 crisis, Global Systemically Important Banks (G-SIBs) continue to retain significant market share. Furthermore, even if they are requested by Basel III to hold more capital in absolute terms (following additional capital buffers and total loss absorption capacity requirements), they partly compensate these requirements by continuing to use internal risk models (instead of standardized risk ones), which allow them more room to use different risk weights for their assets, and thus partly reduce their capital requirements.

cooperation from authorities of countries in the process of UMPs exit would be to ensure more fair conditions in international trade. Ensuring a level playing field for domestic and foreign producers (lower tariff and non-tariff restrictions) could be advantageous both for countries leaving UMPs (access to cheaper inputs, helping their economic recovery process) and for non-UMPs countries (which could offset some of their foreign exchange losses with eventual capital outflows by increasing exports). Besides, they could bring greater dynamism to international trade as a whole, and avoid unilateral actions such as trade barriers and competitive depreciations (trade and currency “wars”) to try to gain market share abroad.

However, to actually increase coordination of international economic policies, it is necessary that a majority of countries not only have in mind their own short-term problems, but also take into account global net benefits of implementing coordinated policies in the medium term. Unfortunately, so far this does not appear to be the case. Therefore, such degree of progress in international economic policy coordination still remains difficult to be adopted in practical terms. This might be one element that could turn the world economy more volatile and subject to new episodes of economic and financial crises.

5.9. Future Monetary Policy Frameworks

The issue of how will be future monetary policy frameworks after the implementation of unconventional measures in the aftermath of the 2008 crisis raises a lively debate. More specifically, if central banks will broadly return to pre-2008 crisis monetary policy standards (“normalization”), or if other measures (such as UMPs) should be incorporated into the toolkit of central banks under a new set of monetary policy practices (“new normal”). Some interesting articles have been published about this discussion so far.

In 2011, Carré *et al.* (2013) performed a survey with 46 economists and central bankers, aiming to identify post-crisis consensual and dissensual aspects of central banking, and the aspects of central banking that would (or would not) be able to be changed after the 2008

financial crisis was over. The authors find that the respondents agree in general terms on the “broader” view of central banking extended to financial stability. Nevertheless, several divergences emerge between economists and central bankers when it comes to the details of implementation of this “broader” view (e.g., institutions, instruments, goals)¹⁵². The authors find that economists are usually less conservative than central bankers when it comes to promoting changes in central bank practices. However, the overall result would be that the conservative bias would prevail, in the sense that respondents would prefer to remain within the pre-2008 monetary policy paradigm, instead of promoting a significant shift in this paradigm¹⁵³. For instance, the following elements in the paradigm would remain mostly unchanged: i) Price stability would continue to have priority among other policy objectives (although complemented by financial stability goals); ii) Price stability would be achieved under an inflation targeting framework, with an unchanged target despite some proposals for modification. Hence, even if central banks incorporate changes under their future monetary

¹⁵² In fact, there is an intense debate on how central banks should address financial stability issues. In other terms, in which sense the ideal interaction between monetary and financial stability policies would occur. According to Praet (2018), we would have basically three views on this topic: i) “Pre-2008 consensus”: Monetary and financial stability policies have separate objectives and instruments (interest rates and prudential measures, respectively). Financial stability would only matter for monetary policy when it affects price stability (“clean up afterward” view); ii) “Lean against the wind”: Price stability is not enough to ensure financial stability. Monetary policy should lean when necessary to prevent the buildup of financial imbalances; iii) “Financial stability is price stability”: Both objectives are deeply linked and cannot be distinguished. Hence, monetary policies should continuously aim to stabilize the financial system, addressing malfunctioning financial markets and smoothing the monetary transmission process. In the more acute moment of the 2008 crisis, it became clear that the “lean” view was preferred to the “clean” one. Nevertheless, in future policy frameworks, there is no agreement if monetary and prudential policies should be conducted separately or not, in terms of instruments and institutions. Several authors argue in favor of a more coordinated approach between monetary and prudential policies. For instance, Praet (2018) argues that when the buildup of imbalances is accompanied by rising inflation, both macroprudential and monetary policies can operate in the same direction (tightening mode). Conversely, when financial imbalances increase without inflation pressures, macroprudential policies can be implemented separately, to address risks in specific regions/sectors where imbalances are emerging, while monetary policy does not need to be immediately tightened. However, if the financial imbalances observed are not specific to regions/sectors, but systemic (with consequences for the overall economy), monetary policy needs to be tightened to complement macroprudential policy, with both operating with proper calibration aiming to contain excessive imbalances.

¹⁵³ This finding is in line with the view of authors such as Palley (2013), which consider the macroeconomic framework adopted after the 2008 crisis as “Gattopardo Economics”: although some small changes were introduced, the core principles that guided the course of actions after 2008 remained the same as the “New Consensus Macroeconomics” (NCM) that prevailed before the 2008 crisis. According to the NCM, price stability would be the main policy objective, controlled by independent central banks under an inflation targeting framework using short-term nominal interest rates, determined under a Taylor rule. However, in the long-run monetary policy is neutral, and does not affect real variables, once output converges to its potential level.

policy frameworks, these changes would not promote a complete shift in the previous monetary policy paradigm, in the sense that some core principles of the pre-2008 monetary policy framework might remain unchanged.

Later in 2016, Blinder *et al.* (2017) organized a survey and compiled responses from 55 central bankers and 159 academics on their views of what would be the “new normal” for central banks. The main findings revealed by the survey are presented in the sequence. On low interest rates, respondents acknowledge that they could be used again in case they are needed, but negative interest rates would be used with more caution. On asset purchase programs, there were mixed views on their effectiveness: academics and central bankers who implemented asset purchase programs were usually more optimistic, while central bankers from jurisdictions that did not implement them were usually more doubtful about their effective results. On financial stability, respondents foresaw the use of macroprudential instruments on a continuous basis, in order to safeguard sound financial conditions. On communication, the answers showed that a more active communication from central banks towards the public will certainly have space. There was an agreement that forward guidance would remain in monetary authorities’ toolkit. Nevertheless, it was found a divergence in the preferred type of forward guidance: more specific (date-based) for academics, but less specific (qualitative) for central bankers. Another divergence occurred in the view on the relationship between central banks and their governments: while academics find that central banks have “crossed the line into politics” during the crisis responses and have some concern on central bank independence in the future, this opinion was not detected among central bankers.

Indeed, when we observe the analysis of certain academics and central bankers that have produced reports disclosing their views on future monetary policy frameworks, they present diverging opinions.

In academia, an example of a view of how future monetary policy frameworks will be shaped is provided by Reis (2018). According to this author, the main characteristics of “the New Conventional Central Bank” would be the following: i) Determination of interest rates by central banks not focused only on short-term rates, but also giving room to establish long-term rate targets; ii) Balance sheet policies remaining as an important policy option, with central banks targeting interest rates paid on reserves; iii) Focus more on the composition of central banks’ balance sheets, and less in the amounts of assets/liabilities contained in them; iv) Need for more transparency in the interaction between fiscal and monetary policies, and a more careful approach with eventual financial losses in central banks’ balance sheets; v) Main central banks offering liquidity facilities not only for domestic banks, but also for global banks through swap lines; vi) Important role of macroprudential policies in order to safeguard financial stability, but taking into account that they may generate adverse effects (e.g., financial repression) if not managed appropriately. A different view is presented by Lombardi *et al.* (2018), who are more skeptical about the regular use of unconventional measures in future monetary frameworks. For these authors, UMPs have prevented economic collapse, but were not designed to promote adequate growth and have overburdened central banks. Hence, monetary authorities should return to their standard policies with a primary aim to ensure price stability, and thus prevent policy-makers to request (or expect) too much from them in the future. Another view from academia is provided by Fontan *et al.* (2018), who predict three possible scenarios for future monetary policy frameworks: i) The “normalization” to pre-2008 standards, where independent central banks would focus on inflation-targeting regimes by using short-term interest rates as main instruments; ii) Central banks as very powerful and depoliticized institutions, equipped with both monetary and macroprudential instruments, but little democratic accountability and strong links with financial sector interests; iii) Central banks incorporating unconventional policies under their policy toolkit. Still, due to the

distributive effects of such policies, political authorities would have increased influence on central banks' initiatives. Dow (2017) understands that this third scenario may happen without central banks being directly subordinated to governments' decisions. Under an appropriate institutional design, it would be possible for central banks to retain some degree of independence, by setting out explicitly in their mandates areas of cooperation between the central bank and the government, managing such cooperation with joint committees and adequate incentives.

When it comes to central bankers, on one side, we have authors such as Pfister and Valla (2018), who argued in favor of a "New Orthodox" framework for central banks. According to these authors, central banks in the future should keep short-term interest rates as main policy instruments (eventually using negative interest rates to ensure price stability), and avoid asset purchases and large balance sheets, in order to keep monetary and fiscal policies separate. Central banks would also have a role on financial stability, with the support of macroprudential tools, but the lender of last resort role should be limited by strict liquidity rules (high interest rate, high-quality collateral, limited timeframe), in order to avoid monetary authorities lending to insolvent institutions. On the other spectrum of central bankers' views, we would have for instance BOJ Deputy Governor Amamiya (2017). He argued in favor of future monetary policy frameworks where central banks' balance sheets remain large, the payment of interest on reserves acts as an important operational target, and transparency in central banks' reaction function (with clear communication and increased role for forward guidance) is a key element for those institutions to achieve their objectives. A third and intermediary view was presented by ECB Deputy Director-General Monetary Policy Natacha Valla (2018). According to her, when compared with the pre-2008 crisis, the banking system has suffered significant structural changes, which require additional liquidity needs (i.e., regulatory rules, such as liquidity coverage ratios) that request systematic demand for central

bank reserves. Hence, the decision if the central bank should reduce its balance sheet and return to the previous interest rate “corridor” system, or keep large balance sheets and remain with the interest rate “floor” system, would depend on the ability of central banks to predict these additional liquidity needs. If these additional liquidity needs are relatively stable and forecastable, they could be satisfied by regular liquidity operations within the “corridor” system and central bank balance sheets could be reduced. However, if these additional liquidity needs are uncertain, remaining in a “floor” system with excess liquidity provision and large central bank balance sheets would be more robust, to provide a buffer against shocks in interbank markets.

An additional topic under study to be possibly introduced in future monetary frameworks is the creation of central bank digital currencies (CBDCs). It has been an object of research by central banks in several jurisdictions in advanced and emerging economies (e.g., United Kingdom, Euro area, Sweden, Norway, Canada, China, Uruguay, Ecuador), international organizations (BIS, IMF), academia and policymakers. Among the definitions that can be found on CBDC, we would highlight two: i) A new form of money, issued digitally by the central bank and intended to serve as legal tender, but with clear differences from cash (physical *versus* digital) and reserves (available just for banks *versus* available to a broader set of agents), as mentioned by Mancini-Griffoli *et al.* (2018); ii) A central bank liability, denominated in an existing unit of account, which serves both as a medium of exchange and a store of value (Committee on Payments and Market Infrastructures - CPMI, 2018). According to these authors, there could be various options to design a CBDC, including: technology (token-based *versus* account-based); access (restricted *versus* open to general public); operational availability (ranging from current opening hours to 24 hours a day and 7 days a week); degree of anonymity (ranging from none to complete); and interest-bearing characteristics (yes or no). Each design option would entail significant implications

for payment systems, financial systems structure, financial stability, and monetary policy implementation. Here we will center our analysis on the implications of the introduction of a CBDC to monetary policy implementation. A preliminary view is that monetary policy implementation would operate broadly in similar ways to the existing ones. For instance, Meaning *et al.* (2018) affirm that monetary authorities would continue guiding the economy through varying the interest rate paid on CBDCs (if CBDCs were interest bearing) and the aggregate quantity of CBDCs issued. However, some of the monetary policy transmission channels could be strengthened. This would be the case of interest rates, once the pass-through of policy rate changes to non-bank agents (non-financial firms/households) would be direct. Furthermore, CBDCs could overcome the costs associated to the zero (or effective) lower bound, meaning lower levels of nominal negative interest rates could be introduced if desired, as indicated by Prasad (2018). Moreover, as the real value of CBDC could be held stable over time more easily, it would be possible to achieve true price stability, as mentioned by Bordo and Levin (2018). Additionally, if well managed, CBDCs could become an effective safe asset, with liquidity and creditworthiness compared to assets such as short-term government bills.

Nevertheless, CBDCs could raise numerous concerns in other important perspectives, as mentioned by CPMI (2018): i) financial system structure (i.e., CBDCs competing with banks' deposits, affecting pricing and composition of bank funding); ii) financial stability (e.g., in episodes of "flight to safety" to CBDCs, greater possibility of runs from banks and money market funds) ; iii) political economy (i.e., in certain CBDC designs, central banks could suffer greater political interference due to its increased role in the allocation of resources). Weighting possible benefits and costs, the majority of authors who discuss CBDCs argue that it is still early to conclude that the net effects are positive. Hence further research is needed, in order to consider the more appropriate design options according to

specific cases in each jurisdiction, and also cross-border implications, before CBDCs can be introduced in monetary policy frameworks, especially in designs with wider access.

Ultimately, we have seen that the discussion in the literature related to future monetary policy frameworks does not point to a single direction or “one size fits all” model. Nonetheless, most authors agree that central banks in the future will have certain common elements, such as a more active communication than before the 2008 crisis, broader mandates (including financial stability into their previous narrow goal of inflation stabilization), and the use of macro-prudential tools on a wider basis, although with various differences in the implementation of those elements. In particular, the inclusion of financial stability into central banks’ mandates is the broader recognition (especially after the 2008 crisis) that financial systems’ cyclical behavior can lead to regular crises of endogenous nature¹⁵⁴. Because of these regular financial crises, central banks’ historical role of “elastic” liquidity providers and lenders of last resort (e.g., BOE in 1825, Fed creation in 1913)¹⁵⁵ will be once again included in the toolkit of future frameworks. Furthermore, this role will be supported by macroprudential measures and other regulatory initiatives of continuous implementation, aiming to increase financial systems’ resilience, and improve the instruments to face new financial crises.

On the future use of (what was called so far) unconventional monetary policies, even if there is not yet a broad agreement, it is likely that a significant share of them may remain in central banks’ toolkits. This situation might occur, since central banks which have already implemented them have learned with this experience, and could consider implementing again UMPs which they evaluate that had net positive effects according to their objectives.

¹⁵⁴ These regular severe financial crises of endogenous nature have been described in the literature since a long time ago by authors as Keynes (1936) and Minsky (1982). More recently, the expression which represents this idea and has been used more often is that the financial system works with a “financial cycle”, following researchers in the IMF (Claessens *et al.*, 2011) and BIS (Borio, 2012). Regular financial crises (or the evolution of the “financial cycle”) would be explained by agents’ procyclical behavior, a topic further discussed in section 4.3.1.

¹⁵⁵ For further discussion of the BOE as lender of last resort in 1825, see section 2.2.1. For more information on the Fed creation in 1913, see Meltzer (2003).

5.10. Conclusions

This chapter centered its discussion on the process of exit from unconventional monetary policies, and how will be shaped future monetary policy frameworks. Regarding the exit from unconventional monetary measures, we have seen that this process involves significant challenges. Its asynchronous profile, with distinct timing according to each jurisdiction, adds complexity to those challenges. On the one hand, we acknowledge that some progress towards adopting measures to ensure financial and macroeconomic stability has been achieved in the post-2008 period. Hence, if the exit process is carefully managed, with proper sequencing and communication, major disruptions may be avoided. Nonetheless, the possible large spillovers from the exit process and the difficulty to advance in international economic and financial policy coordination are risks that may not be underestimated. They have the potential to turn the world economy more volatile, and subject to new episodes of economic and financial crises.

In order to face those risks, we argue that central banks should not merely promote a complete return to pre-2008 standards (“normalization”). Instead, they need to take advantage of the experience with past episodes and the 2008 crisis response, in order to improve their future monetary policy and financial stability frameworks (“new normal”). Based on this, measures implemented in the post-2008 crisis would have three possible destinations in new frameworks: i) Be discarded, due to their predominantly negative effects; ii) Not be regularly implemented, but be kept as a tool if needed to achieve central banks’ objectives, especially under situations of crises; iii) Be incorporated as a regular measure of monetary policy/financial stability frameworks. For instance, in the case of the Euro area (analyzed in more detail in chapter 3), we would have the following examples: i) Exclude the SMP, once the sterilized bond purchases during its course did not solve the financial fragmentation in periphery countries, sometimes increasing these countries sovereign yields; ii) Do not

implement TLTRO II on a regular basis, but keep TLTRO II as an alternative facility to improve liquidity conditions, and foster targeting credit to the real economy if needed; iii) Keep forward guidance as a permanent tool to clarify central bank's reaction function and improve communication, and macroprudential measures to expand the resilience of the financial system against imbalances. In the case of small advanced open economies and emerging countries, central bank balance sheet policies¹⁵⁶ (e.g., yield curve management, with monetary authorities selling/buying government bonds previously available/ placed after on their balance sheets to cope with excessive inflows/outflows and foreign exchange appreciation/depreciation) could be added to other actions already applied to face destabilizing pressures or excessive volatility in asset and foreign exchange markets (e.g., macroprudential measures, capital flow management initiatives, foreign exchange interventions). In this sense, monetary and financial stability authorities in advanced and emerging economies will need to be institutions with an increasingly evolving profile, in a continuously adaptive and innovative process, in order to face the challenges posed by markets that are each day more dynamic, innovative, complex, interconnected and globalized.

¹⁵⁶ In the case of emerging economies, central bank balance sheet policies would be limited by the size of foreign exchange reserves, once emerging currencies have an inferior position in the international currency hierarchy, and cannot create international liquidity, as argued by Chang and Velasco (2017). Such constraint is not experienced by major central banks in advanced economies, whose currencies have a higher position in the international currency hierarchy, as mentioned by Conti, Prates, and Plihon (2014).

Chapter 6. General Conclusions

This thesis touches upon important aspects that involve the past, present and future of unconventional monetary policies: its historical background and conceptual debate; the experience of UMPs in advanced economies, with the Euro area case; the effects of UMPs in emerging economies, and its links with corporate debt; the process of UMPs exit and the future of monetary policy frameworks.

After the introduction in chapter 1, in chapter 2 we described UMPs historical background and conceptual debate. First, by reporting several historical experiences of the BOE, Fed, and BOJ, we have observed that policies which after the 2008 crisis were considered to be “unconventional”, were not new. Broad liquidity provision operations, asset purchase programs, yield curve controls had already been implemented by central banks in various occasions to deal with difficult situations in the financial system and in the macroeconomic scenario.

Furthermore, with the extensive liquidity provided by UMPs, central banks had to adjust their monetary policy operational framework (from a “corridor” system to a “floor” system) and the interest rates used as a reference to steer short-term interbank markets (from the target/refinancing rate to the interest on reserves/deposit rate). UMPs would have two objectives: i) Restore the proper functioning of financial markets and their intermediation mechanisms; ii) Introduce additional monetary stimulus, once conventional channels were limited. To this end, they would operate through different instruments: credit policies (for the first objective), and quasi-debt management policies, forward guidance, exchange rate ceilings, negative interest rates (for the second objective). The idea is the first objective has been met, as credit policies (liquidity provision operations and private asset purchase programs) had an initial positive effect of preventing a widespread collapse of financial markets. However, financial intermediation regular operations and the transmission of falling

yields to the private sector occurred at different times depending on the location. As for the second objective, the evidence is that in forward guidance programs and in public asset purchase programs, the main transmission channel of UMPs has been signaling, with portfolio rebalancing channel also playing a relevant role in some asset purchase programs (e.g., in USA LSAP 1 – LSAP 3, mainly through the scarcity mechanism, and in Operation Twist notably through the duration mechanism).

We examined in more detail the case of nominal negative interest rate policies, unconventional measure not implemented in large scale before the 2008 crisis. Regarding the theoretical analysis, despite the arguments supporting the implementation of NIRPs originally came from mainstream authors (Monetarists and some New Keynesians), their adverse effects have been clearly pointed out not only by heterodox authors (Post-Keynesians), but also by other authors coming from the mainstream (group of New Keynesians and Neo-Fisherians), recognizing the flaws of views such as exogenous money and Quantitative Theory of Money. In practical terms, while NIRPs positive effects were usually small and temporary, these policies have brought additional macroeconomic and financial stability challenges for the jurisdictions they were implemented. Hence, instead of insisting on NIRPs, we argued that an active fiscal could be the first-best alternative of expansionary measures. Nevertheless, due to fiscal policies' legal/ political constraints in most jurisdictions where NIRPs were implemented, we argued for a complementary/ alternative role of countercyclical macroprudential measures/targeted liquidity operations and initiatives to improve debt restructuring/insolvency frameworks in these countries. We believe such policy mix would enhance credit supply/demand conditions and promote a more sustained economic growth in jurisdictions that adopted NIRPs, as well as lower financial stability concerns for foreign economies eventually affected by negative interest rate spillovers.

Regarding the effects of UMPs on financial variables, the evidence is that UMPs supported financial asset prices in general. In the case of sovereign bond yields, they usually promoted a reduction in their levels, with larger impacts in initial announcements, or in announcements with a greater degree of “surprise” on markets. In terms of UMPs effects on macroeconomic variables, the evidence is that the impacts on GDP were of higher magnitude than on inflation, although the effects on inflation usually lasted for a period longer than GDP. However, the effects of these programs would tend to decrease in time, which would require that authorities proceed with modifications in their scale and scope, so that they would continue to be effective should it be necessary to keep them. Maintaining these programs for a very long time would also create a number of risks, especially for financial stability. On UMPs distributional effects, the evidence is mixed, depending on the UMP being analyzed, the distributional channels in place, the economic structure of the country under consideration and the income and balance sheet profile of individuals. Unconventional monetary policies also had significant effects on international terms by stimulating strong capital flows to other economies, usually towards emerging countries. In general terms, the evidence is that these economies had temporary benefits with liquidity inflows, but in some places, excessive inflows generated imbalances in foreign exchange, credit, and asset markets. Taking into account the potential imbalances generated by UMPs in the countries of origin and in foreign jurisdictions affected by their negative spillovers, there is a need for continuous improvement of regulatory frameworks. This improvement would apply both for financial/non-financial agents, on a coordinated basis between monetary/fiscal/financial supervision authorities, at a national and international level. It would allow that those imbalances were properly addressed, so that economies would be better prepared to face future crises.

Due to the supposed inadequacy of the inflation targeting regime to respond to the 2008 crisis, some authors have proposed the implementation of other measures beyond UMPs

already implemented, such as alternative monetary targets (nominal GDP targeting or price level targeting) and policies (monetary finance), as well as enlarging central banks' mandates (incorporating employment, wages, inequality and environmental objectives). However, those proposals face several challenges in practical terms, and strong political dissent, which turn their implementation very difficult in most jurisdictions.

The discussion follows with chapter 3 that debates the experience of UMPs in advanced economies, focusing on the Euro area case, analyzing to what extent they influenced Euro area's main economic indicators in the period. In particular, we analyze Euro area's sovereign and private yield curves responses with each asset purchase program announced/implemented from 2009 onwards. Regarding sovereign bond programs, unlike other programs, the PSPP initial announcement and implementation led to lower yields across almost all countries (with the exception of Greece, that was not eligible). Furthermore, the PSPP led to more intense yield drops in periphery countries (mainly in the announcement date, implying a stronger role for the signaling channel of unconventional monetary policy), whereas in core countries yield drops were smaller, but more significant in the implementation date, implying a stronger role for the portfolio rebalancing channel of unconventional monetary policy. We also underline the importance of the way central banks communicate their announcements, and how they achieve better results when they do it in a more proper way, improving the effects of their guidance over markets (e.g., UMPs signaling channel). This fact was observed on sovereign bond programs "verbal intervention" announcements, as well as in private bond programs, with the CSPP experience. In general terms, some UMPs avoided the more acute risks of contagion through the Euro area and managed partial improvements in macroeconomic indicators. Conversely, other programs did not reach their initial targets, receiving strong criticisms for not avoiding or aggravating the crisis. The ECB had to do several modifications during the course of UMPs implementation,

adapting measures according to its own former programs (“learning by doing”) and to other central banks experiences (“learning by observing”), in order to improve its framework. Nevertheless, serious problems remained for governments and private agents in the region, related to fiscal, financial, political and social issues.

Therefore, although the ECB strategy of ending of net asset purchases while still keeping a partly accommodative monetary stance is considered appropriate, the path for a sustained growth recovery in the Euro area cannot rely only on easy monetary policies. They should also be complemented by a fiscal policy which is more coordinated and has a countercyclical role, coupled with adequate institutional reforms that together foster credit markets, encourage private/public investments in the long term and reduce regional asymmetries. Additionally, it is believed that a more robust and integrated framework for financial regulation/supervision would contribute to reducing negative spillovers from volatility episodes, bringing more financial stability to the area.

In chapter 4 which explores the effects of UMPs in emerging economies, we focus our analysis in corporate debt expansion in emerging countries after the 2008 crisis. We present EMEs corporate debt profile, main determinants and economic policy implications for these nations. First, it is presented the features of emerging market corporate debt after 2008, with particular importance for the growth of leverage, net foreign exchange exposure, and later deterioration in firms’ debt repayment capacity. Next, we do a panel regression to identify the main changes in the determinants of emerging market corporate debt expansion before and after the 2008 crisis. Our analysis suggests that the exchange rate has been one of the most important determinants through the period 2000-2016, and also in the period before 2008. But after 2008, beyond some country-level factors (exchange rate, national GDP growth, firms’ higher liquidity levels), other factors that have global origins (more accommodative monetary policy in USA, lower financial market volatility, global GDP growth, higher commodity

prices and its interaction with the exchange rate appreciation) have become increasingly important. One of our contributions is to identify a factor not previously emphasized in the literature which investigates the determinants of corporate debt in emerging economies: the interaction between higher commodity prices and more appreciated exchange rates. Combined with an international scenario particularly uncertain, this raising indebtedness generated many challenges for enterprises in emerging economies: currency mismatch, firms' susceptibility to creditors'/banks'/institutional investors' interests, macroeconomic volatility. In addition, although several lines of defense have been developed by governments at the national level, the capacity of these lines to provide the necessary support for private agents is still unclear, raising financial stability concerns in those countries. Those concerns would be better addressed if emerging countries and international institutions took additional initiatives, such as an improvement in regulatory frameworks, as well as coordinated macro and micro-prudential measures. In this sense, an enhancement of the available instruments to face new financial crises would take place, opening space to pursue a better strategy towards sustainable growth in the medium/long-term.

We end our analysis with chapter 5, which describes UMPs exit process and future monetary policy frameworks. Regarding the exit from unconventional measures, we have seen that this process involves significant challenges. Its asynchronous profile, with distinct timing according to each jurisdiction, adds complexity to those challenges. On the one hand, we acknowledge that some progress towards adopting measures to ensure financial and macroeconomic stability has been achieved in the post-2008 period. Hence, if the exit process is carefully managed, with proper sequencing and communication, major disruptions may be avoided. Nonetheless, the large spillovers from the exit process and the difficulty to advance in international economic and financial policy coordination are risks that may not be

underestimated. They have the potential to turn the world economy more volatile, and subject to new episodes of economic and financial crises.

In order to face those risks, we argue that central banks should not merely promote a complete return to pre-2008 standards (“normalization”), but need to take advantage of the experience with past episodes and the 2008 crisis response, in order to improve their future monetary policy and financial stability frameworks (“new normal”). Based on this, measures implemented in the post-2008 crisis would have three possible destinations in new frameworks:

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- i) Exclude the SMP, once the sterilized bond purchases during its course did not solve the financial fragmentation in periphery countries, sometimes increasing these countries sovereign yields; ii) Do not implement TLTRO II on a regular basis, but keep TLTRO II as an alternative facility to improve liquidity conditions, and foster targeting credit to the real economy if needed; iii) Keep forward guidance as a permanent tool to clarify central bank’s reaction function and improve communication, and macroprudential measures to expand the resilience of the financial system. In the case of small advanced open economies and emerging countries, central bank balance sheet policies (e.g., yield curve management, with monetary authorities selling/buying government bonds previously available/ placed after on their balance sheets to cope with excessive inflows/outflows and foreign exchange appreciation/depreciation) could be added to other actions already applied to face destabilizing pressures or excessive volatility in asset and foreign exchange markets (e.g., macroprudential measures, capital flow management initiatives, foreign exchange interventions).

Ultimately, it remains to be seen in future frameworks with broader mandates, more instruments and improved communication, if central banks and financial supervision authorities will manage to increase the effectiveness of monetary policies and ensure financial stability, once the challenges posed by financial markets that are each day more dynamic, innovative, complex, interconnected and globalized are increasingly higher. In order to face those challenges, monetary and financial supervision authorities in advanced and emerging economies will need to be increasingly evolving institutions, in a continuously adaptive and innovative process.

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