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**RESPONSES TO THE IMPACTS OF THE GLOBAL
FINANCIAL CRISIS
CHALLENGES TO THE CENTRAL BANKS**

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LIST OF ABBREVIATIONS

ABCP: Asset-Backed Commercial Paper

ABS: Asset-Backed Security

ABSPP: Asset-Backed Securities Purchase Programme

ADB: Asian Development Bank

AIIB: Asian Infrastructure Investment Bank

AFC: Asian Financial Crisis

AMRO: Asian Macroeconomic Research Office

ASEAN: Association of Southeast Asian Nations

ABSPP: Asset-Backed Securities Purchase Programme

BIS: Bank for International Settlements

BOE: Bank of England

BOJ: Bank of Japan

BOR: Bank-Offered Rate

CBRC: China Banking Regulatory Commission

CBPP: Covered Bond Purchase Programme

CDO: Collateralized Debt Obligation

CDS: Credit Default Swap

CGIF Credit Guarantee and Investment Fund

CMBS Collateralised Mortgage-Backed Securities

CMI The Chiang Mai Initiative

CSRC China Securities Regulatory Commission

DWF Discount Window Facilities (BOE)

ECB European Central Bank

ESCB European System of Central Banks

EONIA Euro Overnight Index Average

EURIBOR Euro Interbank Offered Rate

EMEs Emerging Market Economies

ESM European Stability Mechanism

ETF Exchange-traded Fund

EU European Union

FAI Fixed Asset Investment

FCA Financial Conduct Authority

FDI Foreign Direct Investment

FHCs Financial Holding Companies

Fed Federal Reserve Board

FPC Financial Policy Committee

FSA Financial Services Authority (UK)	MBSs Mortgage-Backed Securities
FSA Financial Services Agency (Japan)	MLF Medium-term Lending Facility
FSC Financial Stability Committee (UK)	MOF Ministry of Finance (China and Japan)
FSCS Financial Services Compensation Scheme	MOU Memorandum of Understanding (BOE)
FSOC Financial Stability Oversight Council	MPC Monetary Policy Committee
GAO Government Accountability Office	MPM Monetary Policy Meeting
GC ECB Governing Council	MROs Main Refinancing Operations
GEM Growth Enterprise Market	NBFI Non-banking Financial Institution
GFC Global Financial Crisis	NBSC National Bureau of Statistics of China
HCPI Harmonized Consumer Price Index	NPL Non-performing Loan
ICBC Industry and Commercial Bank of China	OECD Organisation for Economic Cooperation and Development
IMF International Monetary Fund	OFS Office of Financial Stability (Policy and Research)
JGB Japanese Government Bond	OMO Open Market Operation
J-REIT Japan's Real Estate Investment Trust	OMT Outright Monetary Transactions
LET Limited exploitable trade-offs	PBC People's Bank of China
LIBOR London Interbank Offered Rate	PRA Prudential Regulation Authority
LOLR Lender of Last Resort	PRC People's Republic of China
LTROs Longer-Term Refinancing Operations	PSL Pledged Supplementary Lending
	QE Quantitative Easing
	QQE Quantitative and Qualitative Monetary Easing

RMB Renminbi

SAFE State Administration of Foreign Exchange

SEC Securities and Exchange Commission (US)

SFOFCF Special Funds-Supplying Operation to Facilitate Corporate Financing (Japan)

SIFIs Systemically Important Financial Institutions

SIV Structured Investment Vehicle

SLF Standing Lending Facility

SLOs Short-term Liquidity Operations

SLS Special Liquidity Scheme (BOE)

SMF Sterling Monetary Framework

SMP Securities Markets Programme

SOCB State-Owned Commercial Bank

SOE State-Owned Enterprise

SPV Special-Purpose Vehicle

SRR Special Resolution Regime

SRU Special Resolution Unit

SVAR Small Structural Vector Autoregression

TAF Term-Auction Facility (Fed)

TALF Term Asset Backed Securities (Fed)

TBTF „too-big-to-fail“

TFEU Treaty on the Functioning of the European Union

TSC Treasury Select Committee

UMP Unconventional Monetary Policy

US Fed Federal Reserve System of the United States

VLTROs Very Long-Term Refinancing Operations

WTO World Trade Organization

ZIRP Zero Interest Rate Policy

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PART 1 – THE RESEARCH WORK

1.1. THE CHOICE OF THE SUBJECT

As a lecturer at the University of Hertfordshire - Szamalk School of Economic Studies, I taught International Financial Management from 2001 to 2007, then I joined Dennis Gabor College, where my subjects and research field included economic integration in the EU and international finance. At present, I teach finance at the Budapest University of Technology and Economics. Previously, I did research in international banking and institutions. My doctoral dissertation (1986) deals with World Bank projects in Hungary.

In 2006, I studied the issue of the euro- adoption in Hungary with regard of the Convergence Programme including the goals to be achieved in order to fulfill the Maastricht criteria and the Hungarian government's economic policy.

My research focused on the impacts of the global financial crisis, the sovereign debt crisis and the escalation of Greece's fiscal problems in 2010. I dealt with the institutions set up to rescue ailing eurozone member countries, the German proposal for establishing a rescue fund: the European Monetary Fund (EMF), the European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM). Questions addressed were efficacy, feasibility and moral hazard.

The global financial and the subsequent economic crisis raised the issue of responsibility from many aspects. In 2013, my research work focused on the lessons that can be learned to prevent such a big shock in the future. It implies answering whether financial regulations are needed and how the global financial system can be reformed to become more resilient to shocks through implementing financial sector reform steps.

The crisis brought to the surface both the structural and the operational weaknesses of EMU, and challenged it in fields, where the Monetary Union

had not been challenged before. The future of the European monetary integration is vital for Europe. Therefore it is essential to gauge the eurozone from the aspect of its vulnerability and susceptibility to crises to prevent a recurrence, or to forecast the economic, financial and political developments in Europe for the decade to come.

Critical discussions on the design of EMU have been going on ever since the Maastricht Treaty was signed. The financial and subsequent sovereign debt crises have had a deep impact on the level and pace of economic growth and macrofinancial stability in Europe. They have forced to rethink the architecture of the Monetary Union and economic governance arrangements, as well as the main macroeconomic forces prevailing in the euro area.

The crisis has posed new challenges to fiscal and monetary policies in all the countries, including the euro area. Numerous and creative monetary and fiscal policies or financial interventions have been deployed either in the European Union or in the US, China and Japan to limit the damage and mitigate the crisis. In my dissertation, I intend to give a broad overview and assessment of the responses of monetary, and to some extent fiscal policies to the crisis and provide comparisons of the reactions in different economies.

The euro area's exposure to the global and sovereign crises was exacerbated by faulty concepts on synchronization of EMU member states' business cycles and on macroeconomic stability. It motivated me to research the topic and examine how to enhance the stability and prosperity of the European monetary integration.

1.2. THE GOAL OF THE RESEARCH

The overall aim of my research is to examine and analyze the monetary policy responses given to the challenges of the recent global financial crisis with the redesign of the European monetary integration as a priority. Lessons drawn from the pre-crisis flaws and failures may create a basis for shaping the

next stage of operating the single currency system. The examination is based on the comparison of monetary policy responses to the challenges of the global financial crisis including unconventional policy tools and central bank responsibilities in the light of the new objectives. My comparative analysis has been extended to the two main Asian central banks: People's Bank of China and the Bank of Japan. These parts of the thesis are based on my previous research work to a great extent.

Taking into account the comments of my opponents and the remarks discussed on the public debate, I examined the issue of the expanded balance sheets of central banks with special regard of exit strategies from the unconventional monetary policy.

The past two decades have seen a significant growth in financial liabilities in advanced economies. The financial deepening increased the fragility of the euro area leading to concentration of risks, which remarkably increased the euro area's vulnerability to shocks and cross-border contagion. Fiscal policy errors in certain member states contributed to escalating the crisis and prevented these countries from pursuing countercyclical stabilization policies.

My research aims to analyze the response of monetary policies to the global crisis within EMU and in other major economies including the US, the UK, China and Japan. Focusing on the European monetary integration, comparison of responses with those of other economies will contribute to better understanding of alternatives under certain conditions.

My research question is whether common fiscal and monetary policy was successful in contributing better to financial stability. Without the bold use of central banks' tools, cutting rates and providing abundant liquidity in 2008 and 2009, the meltdown of the financial system could not have been avoided. The European Central Bank was the first major central bank to cut the interest rates below zero in Europe. A number of central banks, including those of Sweden,

Denmark and Switzerland, pushed their benchmark interest rates to negative. The dissertation will discuss what the consequences of such unconventional measures will be and how central banks fight deflation.

The framework of monetary policy shows differences in individual central banks' main goals regarding price stability. Central bank forecasts played a significant role in monetary policy decision-making. When capital markets are presumed to be efficient, financial imperfections and their potential macroeconomic effects are disregarded. Monetary policy intervention happened only after financial crisis to mitigate damage.

The research aims to find out whether and to what extent monetary policy should take into consideration financial market developments *before* a crisis occurs. As a result of that, monetary policy could better contribute to financial stability. It can be asked if price stability takes any specific form owing to the crisis. Macroprudential policy is about strengthening the resilience of the global financial system so that the procyclicality and interconnectedness of financial institutions can be managed appropriately. Should monetary policy be overburdened with other objectives? Would not that mean exaggerated expectations about the effectiveness of monetary policy tools without going against credibility? The answer to these questions implies examining the tools for adjusting monetary and macroprudential policies.

The economic performance of the euro area countries shows a widening divergence. Should heterogeneity be a challenge for the single monetary policy? The financial crisis has brought some unsustainable shortcomings in some member countries to the surface, which had been neglected before. How can the ability of these economies be restored to meet the requirements of the single monetary policy?

The dissertation refines the analysis of EMU's design flaws from the aspect of EMU's fiscal and monetary policy maneuvering, asking whether it was constrained by its structural and operational weaknesses. Research focuses

on the question whether EMU will be able to pass the serious challenges it is confronted and what options are available to policymakers.

My central research question addressed the five selected central banks challenged by the financial crisis. Central banks were given special attention as they had to maintain financial stability under unprecedented circumstances and took particular responsibility when dealing with financial stability issues. The research aims at examining central bank independence from the aspect of their new macroprudential tasks. The role of the central bank balance sheet is a relevant issue in respect of the exit strategies. The dissertation intends to outline the new stage of the monetary policy after the years of employing the unconventional tools.

1.3. METHODOLOGY

My main research question was how the financial crisis had challenged the five selected central banks to maintain financial stability under considerable and unprecedented duress. As illustrated by the changes and reforms, which were made during the last few years, they have taken particular responsibility for dealing with financial stability issues. The main question has been answered through a comparative analysis. I have compared five major central banks: the European Central Bank (ECB) (i); the Bank of England (BoE) (ii); the US Fed (iii); the People's Bank of China (PBC) (iv) and the Bank of Japan (BoJ) (v). Due to China's apparent speedy resilience, I gave special attention to the PBC. I applied critical assessment concerning the strengths and weaknesses of its regulation.

My research is based on analyzing qualitative and quantitative data. I have used literature review and analysis, therefore I have collected data from diverse sources, including books, journals, newspapers, conference papers, reports from international organizations, government policy records and websites to test my hypotheses.

My secondary data include quantitative data from financial data sources, databases, graphs and charts. It is not a simple presentation of such materials, rather I have integrated different arguments systematically and have developed critical assessments of their meanings and value. My study comprises logical, explanatory, exploratory and evaluative methods of analysis.

This study will focus on employing data to gain insights into the five central banks' policy responses to the global financial crisis. My work aims to analyze the effects of the factors, policies and measures on the economy to reveal deep context.

To support my conclusions on the impact of unconventional monetary policy tools on the economy, I examined and presented the changes in GDP and unemployment data of the economies subject to my dissertation during the financial crisis and in the subsequent years. I made graphs to display my results.

To measure the impact of central bank macroprudential tools, I did statistical research and analyzed financial statement information of systemically important financial institutions to examine the effectiveness of capital adequacy rules through financial statement data. Limited access to accounting databases of central banks made the research difficult. Nevertheless, I managed to get access to financial statement data to nine systemically important financial institutions (SIFIs) with headquarters in Hungary, which enabled me to analyze the annual changes in the relevant ratios in each of the selected banks. I examined 11 ratios, out of which I dealt with two profitability indicator ratios: the Return on Net Assets (ROA) and the Return on Equity (ROE) in detail. As a macroprudential authority, the Hungarian Central Bank (MNB) applies its mandate to manage financial systemic risks at the national level proactively and in line with the regulatory framework of the European Union. The commitment of the MNB, the

economic environment of the country as well as the findings underpin the extension of the conclusions of research to other economies.

I used R statistical software and adapted panel regression to make my analysis. Analyzing panel data enabled to reveal the cause-effect relation in financial statement data of the selected banks. As a particularity of the method, it enables us to divide the dependent and independent variables relation i.e. to examine idiosyncratic effect. Both fixed effects and random effects panel regressions were run with calculating their unidirectional and two-directional versions. R includes different variance estimation methods for random effect panel regression. I employed Swar and Amemiya methods. I used the Hausman test to select the panel model best corresponding to data in the examination.

The dissertation consists of nine parts. Part 1 addresses the research work. Part 2 introduces the theoretical framework. My analysis will start in Part 3 with the assessment of the cyclical and structural components of the crises, introducing various approaches used for measuring the real impacts. In this part, I examine the euro area's greater exposure to the global and sovereign crises with special regard of its structural and operational weaknesses, and the roots of the recent global financial crisis. Part 4 provides an overview of the monetary policy responses and crisis management of the ECB, the BoE and the Fed, while Parts 5 and 6 deal with the PBC of China and the BoJ. Due to the specific features of the Asian economies, I will analyze this region separately, before making my comparative analysis of the five central banks in Part 7. Part 8 introduces the implications of the expanded central bank balance sheets and presents the different aspects of the exit strategies. Part 9 includes the research I conducted based on statistical data to examine and show the impacts of unconventional monetary policies on the economies of the selected countries. The second part of the research focuses on the new commitment of central banks in ensuring financial stability. It includes revealing the relation

between makroprudential tools, the profitability and risk taking of the banking sector through financial statement indicators.

I provide the results of the research and the assessment of the hypotheses at the end of my dissertation. My research is based on studying a great amount of relevant literature, the majority in English, due to the wide range of professional work including publications of Hungarian authors in the topic, a smaller part in Hungarian, or in Swedish.

1.4. RESEARCH QUESTIONS

- How did the EMU deal with the effects of the global financial crisis?
- Was EMU's fiscal and monetary policy maneuvering constrained by its structural and operational weaknesses?
- Did common fiscal and monetary policy result in success in contributing better to financial stability?
- To what extent can central banks be burdened?
- Will EMU be able to pass the serious challenges it faces?
- Whether convergence or divergence pathways characterize the conduct of the selected central banks' approaches to facilitating systemic stability.
- How do central banks support financial sector development in developing countries?
- How to exit from unconventional monetary policies?
- How did the global financial crisis affect the central bank independence?

1.5. THE HYPOTHESES

With regard of the research questions I aimed to analyze and test the hypotheses as follows.

The 1st Hypothesis:

The global financial crisis has widened the existing divergences, as well as the gaps between the respective legal frameworks and prevailing two-tier relationships of the central banks in the examination. The prevailing two-tier relationship is challenged by the financial crisis: the central bank moves closer to government, while increases its direct control over the markets.

The 2nd Hypothesis:

The incomplete design and the structural weaknesses of EMU constrained its fiscal and monetary policy maneuvering.

The 3rd Hypothesis:

With the global financial crisis in general and its impact on financial stability in particular, the independence of central banks was weakened by their respective governments. Reduced independence can mitigate the central banks' market-oriented principles.

1.6. The 4th Hypothesis:

One leading goal for central banks in developing countries is to support financial sector development. This has been further confirmed as a reform principle for developing countries in the post-crisis era.

1.7. The 5th Hypothesis:

Central bank balance sheets have got a special emphasis in their role as the new tool of monetary policy instead of interest rates.

PART 2 – INTRODUCTION TO THE TOPIC AND THEORETICAL BACKGROUND

Burst of financial bubbles, which brought underlying economic problems to the surface, developed into a financial and economic crisis at global level in 2008. The financial crisis turned into a debt crisis and a euro crisis. There were three main factors existing in the pre-crisis period that contributed to escalating the economic and financial crisis in the euro area:

- i.) the macroeconomic risks inherent in a large, highly interconnected and lightly regulated banking system, which were largely ignored,
- ii.) a range of emerging macroeconomic imbalances and market failures, which was overlooked and
- iii.) imprudent fiscal policy mistakes in the Monetary Union member states.

The crisis has posed new challenges to fiscal and monetary policies in all the countries, including the euro area. Numerous and creative monetary and fiscal policy or financial interventions have been deployed either in the European Union or in the US and Japan to limit the damage and mitigate the crisis. It should be noted that this crisis, although it demonstrates features similar to those in the past, is much greater in its severeness and intensity. In terms of falling output and rising unemployment, it has proved the most serious recession since the war. Taking the impacts on the banking system and the risk for sovereign debtors into account, the economies had to face a new situation, which aggravated the conduct of monetary policy.

Nevertheless, the 2008 financial crisis was worse than the Great Depression the recovery seems to be better than 25 to 30 percent fall in the GDP that happened in the Depression (Bernanke, 2014), owing to the appropriate response to it. The way of recovery also differs in the US and the UK from that in the Euro area. The correct assessment of the crisis is vital in

terms of setting the right monetary policy, which may determine the depth of the impacts and the manner or the speed of recovery. For instance, estimating the output gap i.e. calculating the effect the crisis has had on the level and potential growth rate of the economy. Different sizes of output gaps require different policy measures.

The dissertation focuses on the monetary and partly on the fiscal responses to the global financial crisis in the Economic and Monetary Union. To obtain a thorough assessment and conclusion, the reactions of policies in the US, UK, China and Japan are compared with that of the monetary union. The financial crisis turned into a sovereign debt crisis and a euro crisis. In the times of a soaring global economy activity, several of the underlying problems, stemming from the incomplete design of the Economic and Monetary Union, remained concealed. The recession and the financial crisis have brought its structural and operational weaknesses to the surface.

My argument is that the economic situation within the euro area in 2007-09 stemmed from its vulnerability and fragility owing to its architecture. At the union level, the crisis has highlighted that institutional reforms are necessary to implement for two main reasons. One is that the euro area should develop effective mechanisms of fiscal supervision and policy co-ordination to prevent a crisis as severe as the recent one from occurring in the future. The other is: should a recession occur in any EMU country, it is important to stop its escalation in the particular country and its contagion to other countries.

In my dissertation, I first document the impacts of the global financial crisis as well as the underlying economic problems which contributed to its escalation and provide a correct assessment. The fourth part analyzes and compares the fiscal and monetary policy responses in the euro area, in the US and in the UK, then the study proceeds to introducing the implications and assessing the impacts of the measures and steps taken to mitigate the crisis.

The following parts address the central banks and their monetary policies in response to the crisis of two main Asian economies, China and Japan, respectively. To assess the directions of the unconventional monetary policies, I compare the five selected central banks concentrating on their two-tier relationships. Then I devise the potential exit strategies from the monetary policies during the crisis with regard to the shape of the future policies in the post-crisis period. In the last part, I examine and analyze the impact of the non-traditional measures on the economic performance of the economies my dissertation deals with. In the framework of my research, I explore the relation between the central banks' macroprudential tools and the profitability and risk-taking of some systemically important banks. Finally, I draw the conclusions regarding the changes the global financial crisis has brought in central banking.

To understand the weaknesses of the European monetary integration it is necessary to study the Optimum Currency Area theory. Initiated by Mundell (1961), the theory has received increased attention in recent years in the analyses criticizing EMU. At the top of the criteria list a monetary union must meet is the absence of frequent, large-scale asymmetrical shocks.

The elimination of the exchange rate among members in the monetary union no longer allows the exchange rate to absorb shocks that affect different regions asymmetrically. The first criterion is followed by production factor mobility and the system of sufficient fiscal transfers. These three criteria were completed by two others: a certain degree of economic openness (McKinnon, 1963) and export diversification. As for the factors of production, labor markets in most European countries are rather rigid with the labor factor having little mobility.

Mundell represented the „monetarist approach”, according to which fixing exchange rates and the adoption of a common currency will ensure sufficient convergence of the economies that seek membership, particularly of their inflation and interest rates. EMU's pre-crisis design demonstrated the idea

that macroeconomic stability was essentially an issue of fiscal and price stability and that a common currency would progressively bring about a synchronization of the business cycles of the participating economies. As argued by Obstfeld and De Grauwe, the financial dimension of macroeconomic stability was largely overlooked (De Grauwe, 2013), (Obstfeld, 2013). The 2000s saw profound changes in the global financial system and significant growth in capital flows and banking, which was extremely strong within Europe. It was partly due to the deepening integration of the financial markets in the euro area.

Obstfeld suggests a new policy trilemma for currency unions: All three of (i) cross-border financial integration, (ii) financial stability, and (iii) national fiscal independence cannot be simultaneously maintained within the union after a certain level of the financial integration has been reached.¹ Conclusively, financial integration and independent national fiscal policy do not create financial stability.

The euro area crisis that began in 2009 stems from this financial/fiscal trilemma (Obstfeld, 2013). Countries without a single currency have the option of turning to the tool of money creation to support their financial systems in hard times. Financing public debt in such a way leads to destabilized price level and ends up in a quadrilemma: at least one of (i) strong capital market integration, (ii) financial stability, (iii) national fiscal independence, and (iv) price-level stability must be given up.

As it comes to discussing the fragility of EMU by examining the role of the central bank as a lender of last resort and the automatic stabilizers in the government budgets, it is significant to see the existence of a “deadly embrace” between the sovereign and the banks (De Grauwe, 2013). It refers to the case

¹ The classic trilemma in economics relates to monetary policy (see, for example, Obstfeld et al, 2005). It suggests a trade off among the three objectives of a fixed exchange rate, monetary independence and capital market openness.

when falling government bond prices threaten the banks, or sovereigns are threatened with insolvency. As a result, when one is endangered the other follows. This creates a good starting point to analyzing the operation of the European Central Bank (ECB).

Accumulation of private debt resulted in developing bubbles. Deleverage as a consequence of bursts got the deflation dynamics going thus pushing the economy into a deflationary spiral (Minsky,1982).

The idea of the financial instability hypothesis (FIH) was pioneered by Hyman Minsky. He argued that financial crises are endemic in capitalism. The model does not base on exogenous shocks to arouse business cycles of various massiveness, instead, it suggests that business cycles are generated from the internal dynamics of capitalist economies, the fragility of financial markets and the system of interventions and regulations, which are necessary to keep the operation within bounds. Capitalism is prone to move from periods of financial stability to instability, which is a type of market failure and needs government regulation.

Minsky (1992, p.106) maintained that „To understand the short-term dynamics of the business cycle and the longer term evolution of economies it is necessary to understand the financing relations that rule, and how the profit-seeking activities of businessmen, bankers and portfolio managers lead to the evolution of financial structures.” Minsky related some ideas from Schumpeter’s Theory of Economic Development with those in Keynes’ General Theory. Money and finance provide a link between Keynes’ view of the investment decision as a determinant of output and employment with Schumpeter’s view of the investment decision as a determinant of innovation and economic growth.

According to Schumpeter’s theory on business cycles, „cycles are the essence of the organism that displays them” (Schumpeter, 1939, p.6). The starting point of his analysis is stable equilibrium with the aim of identifying

the economic factors arising from the economy itself that destroy the equilibrium and lead to evolution. These real economic processes are referred to as the „circular flow“ and „development“, which creates the economic evolution: changes in the economy that arise from itself.

Contrary to Keynes, Schumpeter presumes that in the circular flow there is a constant tendency towards an equilibrium, which, under competitive capitalism, tends to maintain the optimal allocation of available capital and labour. In the „circular flow“, the role of money is to facilitate the circulation of commodities. It is basically entrepreneurial demand that determines the credit supplied by the banks, consequently the money supply is an endogenous variable. Schumpeter argues that in a developing economy, where an innovation prompts a new business to replace the old, called by him „Creative Destruction“, booms and recessions are inevitable.

„Change of practice by the Federal Reserve System or by any Central Bank in Europe may be itself an act of business behavior and an element of the mechanism of cycles, as well as an external factor; and so may collective measures taken by the business world itself. Every such case must be treated on its merits, and decision may be difficult indeed“ (ibid: 17).

Minsky adopted Schumpeter’s idea of the innovating entrepreneur. Minsky regarded, however, financial innovations produced by financial institutions as the source of financial fragility leading to financial crisis and instability. Schumpeter contrarily stated that innovation was the main source of stability. Minsky concluded that Schumpeterian entrepreneurship, evolution and change are the most evident in banking and finance, where the drive for profits is the clearest factor to make a change (Minsky, 1992).

Financial institutions were essential to Schumpeter’s theory and in the development of Minsky’s thought. The advanced market economies’ institutional arrangements are the setting within which innovation is financed by entrepreneurs.

Whalen (2009) argues that financial innovations including „exotic” securizations, non-bank financial intermediation, trading in derivatives, unconventional mortgages, hedge funds, and the globalization of finance markets are behind the current global economic crisis.

Monetary policy rules on the central bank's systematic adjustment of its interest rate to respond to developments in inflation and macroeconomic performance referred to as Taylor rules. Taylor (1993) offers a framework for the analysis of historical policy and for the econometric evaluation of specific alternative strategies that a central bank can make. The framework links interest rate decisions directly to inflation and economic performance abstracting from a detailed analysis of the demand and supply of money. These reactive rules facilitate the discussion of systematic monetary policy.

Parameterization of measuring the output gap and the inflation according to the rule appeared to describe Federal Reserve behavior well in the late 1980s and early 1990s. The mid-1990s saw a sharp increase in economic productivity in the US. As a consequence, the Fed did not increase interest rates in the way it previously would have done. This is what was considered to have allowed the expansion of the 1990s to continue as an earlier tightening of monetary policy might not have delayed the next economic recession until it finally occurred in 2001 (Asso et al, 2010).

The question arises if the recent business cycles in the US and Japan can be explained on the basis of the Austrian business cycle theory (ABCT) since they display some of its signs. ABCT suggests that an economic boom is sustainable if it is the result of an increase in investment funded by an increase in savings, while an economic boom which stems merely from credit expansion is not sustainable.

Excessive growth in bank credit is owing to the artificially low interest rates set by a central bank or through expansionary monetary policy. These interest rates are below the rate of the market for loanable funds that supply

and demand clear. As a result, the information embedded in market prices or interest rates is distorted. Entrepreneurial decisions are affected, which causes a misallocation of capital across the economy and the credit-sourced boom results in widespread malinvestment.

Consequently, a sustained period of low interest rates and excessive credit creation leads to an unstable imbalance between savings and investment. The boom fed by the credit expansion turns to recession when the money supply contracts and eventually resources are reallocated back towards their former uses (White, 2006).

Mainstream economists have concluded that the housing boom, subsequent to the 2001 recession, was mainly due to the Fed's accommodative monetary policy. Taylor (2007) argues that between 2002 and 2005, the US monetary policy was far more accommodate than an approach based on an interpretation of inflation and output data would have called for.

White and other Austrians predicted that a burst of an asset bubble, specifically the real estate bubble would trigger a crisis, while forecasts of some non-Austrian economists, such as Nouriel Roubini and Stephen Roach focused more on macroeconomic imbalances such as the current account deficit or the federal government debt (Roubini, 2006).

Nevertheless, a strategy for monetary management namely inflation-targeting policies, conducted mainly in a discretionary form have been considered to be capable of keeping inflation low while supporting the central bank's flexibility to manage monetary policy with their independence being emphasized. At the same time, monetary policy is also supposed to support the objectives of general economic policy for the purpose of achieving sustainable growth and a high level of employment. Inflation targeting framework (ITF) sets two goals. One is the central bank's commitment to keep inflation low, the other is to keep the variance of inflation right. While the ITF can greatly

promote attaining the first goal, attaining the second provides more room to debates.

It is widely agreed that central bank transparency can make policy more effective. According to inflation-targeting framework, it is possible to create a „nominal anchor” to the price level by the communication to the public (Ábel et al, 2014a). The target would result in certain „psychological” market conditions which are favorable to reaching the very same inflation goal. The only way for central banks to earn credibility is to demonstrate that they have the tools and the willingness to curb inflation and to keep it low for a period of time (Bernanke et al, 2001). In addition, the element of discretion provides the central bank with the capacity to pursue other political objectives thought necessary in a certain case without compromising the attainment of the stated goal.

Public expectation from the central bank should be met, by suggesting that the bank has the power to expand or contract the money supply, to raise or to sink interest rates, to impose exchange controls, to alter the level of obligatory reserves, to alter the classes of assets and the conditions of granting access to discount facilities, and to impose new bank regulations (Mishkin, 2001). Both critics and supporters of the ITF, including Kohn (2004), Friedman (2003) and Svensson (1999) claim, however, that the ITF does not constitute best-practice in resolving the question of other goals such as real and financial stability. It is in the focus of long debates if monetary policy can beneficially exploit the short-run trade-off between inflation and the output gap. Limited exploitable trade-offs view (LET) suggests best-practice policy can beneficially exploit short-run trade off between real activity and inflation (Svensson and Woodford, 2004).

Some ITF advocates argue there are no exploitable trade-offs (NET). The NET view holders follow Friedman and Lucas in saying that no existing trade-offs can successfully be exploited, so best-practice is not sure to reach nominal

stability. Nevertheless, stabilizing inflation is the best way to achieve that goal (Orphanides, 2003). The view of the ITF is supported by Bernanke, Laubach, Mishkin and Posen commonly referred to as „BLMP”, who conclude that should a great supply shock of some unexpected origin in particular arise, missing or changing a previously communicated inflation target may even be justified (Bernanke et al,1999).

PART 3 – THE GLOBAL FINANCIAL CRISIS AND ITS IMPACTS BETWEEN 2008 AND 2015

3.1. THE ASSESSMENT OF THE CRISIS: CYCLICAL AND STRUCTURAL COMPONENTS

In the late 1970s, a radical financial deregulation process began that accelerated the evolution of financial markets. Financial innovation taking various forms stimulated strong financial booms that ended up in crises. The „New Financial Architecture” (NFA) refers to the integration of financial markets with light government regulation of the era characterized above. NFA created a framework for flawed practices and institutions, which can be regarded as the deep financial roots of the recent crisis. Governments of the world gave responses of similar and different kind allowing new expansions to start, which led to even larger financial markets and culmination of threat. These government interventions were unconventional. The process resulted in the recent crisis, which was basically due to the structural flaws in the financial system. This section reveals the underlying reasons and provides an assessment of the impacts of the crisis.

As a result of financial innovation, complex and opaque financial products became available in financial markets. They lacked transparency, which made it impossible to be priced correctly and therefore lost liquidity when the boom ended. The explosion of these securities flowing through banks at a high rate created large profits while destroyed the transparency, which is necessary to ensure market efficiency. Large investment banks like Lehman and Merrill Lynch were given high ratings by international rating agencies enabling them to borrow at a low price. Instead of exposing risk, the agencies systematically disguised it. Collateralized Debt Obligations (CDOs) are structured financial products that pool together assets such as mortgages, bonds and loans that serve as collateral for the CDO.

The recent economic crisis was remarkable not only because of its severity and size, but of its nature. The true nature of the underlying situation seems to be difficult to reveal as trading of over-the-counter (OTC) derivatives especially those taking the form of CDOs, accounts for confusing those who attempt to paint a clear picture. Derivatives are financial contracts that derive their value from the performance of the underlying asset, the most common of which contain commodities, stocks, bonds, interest rates, currencies or other. Derivative contracts have two groups: over-the counter (OTC) derivatives and exchange-traded derivatives (ETD).

OTC derivatives are contracts that are traded without going through an exchange or other intermediary, while ETD derivatives are traded via specialised derivatives exchanges. Positions in the OTC derivatives market reached the amount of US\$ 708 trillion in 2011. They comprised interest rate contracts (67.0 percent), credit default swaps (8.0 percent), foreign exchange contracts (9.0 per cent), commodity contracts (2.0 per cent), equity contracts (1.0 percent) and other type of contracts (12.0 percent) (BIS Survey, 2011). Since OTC derivatives are not traded in an exchange, there are no central counterparties (CCPs).

As a part of the financial sector reform, non-cleared OTC transactions are to be shifted to central counterparties (CCPs). The transition to CCPs would result in better risk management and resiliency in accordance with giving more transparency to the OTC market. The risk of derivatives stems from using leverage meaning that investors can earn large returns from minor changes in the underlying asset's price. On the other hand, however, they can suffer massive losses in case of opposite moves in price.

Derivatives contracts, which were regarded as a bet on the price of something, except for ones for hedging purposes were made unenforceable according to the Gaming Act 1845 (8 & 9 Vict.c.109) of the United Kingdom, which made gaming houses illegal, similarly to the legislation in Australia and

the United States (Buckley, 2012). From the 1980s, derivatives began to be removed from the application of these laws, mainly because sophisticated players were expected to be able to protect themselves, which did not prove right in the crisis. The creation of asset-backed securities of the form discussed above enabled the banks to increase their leverage significantly. These structured financial products were particularly attractive assets for banks to keep, because they could be held off-balance-sheet with no capital adequacy requirements.

The Third Basel Accord is a global regulatory standard on bank capital reserves. According to the Basel III rule, the banks are required to hold 4.5 percent of common equity and 6.0 percent Tier I capital of risk-weighted assets (RWA) (Basel III Capital Rules) besides introducing additional capital buffers during periods of high credit. Put it differently, there was no need for a percentage of the value of these assets to be held as a capital reserve. CDOs, which were made up of loans of varied quality, and other derivatives were distributed widely between the dominant institutions in the financial system. They were perceived as relatively safe since they were given a high rating by rating agencies, while in fact their credit worthiness and cash flow possibilities were doubtful. This was an unsustainable situation. In late 2007, the whole financial network came under strain questioning the viability of many financial instruments, which led to the withdrawal of these funds from Wall Street investment banks and associated institutes.

The collateralized debt obligation „market” was impossible to sustain. Wall Street investment banks were able to evade regulatory constraints. A shadow banking was constructed alongside the regulated sector. They do not take deposits and have no access to central bank funding or debt guarantees. Their activities include short-term funding on asset-backed commercial paper, providing cash loans against a collateral as security or long term loans like mortgages. They supply loans to a wide range of borrowers who might

otherwise be not eligible, owing to less risk aversion of the system. Shadow banks can contribute to increasing systemic risk indirectly as well through interconnectedness. Without the support of their central bank as lender of last resort, they are unable to refinance their short term liabilities. The shadow banking system is blamed for significantly contributing to the global financial crisis of 2007-2012 (Solt, 2015).

The conduct of economic and financial policies is strongly affected by the substantial implications of financial crises (Reinhart and Rogoff (2009). A thorough analysis of the consequences and best responses to crises has become an integral part of policy debates. Crises manifest the linkages between the financial sector and the real economy. Theories focusing on the sources of financial crises have recognized the importance of sharp movements in asset and credit markets.

A financial crisis often occurs together with one or some of the following phenomena: a remarkable change in credit volume and asset prices, disruptive financial intermediation, immense balance sheet problems (of firms, households, financial intermediaries and sovereigns) and significant government support (in the form of liquidity support and recapitalization).

The question may arise why neither financial market players nor policy makers anticipated the risks and tried to slow down the expansion of credit and increase in asset prices. Such phenomena have been around for centuries. Asset prices sometimes deviate from what fundamentals would suggest and move differently from the patterns of standard models. Asset prices can also be affected by investors' behavior or information asymmetries and changes in international financial and economic conditions.

Information asymmetries exist among intermediaries and in financial markets. Safety deserves a premium and perverse spirals can be created. When the demand for quality assets increase, some of lower quality may experience a sharp decline in their prices (Barr and Pierrou, 2015). The crises in the past

exhibit the signs of those of recent recessions when the collapse of banking systems was preceded by sharp increase in credit in real estate investment.

The East Asian financial crisis for instance in the late 1990s compares to ones in the Northern countries. The experience of the United States in the Great Depression shows some similarity to the way leading to the recent global financial crisis in terms of an increase in household leverage or asset prices.

Credit booms can be triggered by a wide range of factors for example shocks such as positive productivity shocks, economic policies, and capital flows. Lagged GDP growth is positively associated with the probability of a credit boom (Dell’Ariccia et al, 2013). Increases in international financial flows can strengthen credit booms. Global conditions also affect national financial markets resulting in asset bubbles, which easily spill across borders.

Capital inflows can extend the availability of funds for banks leading to relaxing credit constraints for corporations and households. Accommodative monetary policies have been connected to credit booms and excessive risk taking. Asset prices and borrower’s value are affected by interest rates so are the conditions of lending. Stiglitz and Weiss (1981) note that risk taking is higher when interest rates are lower and a shift to quality when interest rates rise. The rapid increases in real estate prices and household leverage are explained by the relatively low interest rates in the US during 2001-2004.

Structural factors such as financial liberalization and innovation facilitate more risk taking and can also trigger credit booms. Empirical studies found crises were often preceded by financial liberalization (Dell’Ariccia et al, 2013). Shocks or liberalization keeps innovation in move. Regulation, supervision, and market discipline are not quick enough to catch up with greater competition and innovation. Vulnerabilities in credit markets can emerge. A decline in lending standards owing to stronger competition in financial services may contribute to financial fragility in the short run in particular.

During financial crises, asset prices and credit booms and busts differ from the movements of a normal business cycle: booms are shorter and more intense than other upturns, and crunches and busts are longer, deeper and more violent than regular downturns. The violent episodes last longer (Dell’Ariccia et al, 2013).

Reinhart and Rogoff (2009) distinguish two groups of crises, both including two types. The first group is classified on the basis of quantitative definitions, the other depend mainly on qualitative and judgmental analysis. Currency crisis and sudden stop belong to the first group as these are measurable variables and allow the use of quantitative methodologies. Other crises are connected to adverse debt dynamics or banking system turmoil. Since these variables are not easy to measure, the use of qualitative methodologies is more appropriate.

A foreign debt crisis occurs when a country is unable to repay or refinance or does not want to service its foreign debt. It can take the form of a sovereign or private or both debt crisis. A domestic public debt crisis takes place when a country does not honor its domestic fiscal obligations in real terms. In a systemic banking crisis, bank runs and failures can make the banks suspend the convertibility of their liabilities or force the government to intervene to prevent that by extending liquidity and capital assistance on a large scale.

Research that has been conducted on the the causes of the recent crisis revealed some factors similar to previous crises. Although these factors may differ on the exact weights in different results, features concluded in common are as follows. Unsustainable asset price increases, credit booms leading to excessive debt burdens, build-up of marginal loans and systemic risk as well as the slow reaction of regulation, supervision, and market discipline to greater competition and innovation.

Nonetheless, the recent global financial crisis demonstrated some new factors in terms of its roots: widespread implementation of complex and non-transparent financial instruments, the high level of national and cross border interconnectedness of financial markets, banks and institutions, the high degree of leverage of financial institutions and the role of the household sector (Gál, 2010). These new and common factors in the framework of the „New Financial Architecture” led to the severest financial crisis since the Great Depression.

Restoring confidence in the financial system, if possible at all, required immense government participation, outlays and guarantees. As for real and financial implications, they are hard and show common features with other episodes. They include large output losses and declines in consumption, investment and industrial production. Financial crises have large economic costs. Crises impact economic activity and can trigger recessions worse than a „normal” business cycle recession. The average duration is longer and output losses are larger than those of a recession not triggered by a financial crisis. So is the cumulative loss, the output loss relative to the peak before recession.

Various approaches are used for measuring the real impact of a crisis on output. The traditional business cycle methodology implies that recessions associated with credit crunches and housing busts are costlier compared to those associated with equity price busts. Adding up differences between trend growth and actual growth for some years after, the crisis can show overall losses, which vary in different countries. On this basis, according to Laeven and Valencia (2012), emerging markets tend to suffer larger losses due to the recent crisis than advanced economies, which can also differ significantly. An indication of the significant costs that crises incur is consumption and overall welfare. A decline in consumption during recessions associated with financial crises is typically seven to ten times as large as those without such crises in emerging markets. In recessions without crises, the growth rate of consumption slows down but does not fall below zero.

Financial variables show with large downward corrections. In advanced countries credit falls by about 7.0 percent, house prices drop by about 12 percent, while equity prices decline by more than 15 percent during credit crunches (Reinhart and Rogoff, 2011). The most remarkable hit on the real economy from a financial crisis is the lack of credit. Rajan (2005) and Kroszner (2007) point out that after banking crises sectors grow more slowly, so they naturally need more external financing owing to banks' limited lending capacity. Recoveries in aggregate output after credit crunches tend to take place before the revival of credit growth and turnaround in house prices. Sectors more dependent on external finance grow relatively less. „Creditless recoveries” are more common after banking crises and credit booms.

Financial crises are associated with reductions in investment, R&D and employment and firms' giving up on growth opportunities. The timing of crises is more difficult (or even impossible) to predict than identifying vulnerabilities. The phrase „Minsky moment” refers to the situation when a market fails or falls into crisis after a long period of speculation or unsustainable growth (Minsky, 1993). What we have seen in the recent case of the financial crisis was a slow movement of the global financial system toward „money manager capitalism” - as Minsky put it - that collapsed in 2008. Wray (2011) named it the „Minsky half-century”.

3.2. MACROECONOMIC INSTABILITY AND THE INCOMPLETE DESIGN OF THE ECONOMIC AND MONETARY UNION

As argued by Obstfeld (2013) and De Grauwe (2013), the financial dimension of macroeconomic stability was largely overlooked. The deepening of the financial integration and the expansion of the financial-sector at the same time undermined financial and macroeconomic stability. The large scale of the banking system balance sheets spurred national governments to use fiscal guarantees paving the way to the close linkage, as De Grauwe (2011) refers to it, „deadly embrace” between the sovereign and the banks. Converging sovereign yields and other interest rates in different euro area economies did not support differentiation between member states as for public finances.

The phenomenon that bank portfolios from the Northern part of the euro area were diverted toward the periphery of economies in Southern-Europe strengthened risk. Low nominal interest rates and easy access to credit fostered demand and inflation reducing real interest rates, which had destabilizing effects, such as housing booms accompanied with an increase in investment of non-tradable construction or high government borrowing. This process ended up in cumulating current account deficits and external liabilities.

The euro area's greater exposure to the global and sovereign crises derives from three factors. The worldwide expansion in capital flows and banking, both nationally and across borders was particularly strong in Europe in the 2000s, partly due to the deepening integration of euro area financial markets. Rapid growth in financial markets made it difficult to see the consequences of some specific features the Economic and Monetary Union had. These implications were not anticipated before the implementation of the common currency.

The stability of exchange rates was regarded as a prerequisite to monetary union. To see the design flaws of EMU, it is necessary to examine the pathway leading to its constitution. The European Monetary System (EMS)

was created in 1979 by eight of the European Union [European Economic Community (EEC) at that time] member states² as a prelude to monetary unification. I conclude the ERM did not seem to have laid the groundwork for the monetary union, and the Maastricht Treaty also has some critical points, which determine its operation in the long run.

3.3. THE EVOLUTION OF THE NEW ERM

Since inflation rates in the weak currency members had been lowered to the rates of the strong currency countries,³ and due to the stigma devaluation meant to one country, there were no realignments between January 1987 and 1992. Strong currency was associated with economic strength and prudent national economic policies. The aversion to devaluation relative to the Deutsche mark strengthened the central banks' commitment to low inflation and placed the strong domestic currency in the centre of the economic policy (Cadot, 1996). French inflation for instance, was reduced from an average rate of 11.0 percent to an average of 3.5 percent by this strategy from the early 1980s to the late. The success of this strategy made further devaluations unnecessary (Eichengreen and Wyplosz, 1993).

National pride transformed the system from fixed-but-adjustable to a fixed rate system. The Single European Act of 1986 set removal of all remaining trade barriers within the European Community. The Act includes provisions concerning the establishment of free flow of capital (Council Directive 88/361 EEC, 1988 June 24). The Commission sought to abolish the general arrangements for restrictions on capital movements i.e. all the operations

² The nine members of the EEC in 1979 were: Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, UK
UK became a member of the ERM (the Exchange rate Mechanism of EMS) on October 8 1990

³ Strong currency countries were: Germany and the Netherlands from 1979 to 1982
Germany, the Netherlands, Belgium, Denmark from 1983 to 1992 (International Monetary Fund data)

carried out either by a natural or legal person with effect from July 1, 1990 until December 31 1992.

Capital movement includes direct investments, investment in property, operations in securities, current and deposit accounts, financial loans and credit. Spain and Ireland were given an extension to 1992, Portugal and Greece to 1995. Capital controls were essential to decrease the downward pressure on the weak currency countries' exchange rates before they were able to lower their inflation rates (Giavazzi and Giovannini, 1989). This policy instrument made it possible for the EMS countries to limit exchange rate volatility and reach a convergence in inflation rates to that of the strong currency members. Capital controls enabled central banks to intervene in currency markets more successfully, owing to insulated domestic credit markets from increases in interest rate. Single Europe assumes free mobility of capital. Countries could have allowed it to themselves if they had been protected against the effects of free capital mobility.

The success of the EMS during the 1980s was mainly ensured by capital controls supporting the members in achieving their goals of stabilizing the exchange rates and converging inflation rates toward the rate in the strong currency zone. Removing this instrument with fix exchange rates retained meant losing the prospect of achieving the objectives of convergence (De Grauwe, 1990). Exchange rate stability could be maintained with full convergence. What was created was irreconcilable. If monetary policy aims to achieve domestic goals, the goal of limiting exchange rate fluctuations should be forfeited.

The pursuit of one economic goal often restricts obtaining the other. As long as capital controls were maintained, they served as another tool to attain the other goal. Simply put, an economic policy instrument can serve only one goal. Being forced to choose between two economic policy objectives, or using one policy instrument and trying to achieve two goals leads to tensions that

cannot be maintained even in the short run. Put it differently, it resulted in instability and can be assessed as the system's flaw. Partly due to recognizing the unsustainability of that state, the members put the transformation of the EMS into a full monetary union on agenda according to the recommendation of the Delors Report.

The signing of the Maastricht Treaty in 1992 set a timetable for adopting a single currency scheduled January 1 1999 the latest. This type of a fixed-but-adjustable exchange rate system developed into a de facto fixed-rate system by the early 1990s, as there were no realignments between 1987 and 1992. The inflation rates of the weak currency countries had been lowered by the late 1980s (IMF, 1990).

The weak currency countries' aversion to devaluation stemmed from the general view that it was regarded as a sign of weak economy and faulty economic policy, which strengthened their central banks' commitment to lowering inflation. Accomplishing the goal of low inflation made devaluation unnecessary. In the ERM practice, the German mark had become the „inflation anchor” of the system. The Bundesbank pursued monetary policies according to the requirements of internal balance, when a conflict emerged – payment surplus, appreciating mark with inflationary pressure – Germany opted for tight money to prevent inflation; the Bundesbank pursued its own preferences.

The other ERM countries had to give priority to external balance that is stabilizing their exchange rates and keep balance of payment equilibrium, and use monetary policies, tightening or easing, according to that. The system had all the signs of a currency area, which was anchored to the mark and German monetary policy and was too tight for the other member states (Mundell, 1994). The priority of the German economic policy was to reduce inflation.

The main concern in other EC countries was unemployment. Maintaining fixed exchange rates required single monetary policy. Reducing unemployment is far beyond having only economic implications. Exchange

rates had to be abandoned in favour of domestic goals. Despite massive interventions of the central banks, the attempt of keeping EMS exchange rates within narrow bands had to be given up. Narrow bands were replaced by a system with 15.0 percent ranges on each side referred to as de facto floating. Although wide bands were considered temporary, no agreement indicated a return to narrow bands or supported its feasibility.

3.4. DESTABILIZING EFFECTS THREATENING THE EURO

The main factor contributing to the euro area crisis in 2009 derives from the financial/fiscal trilemma suggested by (Obstfeld, 2013). The new policy trilemma for currency unions is constituted by the impossible simultaneous maintaining of cross-border financial integration, financial stability, and national fiscal independence.

Consequently, if countries sacrifice the options of financial restraint and capital controls, they cannot credibly backstop their financial systems without external fiscal support. A country reliant mainly on its own fiscal resources is likely to give up on financial integration as well as stability, because financial risks will be assessed nationally by the markets. As an alternative, if a country with limited fiscal space withdraws from the integrated financial market, it may control and insulate its financial sector in order to reduce fragility to the minimum level. Any diagnosis that overemphasises the lack of enforcement of existing fiscal rules is partial.

Pisani-Ferry (2012) provides a useful organizational structure for understanding the unforeseen consequences of intense financial market growth and proposes an alternative trilemma based on no monetary financing, lack of centralized fiscal functions, and national banking systems. It is the impossible trinity of strict no-monetary financing, bank-sovereign interdependence and no co-responsibility for public debt.

My argument is that the turmoil in the world economy and in the euro area in the period after the outburst of the crisis finds its roots in financial vulnerabilities of the incomplete design of Economic and Monetary Union. Initially, architects were concerned with monetary policy, fiscal policy, and structural reform in nonfinancial markets e.g. labor markets, leaving the financial dimension out of scope. The process of financial integration, ruling optimism concerning risk and growth, as well as global liquidity, created credit conditions at the time when EMU began to work resulted in excessive borrowing.

Asset price bubbles occurred in housing and in the sovereign debts increasing banks' exposure to the risk of collapse creating the „too-big-to-fail” (TBTF) issue. It means that when a systemically important financial institution (SIFI) fails, losses or disruptions could be severe enough to lead to failure of third parties. The problem is rather the fact that financial institutions are too interconnected to fail. Preventing TBTF banks from failing might be necessary for maintaining the stability of the financial system in the short run. Bailing out TBTFs, however, is likely to lead to a less stable financial system in the long run due to moral hazard.

The theoretical basis of the creation of the monetary union is optimal currency area theory, which considers exogenous shocks rather than the endogenous dynamics of capitalism. Diagnostic failure prevailing in the North blames government profligacy for the euro-crisis. Both allow disguising the design flaws of the euro area. My argument is that endogenous dynamics of booms and busts work also on the level of national economies, which remained so within Economic and Monetary Union. The central bank as the lender of last resort is supposed to counterbalance the instability of capitalism, which stems from its nature. It implies two responsibilities: injecting liquidity in the banking sector and to the government bond markets. When problems in the government arise, sovereign bond prices drop, extend the problem to the banks

and cause insolvency, thus develop a vicious circle. The ECB as a lender of last resort in the government bond markets has an infinite capacity of buying government bonds. The European Stability Mechanism (ESM), which became operational in October 2012, has limited resources and cannot credibly commit to such an outcome. The fact that resources are infinite enables the bank to stabilize bond rates. It is the only way to gain credibility in the market.

The structure of the balance sheets of both the banks and the sovereign is unbalanced in terms of maturity. It refers to the liquidity difference of their liabilities and assets, thus a collective move of distrust can trigger a liquidity crisis that can cause sovereign default. This also underpins the necessity of the central bank's extended core responsibility. Stabilizers can be built in the government budget. The private sector's post crash deleverage may carry the threat of a deflationary spiral (Fisher, 1933). Increased savings together with reduced consumption, output and national income will decline leading to the savings paradox. It can be offset by the government's saving less and borrowing more. The private sector's asset sales can trigger a downward spiral by causing insolvency for those holding these assets. The harmful effect can be stopped by the government's taking over them. These processes moved by the stabilizing elements are not organized on the level of EMU. Monetary integration does not obviously include economic integration.

According to the theory of optimum currency areas (OCA) (Mundell, 1961), sufficient real wage flexibility and labour mobility can compensate for real divergences. The lack of those in Europe makes it less likely for the requirements of a sound monetary union to meet. In addition, market efficiency with prices fully reflecting available information has not been constituted by the European Union, which also suggests that monetary integration does not imply economic integration. Maastricht has brought the loss of two economic policy levers, monetary and exchange rate policies, and has left two other, the national fiscal policies and the EU budget itself. It means national governments

are restrained in reacting to asymmetric shocks, the outcome of which depends to a great extent on the relative phasing of business cycles between each member state and on the ability that cycles can be responded through the EU budget. Since monetary sovereignty and exchange rate tool are no longer accessible, fiscal latitude is needed for the members to treat shocks, particularly in an environment where labour migration has failed to function as a valve for dealing with asymmetric shocks.

In summary, emphasizing the lack of enforcement of existing fiscal rules provides a partial diagnosis to the euro crisis. The euro area's inherent weaknesses revealed by the crisis have made euro-area vulnerable. At the core of its vulnerability stands the impossible trinity of strict no-monetary financing, bank-sovereign interdependence and no co-responsibility for public debt (Pisani-Ferry, 2012).

Secondly, the euro area has deprived itself of the shock absorbers most economies can lean on to reduce the negative effects of demand shocks and fully expect a central bank to respond an economic downturn.

My argument is that euro-area crisis was not a sovereign-debt crisis. The fact that Belgium and Italy, which entered the crisis with extraordinarily high debts did not land in serious trouble, while Ireland and Spain, which entered the crisis with low levels of sovereign debt needed bail-outs, underpins this statement. The problem was massive capital flows across borders, which encouraged high levels of private borrowing in the economies which at last got into trouble. A reversal in those flows generated by the financial crisis made private borrowers and banks get into big trouble, which turned into serious economic downturns and bank failures and led to explosive growth in sovereign debt burdens. Massive sovereign debt was the symptom rather than the cause of the crisis.

3.5. THREAT OF SOVEREIGN DEFAULT IN EUROPE

The Maastricht Treaty failed to provide enforcement mechanisms if a member state failed to meet the convergence criteria. Instead, the only provision was to prepare a report for the opinion of the Economic and Financial Committee, a body set up under the terms of the Treaty. Joining EMU promised great benefits for the nations with lower sovereign credit ratings than those of the strongest member states as they were enabled to borrow like members with excellent ratings. The use of a single currency, which prevents trading partners from devaluing their currencies without a centralized fiscal policy, requires each economy to manage its trade balance so that imbalances will not result in excess debt. This environment with no enforcement mechanism for nations failing to meet the convergence criteria and borrowing as if they were with excellent ratings, was incentive enough for economies to overload themselves with debt. (Losoncz, 2013, pp. 115-120). The International Monetary Fund estimated that total debt levels in the euro area grew 2.5 times faster than GDP from 2006 to year-end 2012 (IMF, 2012).

In addition, owing to data revisions of a large scale done by Greece, the reliability of the Greek statistics on public finances is strongly questioned. These revisions made Greece's admittance to EMU possible. According to Eurostat, Greece's 2003 budget deficit had actually been 4.6 percent of GDP, rather than the previously reported 1.7 percent of GDP, which means a revision of similar scale in the three-year deficit figures of 2000–2002 (Eurostat, 2004). Yet, in my opinion, Greece cannot exclusively be to blame for the European sovereign debt crisis of 2009–2012. The country can be regarded as a spark to ignition.

The first country to get into trouble was Greece, which did have a big public-debt problem in addition to other difficulties. At the level of 129 percent of GDP in 2009 (IMF, 2009), Greek public debt was and remained the highest in the euro area. The crisis response therefore focused on public debt as a crisis

indicator outside and inside the euro area as well. In the second section, I will address the issue of crisis responses in detail.

As for the beginning, the Greek government had difficulties in selling its bonds to private investors in late 2009, due to high interest rates the investors demanded. The European Union and the International Monetary Fund approved a €110-billion loan package to the Greek government in May 2010 to cover its borrowing needs through 2013. In exchange, Greece promised to reduce its public deficit by diminishing spending. This rescue package was followed by another €130-billion package between July 2011 and March 2012, and the debt crisis in Greece continued in 2012.

Ireland and Portugal have required similar EU-IMF rescue packages. Cyprus, Italy, and Spain had difficulties in selling their bonds. Similar difficulties threatened other members of Economic and Monetary Union (Kolb, 2011). In spring of 2012, only four economies out of the 17 members of the euro area had long-term government bonds with the highest Standard & Poor's rating, AAA.⁴ They were: Finland, Germany, Luxembourg, and the Netherlands. The bonds of five countries: Cyprus, Ireland, Italy, Portugal, and Spain had junk ratings, BBB+ or lower.

Greek bonds were not rated in 2012, since they were given the lowest possible rating, CCC in July 2011. In 2012, they were listed as SD, which is given to a borrower who has defaulted on a specific loan or class of loans, but not on all obligations. (Tennant and Marlon, 2016).

Individual economies became vulnerable to sovereign debt crises in various ways. I will focus on the peripheral Eurozone economies, namely

⁴ Standard & Poor's assigns sovereign borrowers one of 12 possible long-term credit ratings. The major categories are AAA, AA, and A, BBB, BB, B, CCC, CC, C, SD and D, where AAA is the highest rating and D is the lowest. Credit ratings of AAA through CCC may also be assigned a + or – sign to indicate relative creditworthiness within the major credit rating category. A borrower who has defaulted on most or all of its obligations receives a rating of D. A borrower who is under regulatory supervision because poor financial conditions receives a rating of R.

Greece, Portugal, Ireland, Italy and Spain, commonly called PIIGS. The peripheral euro area economies were hit particularly hard. Although fiscal profligacy was more or less typical, it was not the most important reason for having been struck by the recession so severely.

Each of these countries was characterized by specific conditions. Spain responded to recession by employing Keynesian stimulus policies in 2008, running large public deficits that grew rapidly. Italy and Belgium had joined EMU with a debt level over 60 percent of GDP, which meant exceeding the rule, with the union's expectation that it could be reduced due to the „satisfactory pace”. This pace was the result of creative accounting employed by France as well, constituting government expenditures and government revenues. Portugal, Ireland, Italy, Greece, and Spain had two main features in common.

The first is that they did not produce existing recoveries from the 2008–2009 recessions, while the German economy started to recover, though weakly, in 2010 and 2011. The second, the PIIGS had large borrowing requirements because of high deficits or large debts or both. The need of frequently selling large quantities of bonds leaves the countries vulnerable to self-fulfilling debt crises (Conesa and Kehoe 2012). Such a crisis occurs when investors expect a government to have trouble in repaying its debt and they are unwilling to pay a high price for new government bonds. As a result, the low value makes it difficult for the government to repay the old bonds that become due and thus fulfill the expectation.

The PIIGS had three characteristics in common related to the problems which occurred in these economies: specific domestic instabilities, current account deficits and the common currency and contagion from the US. Spain experienced a housing and construction boom. The fall in housing prices and construction jobs as well as bankruptcies of the largest construction companies lead to its increased budget deficit and public debt. Irish public deficit and debt

began to soar in 2008 and 2009, following the burst of the housing bubble resulting in the collapse of the six major private banks guaranteed by the Irish government. Greece was growing rapidly at the beginning of the 2000s and was accompanied by heavy government borrowing. The country used fraudulent accounting practices to disguise its serious violations of the three-percent-deficit Maastricht criterion. Portugal benefitted from the low interest rates in terms of borrowing, nevertheless, it ended up in large public debt. The country had over-expenditures into large public projects including constructing stadiums. Mismanagement in public services and investment bubbles led to a rising public debt and an unsustainable fiscal position. Greece and Italy with sensitive public debt levels before the crisis suffered from an additional constraint of high level of corruption in politics. The inflow of foreign capital was used inefficiently to finance consumption and maintain political power.

The second common feature was the introduction of the euro. Large current account deficits were induced since it became cheaper for the peripheral economies to borrow on the international market leading to a dependency on credit from abroad. When this credit flow stopped, they found themselves in a typical sudden credit stop (Reinhart and Rogoff, 2009). Domestic imbalances became more visible once the foreign inflow of credit stopped.

Apart from worsening fiscal balances and the sudden stop of credit, the third contributor to trigger the sovereign debt crisis was the spread of outside contagion, particularly from the US. The financial crisis that started in the US quickly spread worldwide and brought the domestic instabilities of the euro area economies onto the surface. Peripheral economies which were dependent on low cost capital from abroad to finance their consumption and government expenditures were inflicted painfully.

Peripheral euro area economies enjoyed particularly favourable economic conditions before the start of the crisis at the beginning of the 2000s.

Some of them grew well beyond their potential levels of GDP indicating that their economies were overheated. Greece's growth was fuelled by its rising debt and large capital inflows and was growing 8.0 percent above its potential GDP. Behind the growth of Spain and Ireland the driving forces were the asset price booms in housing and construction resulting in an output gap similar to that of Greece. The economies of Portugal and Italy were not so overheated but struggled with similar structural problems. Peripheral economies experienced rising current account deficits while Germany produced a large CA surplus in the period between the introduction of the euro and the start of the crisis, contrary to the fact that they used to experience CA surpluses prior to the introduction of the common currency with the exception of Greece. As for their fiscal positions, it was not until the start of the crisis that it began to deteriorate.

I conclude that it was not fiscal profligacy to blame for such a severe sovereign debt crisis in spite of its actual existence. The combination of contagion coming from the outside and these economies' exaggerated reliance on foreign capital inflows aggravated the systemic risk of each country.

Running a current account deficit implies running a surplus in the capital account. Capital inflows can be transferred to serve various purposes. Investment in production allows deficit to remain. Financing consumption or government expenditures results in an asset price boom or an unsustainable fiscal position, as the example demonstrates it in Ireland, Spain and to a certain degree in the US or in Greece, Portugal and Italy. In summary, inflow transfers ended up in consumption increasing steadily with investments being more cyclical and volatile.

History of debt defaults, financial contagion, inflation crises and banking crises of Greece before the common currency was introduced was reflected by its higher bond yields as a risk premium. Comparing the spreads leads to a high difference between Greek and German bonds. With the introduction of the

euro, the spread started diminishing, making the risks non-perceivable and Greek debt seemed to be financially as safe an investment as the German debt. It relates to every peripheral euro area bond in the market, owing to the ECB policy i.e. avoiding inflation and currency instability in these economies.

Consequently, taking no fiscal responsibility while borrowing at low rates to fuel consumption driving GDP above its potential level resulted in high government spending in Greece and Portugal, while Ireland and Spain experienced housing market booms. Government expenditures also show a rising trend for each country (Losoncz, 2014).

Low interest rates in the euro area and attractive investment opportunities in periphery economies fuelled investments in periphery economies mainly from the core. The risk of default was reduced by the fact that the euro was backed up by all euro area nations. The asset prices kept rising fuelling domestic asset bubbles. This process was maintained until US financial contagion throughout the world put an end to capital inflows. Due to the fact that peripheral euro area economies were no longer able to issue debt in their own currencies, the sudden stop in 2009 pushed them into a sovereign debt crisis.

The impact of outside contagion can be summarized as follows. Banking crises in advanced economies lead to a decline in growth and export thus limiting their ability to service their debts. Slow rate of growth of the world economy has a downward impact on commodity prices reducing export earnings to their manufacturers thus affecting their debt service. A credit squeeze caused by banking crises in global financial centers worsens the emerging market economies' access to credit facilities, which leads to contraction of their economic activity. Banking crises undermine investor confidence and prevent them from taking risk through shifting them to safe assets such as low-yield government securities. In the end, emerging markets will find themselves without borrowing and less attractive to investors.

Banks in the euro area were buying the peripheral debt as part of their zero risk-weighted assets, According to the capital adequacy rules of Basel II, capital requirement for holding sovereign debt was just 1.6 percent. Consequently, banks were to lend to sovereigns instead of businesses the regulatory requirement on which was 8.0 percent (Basel II Capital Rules). The possible outcome of an artificially created EU bank demand for peripheral debt would mean higher debts in Italy and Greece. High exposure of EU banks to peripheral debt and the deteriorating fiscal positions of these economies even further endangered by the Basel accords would increase the systemic risks for their banks as well. In addition, in case of Ireland and Spain the boom's turning into a bust brought a soaring unemployment.

Fiscal deficits and rising public debts made investors exit from euro area peripheral debt. Although the current account deficit proved to be the main reason behind their bubbles, investors make the decision to buy government bonds based on the government's solvency outlook. As soon as they perceive signs which indicate decreasing probability of remaining solvent, government debts of this kind become a risky investment.

Loss of confidence further strengthens the banks' reluctance to lend and as corporations in the euro area depend on bank financing to a greater extent than their American counterparts, the impact of lower economic activity as a consequence may have serious effect on the real economy of the euro area. Higher bond yields or spreads over the German bonds reflect investors' doubts about bond issuers' ability to service their liabilities. Higher costs of borrowing and more illiquidity for these countries will inevitably lead to their insolvency.⁵ The rise of bond yields in Italy, Spain and France, and the illiquidity of German

⁵ When the bond yield spread rises above 500 basis points, this implies higher costs for debt holders in the form of margin requirements (collateral payments when bond prices fall) and could lead to a further cycle of higher yields. It happened to Ireland before its bonds were given a "junk" investment grade.

bonds was a response of the markets to political incompetence. Short-term fixes cannot replace a strategy targeting deficit reduction and restoring growth.

The ECB refused to act as lender of last resort as it could not replace the governments in restoring investor confidence. If it had done so and monetized debt, it might have led to higher inflation.

A related question is why sovereign debt crises like those in Europe do not currently threaten countries like Japan, the United Kingdom, and the United States, although they also have large public debts and have suffered from the recent recession. One of the two main differences in the US is that the central government has the power to raise substantial resources through taxation, while the EU has not. The other is that each has its own currency the value of which can fluctuate freely to offset changes in economic conditions.

In this chapter, I presented an analysis of the causes and consequences of the euro area crisis. The next chapters will focus on the policy responses and potential remedies.

3.6. DEFLATIONARY PRESSURE

Below, I will discuss deflation as a negative effect in the context of the global financial crisis and a possible consequence of the processes and central bank responses in particular.

Deflation is defined as a sustained and broad decrease in price level of goods and services in an economy over a period of time.

The IS-LM model suggests deflation is caused by a shift in the supply and demand curve for goods and services, particularly a fall in the aggregate level of demand. It increases the real value of debt and may result in a deflationary spiral. The process of “debt deflation”, i.e., the increase in the real value of nominal debt obligations brought about by falling prices, erodes the net worth position of borrowers (Ábel et al, 2014b).

A weakening financial position both affects the borrower's actions (e.g. the firm may try to conserve financial capital by laying off workers or cutting back on investment) and also, by worsening the agency problems in the borrower-lender relationship, impairs access to new credit. Thus, as discussed in detail in Bernanke and Gertler (1990), “financial distress” (such as one induced by debt deflation) can in principle impose deadweight losses on an economy, even if firms do not undergo liquidation. Debt instruments, including deposits, are set in money terms. Deflation thus weakens the financial positions of borrowers, both non-financial firms and banks.

Bank liabilities, primarily deposits, are almost entirely fixed in nominal terms. On the asset side banks hold either primarily debt instruments, or combinations of debt and equity. Ownership of debt and equity is essentially equivalent to direct ownership of capital, therefore the bank's liabilities are nominal and its assets are real, so an unanticipated deflation begins to squeeze the bank's capital position immediately.

Concerns about deflation usually emerge after big financial crises or asset - bubble bursts. This period was, for instance, the Asian crisis of 1997, the dotcom bubble of 2000-2002 and the global financial crisis of 2008. These concerns have been existing in recent years, owing to Japan's experiencing its asset bubble burst in the early 1990s. In the wake of the financial crisis, the Fed and the other central banks have released great amounts of quantitative easing⁶.

Easy lending opportunity, however, have not been used for infrastructure, R&D or technology development. Although the unemployment rate is down, wage growth is lagging behind the desirable 3.5 to 4.0 percent. The euro area as a whole grew by only 0.3 percent in the last quarter of 2015,

⁶ Quantitative easing is an unconventional monetary policy means by which a central bank buys government securities or other financial assets from commercial banks or from the market in order to lower interest rates and increase the money supply.

with Finland, Italy and Greece posting a negative growth rate and Portugal and France virtually stagnating. It can be traced back to insufficient global demand for supporting current levels of production. Once consumer spending begins to decelerate, corporate sector begins deferring or slashing capital expenditures. Corporations may also begin to reduce the workforce in order to maintain profitability. This ends up in a vicious circle. Such contraction in consumer and corporate spending can trigger a recession.

The slowdown of economic activity implies that part of the debt accumulated in the world economy is unsustainable. The world emerged from the 2008 crisis with massive private and public sector debts. The macroeconomic policies pursued after 2008 did not really contribute to reducing this debt. It was rather shifted from one sector to another or from some geographic area to another. Insufficient growth do not allow this debt to be repaid thus another crisis is likely to occur. The interconnectedness of global finance means that no economy is shielded from such risks. The slowing down of global output and trade affects stock markets through financial investment perceptions by questioning the profitability of many economic activities. Increasing fear that many of the assets that are held are overvalued may generate their massive sales in the market.

One way the Fed and other central banks can combat deflationary trends is through Negative Interest Rate Policy (NIRP).⁷ It is a stimulus measure deployed to boost lending and consumption activity whereby the nominal interest rates are set with a negative value. A negative interest rate will force banks to transfer the increase in the cost of holding the deposits to the customers instead of crediting their account for holding their money. In theory, setting the negative interest rates will reduce borrowing costs for the

⁷ The Swiss government successfully implemented the NIRP in the early 1970s to counter the appreciation of the currency, as investors were hedging their positions in other parts of the world by buying Swiss franc. Sweden and Denmark also used the NIRP in 2010 and 2012 respectively to prevent influx of money into their economies.

companies and individuals. This will provide incentive to businesses and individuals to invest.

Succeeding the global financial crisis, the European Central Bank was the first major central bank to employ negative interest rates in 2014 to prevent countries in the euro area from facing a deflationary cycle. The ECB was followed by Japan, while the Fed was to use this policy if inflation rate in the US turned negative. In case the Fed decides to implement policy, the investors need to be aware of the logic behind NIRP how their portfolio will be affected. It has stayed away from manipulating interest rates, instead, they have chosen to implement a long term quantitative easing policy.

The QE program i.e. the expansion of the money supply of dollar that lasted for nearly two years resulted in fact in no increase in the inflation rates.⁸ These measures have encouraged businesses and households to hold on to their cash and continue to postpone their purchases. Lower spending will lead to less demand, which will, in turn, lead to increased job losses and lower profits.

The question arises: why QE has been ineffective in increasing inflation?

My argument is as follows. Market decisions are rather driven by the information that quantitative easing suggests about central bank's goals in terms of interest rates of bonds, than the actual sales and purchases. Put it differently, information as a signal drives decision making and market behaviour more intensely than real actions.

I presume that central banks seem to have won the battle against deflation but they are not sure to win the war.

⁸ Despite massive central bank asset purchases in the US, the Fed is currently falling short of its 2 percent inflation target. Further, Switzerland and Japan, which have balance sheets that are much larger than that of the US relative to GDP, have been experiencing very low inflation or deflation.

PART 4 – THE RESPONSE OF MONETARY POLICY TO THE CRISIS

4.1. REASONS FOR THE DIFFERENCES IN MONETARY POLICY RESPONSES

The global financial crisis and associated recessions have shown the limits of policy measures. This chapter will discuss the ability of macroeconomic and financial sector policies to mitigate the costs of such episodes. Research has found various types of policies that attempt to mitigate the cost and reduce the duration of recessions. I will examine whether countercyclical policies can worsen or mitigate recession outcomes. Effects associated with expansionary policies is also worthwhile discussing.

The European Central Bank (ECB), the Federal Reserve System (Fed), the Bank of England (BoE) and the Bank of Japan (BoJ) differ in terms of their tasks or legal statuses while they show more similarities in their institutional structures, monetary frameworks and in the use of instruments. These structural differences need to be taken into consideration when comparing monetary policy responses to crisis between the Fed, the BoE and the ECB. Central banking practices in the world have evolved towards greater independence, transparency and the adoption of monetary policy committees. This trend has contributed to reducing the differences among these three institutions and can also be seen among other central banks.

The differences include communication strategies, nevertheless, the responsiveness of the financial market seems to be high for both the Eurosystem and the Fed in terms of monetary policy inclinations and views on the economic outlook. The Fed does not quantify its definition of price stability, while the ECB and the BoJ do.

As for the economic and financial environment, over the past two decades all three central banks have faced a series of diverse challenges, some of them were country-specific, as in the case of Japan, and others more global in nature.

The Fed made clear its objective of preventing a meltdown (Blinder, 2012) and gained credibility in spite of the fact that it temporarily suspended its commitment to price stability. Euro area's output had fallen behind that of the US in 2009 and had not been able to catch up.

I conclude it was due to the delay in economic stimulus. In addition, the credibility of the ECB was not strengthened by its deeds (Fatas and Summers 2015). With the core inflation rate in below one percent a year, the euro area slipped into a low inflation trap, well below its stated target of 2.0 percent a year.

The monetary policy responses to the crisis by the Federal Reserve, the Bank of England and the European Central Bank have been different because of the large differences in their institutional set-up, structural differences in the financial markets and economic differences. Different use of the non-conventional policy measures stem from these differences. I will summarize them below.

The center of the crisis was located in the US during the period 2007 and 2009. It moved to the euro area at the end of 2009 and at the beginning of 2010. It was the reason why monetary policy responses to the crises of Fed, BoE and ECB were done at different times. A decline in financial asset prices escalated in a financial crisis, but while in the US and in the UK, it was centered around subprime assets, in the euro area, it was centered around government debt. Subprime assets did not actually have the value they were supposed to. Sovereign debt was considered risk-free, which is usually used by banks as collateral.

As for monetary transmission mechanism in the US, 25.0 percent of corporate external financing is done by banks while 75.0 percent through financial markets. In comparison, in the euro area 75.0 percent of corporate external financing is conducted by banks and 25.0 percent through financial

markets. This proportion in the UK is approximately 50-50 percent (Solt, 2018).

In addition, the US and the UK have a single sovereign Treasury bond and Treasury bill market. It is easier for the Fed and the BoE to perform monetary policy than for the ECB, which has to deal with 19 different Treasury bond and bill markets.

The ECB has one primary objective, price stability and the other goals are subordinated to the first. The Fed and the BoE have more than one objectives, monetary stability and financial stability. The financial stability goal consists of a sound and stable financial system. The BoE has explicitly stated that financial stability is regarded as a major goal.

„The primary objective of the European System of Central Banks (ESCB) shall be to maintain price stability”.⁹ According to Article 127 (5) Treaty on the Functioning of the European Union the ESCB „shall contribute to the stability of the financial system”. The price stability target is set at an average Harmonized Consumer Price Index (HCPI), weighted by the relative GDP of each Member State in the Union, below 2.0 percent but close to 2.0 percent over the medium term.

The Fed set three main objectives besides monetary stability. They are: permanent economic growth, maximum employment and moderate long-term interest rates. „The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy’s long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices and moderate long-term interest rates.”¹⁰ Its target for price stability is measured by the consumer price index of household consumption and its present target is two percent in the long run,

⁹ Article 127 of the Treaty on the Functioning of the European Union

¹⁰ Section 2A of the Federal Reserve Act 1913, amended in 1977

while its present estimated long run unemployment rate aims at a tendency from around 5.2 percent to 6.0 percent.

The BoE expressed the „lender of last resort” operations as a mean to ensure financial stability. Compared to the ECB this function is stronger for the BoE.

The ESCB¹¹ is allowed to buy debt instruments from euro area member states in the secondary markets,¹² as the ECB has done so during the crisis, on the condition it is necessary to meet the ESCB objectives. To ensure liquidity in the dysfunctional market segments the Securities Markets Programme (SMP) was established. It includes interventions in public and private debt securities markets with the objective of restoring an appropriate monetary policy transmission mechanism and the effective conduct of monetary policy. Thus under its financial stability mandate of Article 127 Treaty on the Functioning of the European Union (TFEU) the Bank launched the Longer-Term Refinancing Operations (LTROs) and provided massive liquidity. The impact of the interventions is offset through specific operations in order to re-absorb the liquidity injected. It implies the monetary policy is oriented towards price stability in the medium run.

Another difference concerns inflation targeting framework. Central banks tend to follow monetary policy rules based mostly on the Taylor rule.¹³ Their short-term goal is to stabilize the economy with the objective of maintaining long-term growth. The monetary strategy to achieve these objectives shows differences for central banks discussed above. The Fed follows a quantitative monetary strategy similar to a Taylor rule with an inflation targeting set at 2.0 percent in the long run. The BoE uses inflation

¹¹ European System of Central Banks, The ESCB comprises the ECB and the national central banks (NCBs) of all EU Member States whether they have adopted the euro or not.

¹² Article 123 of the TFEU prohibits directly monetary financing of the Euro area member states through overdrafts and credit facilities and direct purchasing from debt instruments.

¹³ The Taylor rule links policy rates mechanically to the deviation of inflation from target and the output gap

targeting with a target of 2.0 percent as well. The ECB also uses inflation targeting. In a monetary union there is only one common inflation target, which is applied to all member countries. Inflation projections are not regarded as the only tool to make decisions. The Bank's economic analysis together with other monetary and credit forecasts are used for decisionmaking. The ECB communicates all its policy interventions by referring to its mandate to maintain an HICP¹⁴ inflation rate of close to but below 2.0 percent.

The ECB decision making in monetary policy is done through a more complex system of governance than that of the Fed and even more than that of the BoE, taking into account the number of the ECB Governing Council (GC) members in comparison with that of the Fed Federal Open Market Committee (FOMC) and the Monetary Policy Committee (MPC) in the BoE. The BoE Monetary Policy Committee decisions are published in detail as well as its latest forecasts for inflation, output growth and a record of its meetings. The Fed Federal Open Market Committee meetings minutes are also published containing the policy decisions and the overall discussions but with a delay. The ECB Governing Council contrarily does not publish the minutes of its decisions although the decision taken are explained at a press conference by its President.

4.2. MONETARY POLICY MEASURES TAKEN IN THE EURO AREA

Since the financial crisis broke out, a more active monetary policy has been implemented by the European Central Bank and by other major central banks.

There have been changes in balance sheet policies in terms of the composition and expansion of assets and liabilities (Svensson, 2014). The adoption of a new mandate for the supervision of the euro area banking system

¹⁴ Consumer price inflation in the euro area is measured by the Harmonized Index of Consumer Prices (HICP). The HICP is compiled by Eurostat and the national statistical institutes in accordance with harmonized statistical methods.

meant a fundamental change in late 2014. The communication policy aims to enhance confidence and reduce uncertainty about the future growth of the economy. Nevertheless, some fundamental features have not been amended regarding the institutional framework or the independence of the Bank. The monetary policy strategy of the ECB has remained at its mandate to maintain a Harmonized Index of Consumer Prices (HICP) inflation rate of close to but below 2.0 percent (Darvas and Merler, 2013).

The measures implemented aimed specifically at enhancing credit support. They are defined as „non-standard, unconventional measures” and are considered part of the Bank’s toolkit, but „by definition exceptional and temporary in nature” (ECB, 2014, February 5).

4.2.1. The Modified Refinancing Operations of the European Central Bank

The ECB policy response to the crisis focused on ensuring the provision of the liquidity with the interbank market and other short-term financing being frozen. Modifications to the Bank’s operation included cutting the policy rate from 4.25 percent to 1.0 percent and an additional lowering to 0.15 percent in the periods from October 2008 to May 2009 and from December 2011 to June 2014 respectively. „Enhanced credit support” implies allocating liquidity through Main Refinancing Operations (MROs) and Long-Term Refinancing Operations (LTROs). It covers a period between the start of the global financial crisis in September 2008 and April 2010. They were implemented at a fixed rate with full-allotment to reassure market participants that in case of unforeseen liquidity shortages the banks refinance through the ECB at a known rate for a known period according to their needs. As a result, banks had unlimited access to central bank liquidity with collateral requirements being eased several times including the extension of the list of assets eligible as collateral. The ECB lowered the rating threshold for collateral and agreed currency swaps with major CBs, including the Fed, the BoE, the Swiss National Bank, and the BoJ.

The maturity of long-term refinancing operations was extended from the original three months to six and, by a further extension, to one year.¹⁵ In December 2011 and February 2012 two massive Very Long-Term Refinancing Operations (VLTROs) were conducted with a maturity of three years. Consequently, the maturity of the ECB's balance sheet has lengthened. The asset side of the consolidated balance sheet of the Eurosystem consists mainly of liquidity provided to the banks approximately 80 percent of which has a maturity of three years. The use of the Long-term Refinancing Operations facility shows an asymmetry. Banks in Spain, Italy, Greece, Ireland and Portugal account for 70 to 80 percent of the total borrowing since 2010 (ECB, 2011).

On the other hand, banks in the North reduced their dependence on the ECB operations to minimum levels owing to the fact that they had capital inflows in quest for safety. The VLTROs were designed to be a euro area-wide policy but mainly the banks from the South of the euro area affected by the liquidity crisis to a higher degree took this opportunity.

The excess liquidity in the euro area has dropped significantly since 2013 and has been nearly completely re-absorbed as banks were allowed to repay LTRO facility credit before maturity. I have studied the empirical literature on Long-Term Refinancing Operations (Angelini et al., 2011), (Abbassi and Linzert, 2011), (Darracq and De Santis, 2013). I can conclude that this facility was an effective measure to deal with the liquidity crisis of 2011 and 2012. The facility ensured a stable three-year financing of the banks, subsidized the banking system, contributed to the restoration of its profitability and provided support to the government bond market, as banks partly used their funds for buying government bonds due to their higher yields. Without the facility

¹⁵ The ECB implemented three and six-month full allotment Long-Term Refinancing Operations (LTROs) in November 2008 in € 300 billion plus 12-months LTROs in June 2009 in € 442 billion).

existing lending might have collapsed. Nonetheless, little did LTROs do to prompt lending to the private sector, as banks rather deposited ECB funds at the central bank or purchased government bonds instead.

The liquidity injected in the system during the banking crisis resulted in a significant increase in the balance sheet of the ECB. It means an approximately a 30 percent rise compared to the ordinary year on year increase of four percent. The main change in the size of the ECB balance sheet was caused by the two Very Long-Term Refinancing Operations. The first was implemented in December 2011, with an amount of € 489 billion, and the second in February 2012, with an amount of € 529 billion, both with a three-year maturity and the option for early repayment after one year. In addition to these measures, the reserve requirements were reduced from 2.0 percent to 1.0 percent.

At the end of the period between September 2008 to April 2010, the ECB introduced the Covered Bond Purchase Programme 1 (CBPP1)¹⁶ to promote the ongoing decrease in money market term rates, to encourage lending and to improve market liquidity in the private debt securities market.

The first major change in communication tools of the ECB took place in 2012 when risk premia for Spain and Italy reached their peak. Draghi¹⁷ (July 26, 2012) confirmed that within their mandate, the ECB is ready to do „whatever it takes to preserve the euro.”

The second change the ECB reflected was presented in April 2013 as shifting from „non-standard measures are temporary in nature” to „policy stance will remain accommodative for as long as needed” (Draghi, April 15, 2013). The third change appeared in April 2014, suggesting the possibility of

¹⁶ CBPP1 programme reached a relatively small amount of €61 billion. In November 2011, the ECB launched a second CBPP with a total volume of €40 billion but interrupted it in October 2012 after covered bonds totalling €16.4 billion had been purchased.

¹⁷ Mario Draghi succeeded Jean-Claude Trichet as the President of the European Central Bank as the on 1 November 2011.

implementing „unconventional instruments” owing to the risk of a prolonged period of low inflation (Draghi, April 3, 2014).

4.2.2. The Securities Market Programme (SMP) and Outright Monetary Transactions (OMT)

The Securities Market Programme was initiated in May 2010. This period from May 2010 to August 2011 was characterized by the sovereign crisis mounting rapidly, the Greek crisis and the bailouts of Greece, Ireland, and Portugal. Nonetheless, the ECB was reluctant to act as a lender of last resort for sovereigns. In this phase the ECB bought Greek, Irish, Portuguese, Italian and Spanish government bonds to be held to maturity. The purchases were fully sterilized through fixed term deposits because of potential inflation fears. The ECB raised interest rates from 1.0 percent to 1.25 percent in April 2011 and to 1.5 percent in July 2011. The SMP was not renewed. See Table 1.

Table 1 Key ECB Interest Rates

With effect from:	Deposit facility		Main refinancing operations			Marginal lending facility	
			Fixed rate tenders	Variable rate tenders	Change		
	Level	Change	Fixed rate	Minimum bid rate		Level	Change
			1	2	3		
1999 1 Jan.	2.00	-	3.00	-	-	4.50	-
4 Jan. 2)	2.75	0.75	3.00	-	...	3.25	-1.25
22 Jan.	2.00	-0.75	3.00	-	...	4.50	1.25
9 Apr.	1.50	-0.50	2.50	-	-0.50	3.50	-1.00
5 Nov.	2.00	0.50	3.00	-	0.50	4.00	0.50
2000 4 Feb.	2.25	0.25	3.25	-	0.25	4.25	0.25
17 Mar.	2.50	0.25	3.50	-	0.25	4.50	0.25
28 Apr.	2.75	0.25	3.75	-	0.25	4.75	0.25
9 June	3.25	0.50	4.25	-	0.50	5.25	0.50
28 June 3)	3.25	...	-	4.25	...	5.25	...
1 Sep.	3.50	0.25	-	4.50	0.25	5.50	0.25
6 Oct.	3.75	0.25	-	4.75	0.25	5.75	0.25
2001 11 May	3.50	-0.25	-	4.50	-0.25	5.50	-0.25
31 Aug.	3.25	-0.25	-	4.25	-0.25	5.25	-0.25
18 Sep.	2.75	-0.50	-	3.75	-0.50	4.75	-0.50
9 Nov.	2.25	-0.50	-	3.25	-0.50	4.25	-0.50
2002 6 Dec.	1.75	-0.50	-	2.75	-0.50	3.75	-0.50
2003 7 Mar.	1.50	-0.25	-	2.50	-0.25	3.50	-0.25
6 June	1.00	-0.50	-	2.00	-0.50	3.00	-0.50
2005 6 Dec.	1.25	0.25	-	2.25	0.25	3.25	0.25
2006 8 Mar.	1.50	0.25	-	2.50	0.25	3.50	0.25
15 June	1.75	0.25	-	2.75	0.25	3.75	0.25
9 Aug.	2.00	0.25	-	3.00	0.25	4.00	0.25
11 Oct.	2.25	0.25	-	3.25	0.25	4.25	0.25
13 Dec.	2.50	0.25	-	3.50	0.25	4.50	0.25
2007 14 Mar.	2.75	0.25	-	3.75	0.25	4.75	0.25
13 June	3.00	0.25	-	4.00	0.25	5.00	0.25
2008 9 July	3.25	0.25	-	4.25	0.25	5.25	0.25
8 Oct.	2.75	-0.50	-	-	-	4.75	-0.50
9 Oct. 4)	3.25	0.50	-	-	-	4.25	-0.50
15 Oct. 5)	3.25	...	3.75	-	-0.50	4.25	...
12 Nov.	2.75	-0.50	3.25	-	-0.50	3.75	-0.50
10 Dec.	2.00	-0.75	2.50	-	-0.75	3.00	-0.75
2009 21 Jan.	1.00	-1.00	2.00	-	-0.50	3.00	...
11 Mar.	0.50	-0.50	1.50	-	-0.50	2.50	-0.50
8 Apr.	0.25	-0.25	1.25	-	-0.25	2.25	-0.25
13 May	0.25	...	1.00	-	-0.25	1.75	-0.50
2011 13 Apr.	0.50	0.25	1.25	-	0.25	2.00	0.25
13 July	0.75	0.25	1.50	-	0.25	2.25	0.25
9 Nov.	0.50	-0.25	1.25	-	-0.25	2.00	-0.25
14 Dec.	0.25	-0.25	1.00	-	-0.25	1.75	-0.25
2012 11 July	0.00	-0.25	0.75	-	-0.25	1.50	-0.25
2013 8 May	0.00	...	0.50	-	-0.25	1.00	-0.50
13 Nov.	0.00	...	0.25	-	-0.25	0.75	-0.25
2014 11 June	-0.10	-0.10	0.15	-	-0.10	0.40	-0.35
10 Sep.	-0.20	-0.10	0.05	-	-0.10	0.30	-0.10
2015 9 Dec.	-0.30	-0.10	0.05	-	...	0.30	...
2016 16 Mar.	-0.40	-0.10	0.00	-	-0.05	0.25	-0.05

Source: ECB, 2016 <https://www.ecb.europa.eu/stats/monetary/rates/html/index.en.html>

The impact of SMP can be assessed positive, as it contributed to reducing the level and the volatility of government bond yields (Manganelli, 2012). The extraordinary operating measures of the ECB, such as the implementation of six-month, one-year and three-year Long-Term Refinancing Operations, Securities Markets Programme, Covered Bond Purchase Programme 1 and 2 (CBPP1, CBPP2) may fall in the category of unconventional measures, as they use the CB balance sheet to directly affect market prices and conditions beyond a short-term interest rate (Borio and Disyatat, 2011). These measures intended to change the composition of the assets on their balance sheet, the so-called qualitative easing (Lenza et al 2010).

The interest rate policy of the ECB included reducing the MRO interest rate to 0.75 percent in July 2011 due to bond market developments in Italy and Spain. The Bank reactivated SMP and implemented Covered Bond Purchase Programme 2 (CBPP2).

The ECB introduced the new Outright Monetary Transactions (OMT) in September 2012. In fact, it was the the announcement that affected European bond yields as the programme had not been used. It allowed the ECB to purchase unlimited amounts of government bonds of member states that are already subject to a European Stability Mechanism (ESM). The OMT was to safeguard „an appropriate monetary policy transmission and the singleness of the monetary policy” (ECB, 2012).

The period from August 2011 to May 2013 saw the euro area sovereign debt crisis accompanied with increased banking sector strain, which compelled the ECB to declare in August 2012 that the non-standard measures would be there as long as necessary. Thus the change in communication according to which „all our non-standard monetary policy measures are temporary in nature” resulted in increased uncertainty, even more liquidity demand and rapid deleveraging. The ECB was forced to become a committed lender of last resort for the banking system.

Between January 2013 to May 2013 with less tension in money and bond markets and the banks' repaying their loans, the size of the ECB balance sheet and excess liquidity showed a decreasing trend. Early repayment¹⁸ of VLTROs implies that the banks are less reliant on ECB funds but it is the indicator of banks' reluctance to credit as well. Between June 2013 to May 2014 money market interest rates showed remarkable volatility, which was reflected in the variability of EONIA¹⁹ rate. The ECB, considering inflationary outlook as well, responded by reducing the MRO rate by 25 basis points to 0.25 percent in November 2013. The marginal lending facility rate was cut to 0.75 percent and deposit rate to 0.0 percent, reducing the corridor width from 150 basis points to 75 basis points and became asymmetric.

4.2.3. Introduction of a Forward Guidance Strategy

Forward guidance as a new monetary policy tool, an innovation in the Bank's communication strategy, was introduced in July 2013 with the main idea invented by Krugman.²⁰ It aims to clarify the future path of key interest rates, reduce uncertainty and the interest rate volatility (Filardo and Hofmann, 2014).

This policy leads to a drop in short-term rates for an extended period of time, while inflation expectations increase. Decreasing real long-term rates boosts investment and consumption. As forward guidance is not time consistent, it is not credible. Its effectiveness has been undermined by the lack of benchmark or thresholds based on relevant variables, and by the fact that market participants anticipate that rates will be raised earlier. Moreover, forward guidance has not been strictly defined.

¹⁸ VLTROs were implemented with a three-year maturity and the option for early repayment after one year.

¹⁹ Euro Overnight Index Average. The EONIA rate is the 1-day interbank interest rate for the euro area. It can be considered as the 1 day EURIBOR rate

²⁰ Krugman (1998) analyzed the deflation and liquidity trap problem of Japan in the 1990s

4.2.4. The Effects of ECB Measures and Responses to the Effects

Early repayments and the consequent decrease in excess liquidity have made the EONIA rate converge towards the rate of MROs since late 2013. As an effect of ECB decisions, the EONIA and EURIBOR²¹ were historically low. They have technically reached the zero bound.

In the second and third quarter of 2014, the euro area economy slowed down unexpectedly, while some peripheral countries were falling in recession again. Inflation rates continued decreasing, with negative rates spreading to several countries and strengthening fears of price deflation. The indicator of inflation expectations, the five years on five years inflation-linked swap rate, had fallen below 2.25 percent, which the ECB took as an indication that medium-term inflation expectations were no longer anchored at the medium-term price stability target. In 2014, the interest rates on MROs and on the deposit facility were lowered by 20 basis points, to 0.05 percent and to -0.20 percent respectively, while the rate on the marginal lending facility was reduced by 45 basis points, to 0.30 percent in line with the Governing Council's Forward Guidance.

A new series of TLTROs were announced in June, with ECB funding tied to the credit provision to the real economy. This funding was made available through two windows, in September and December, and was to be followed by further windows between March 2015 and June 2016. It was provided for up to four years, initially with a 10 basis points surcharge over the MROs rate, which was subsequently eliminated in January 2015.

The ECB launched two private sector asset purchase programmes. In fall 2014, an Asset-Backed Securities Purchase Programme (ABSPP) starting in November and a new Covered Bond Purchase Programme (CBPP3) starting in October to last for at least two years. The programmes aimed to encourage

²¹ Euro Interbank Offered Rate.

greater lending to the private sector. The incentive to provide loans was strengthened by favourable conditions as loans could be securitized, and by facilitating bank funding. The amounts altogether took up about €32 billion by end of 2014, but the purchases were to continue at a monthly rate of €10 billion.

The HCPI rate's turning to negative for the euro area average in December 2014 together with weak economy outlook made the ECB Governing Council take up quantitative easing (QE). An expanded asset purchase programme (EAPP) was launched in January 2015. The programme included purchasing private and government securities assets in the value of €60 billion per month.

In the wake of the Lehman collapse and exploding of sovereign debt crisis in the euro area, the unconventional measures taken by the central banks were mainly aimed at stabilizing specific segments of financial systems. They are referred to as „credit easing” They include SMP and VLTROs programmes, and similarly the backup facilities established by the Fed. The interventions were conducted well before short rates reached their lower bound, and can be regarded as lender of last resort function of central banks.

4.3. UNCONVENTIONAL MONETARY POLICY OF THE FED

This chapter introduces the unconventional policy measures of the Fed. I have used the Federal Reserve Bank of New York Staff Reports to collect data.

Quantitative easing (QE) policy in the US was launched immediately in November 2008. Fed balance sheet has expanded from US\$860 billion at the beginning of 2007 to US\$4.2 trillion in 2015. In addition, short-term liquidity measures, such as the Commercial Paper Funding Facility, were introduced in order to support the commercial paper market and reduce the rollover risk. The facility included purchasing three-month unsecured and asset backed commercial paper of top tier credit rating.

4.3.1. Securities Programmes

Term Asset Backed Securities (TALF) programme of the Fed was initiated in November 2008 to deal with liquidity problem in the securitization markets for consumer and business Asset Backed Securities (ABS) and Collateralised Mortgage-Backed Securities (CMBS) with the intention to reopen the new-issue ABS market. The TALF programme provided liquidity and capital to the loan asset-backed securities market as follows. The Fed was lending funds against asset-backed securities, while credit protection of US\$100 billion came from the Troubled Asset Relief Programme (TARP) of the Treasury Department. The total amount of TALF loans took up US\$71.1 billion. The volume of outstanding loans was the highest in March 2010 at US\$48.2 billion. Through the TALF programme, the Federal Reserve seems to have been able to prevent the shutdown of lending to consumers and small businesses, and could limit the public sector's risk simultaneously.

Additional facilities were implemented to make the banks meet their liquidity needs. The Term-Auction Facility (TAF) that was intended to provide liquidity with a maturity of one month against collateral that could be used to borrow overnight at the Fed's discount window. The impact of QE1 on financial markets has been successful as it could reduce rates on government bonds, mortgage-backed securities and corporate bonds (Gagnon et al, 2011). The MBS purchase programme reduced mortgage rates by about 85 basis points in the month after the announcement, and it contributed an additional 50 basis points towards lowering risk premia once the programme had started (Hancock and Passmore, 2011). Estimating the macro impact of quantitative easing QE1 and QE2, it raised the level of real GDP relative to baseline by 3.0 percent, and inflation is 1.0 percent higher than it would have been without the programme (Chung et al, 2011). Regarding the form of QE, Woodford (2012) and Vissing-Jorgensen (2011) found that QE is more effective when private assets are bought.

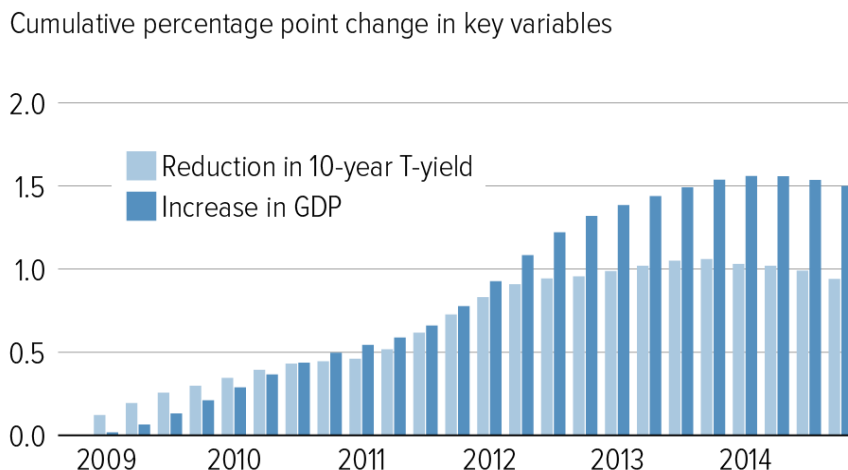
4.3.2. The Use of the Moody's Analytics Model of the Macroeconomy in Evaluating the Impacts of Policy Responses

Macroeconomic models are made to serve three basic functions: providing forecasts, answering hypothetical questions by calculating counterfactuals, and giving a clear understanding of the present and future state of the economy. The Moody's Analytics model of the macroeconomy can be used to illustrate how growth, jobs, unemployment, and other variables might have evolved without appropriate policy responses to the crisis. Comparing the simulated and actual pathways, the differences can be identified as the policy impacts. In the long-run, equilibrium point the expectations are consistent with reality. When this has been achieved, the level of real output, interest rates and inflation remain stable at equilibrium, values which are governed entirely by the supply side of the economy.

In the short run, a shock can cause spending and inflation to deviate from expectations. This results in deviations of current growth, interest and inflation rates from their long-run equilibrium values, giving rise to the business cycle. The Moody's Analytics US Macro Model relies most on specifying, estimating, and then solving simultaneously a large set of equations that reflect the structural functioning of the US economy. This approach was used by the Congressional Budget Office to assess the Recovery Act.²² Figure 1 displays QE lowered rates supported growth.

²² The American Recovery and Reinvestment Act of 2009 (ARRA) commonly referred to as the Stimulus or The Recovery Act, was a stimulus package with the rationale of Keynesian macroeconomic theory

Graph 1 Quantitative Easing Lowered Rates Supported Growth.



source: <http://www.moodysanalytics.com/>

Modelling the Fed's quantitative easing programs on this basis includes a modified Taylor rule in which the federal funds rate is determined. The equation links the Fed's interest rate policy to economic and financial market conditions. It includes a measure of the equilibrium funds rate, the difference between the unemployment rate and the natural rate, the difference between inflation measured by the core consumer expenditure deflator and the Fed's inflation target and the VIX index²³ as an approximate indicator for investor confidence in the stability of the financial system. See Table 2.

²³ VIX index is a trademarked ticker symbol for the CBOE Volatility Index, a popular measure of the implied volatility of Standard & Poor's 500 index options. The VIX is calculated by the Chicago Board Options Exchange (CBOE). Often referred to as the "fear index" or the "fear gauge", it represents one measure of the market's expectation of stock market volatility over the next 30-day period

Table 2 What Explains the Federal Funds Rate?

Dependent variable: Federal Funds Rate

Method: Least squares

Sample: 1979Q1 to 2014Q4

144 observations

Variable	Coefficient	Standard Error	t-statistic
Federal funds rate lagged 1 qtr	0.752	0.045	16.89
Nominal potential GDP growth	0.258	0.053	4.91
Difference between actual and natural unemployment rate	-0.203	0.054	-3.73
Difference between core PCE inflation and Fed's target	0.429	0.084	5.08
VIX index, 2-qtr moving avg	-0.269	0.172	-1.56

R-squared 0.959

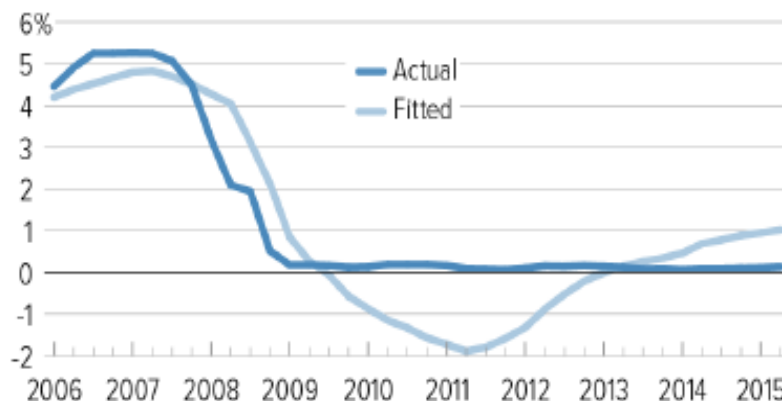
Durbin-Watson 1.673

source: <http://www.moodysanalytics.com/>

The nominal equilibrium funds rate equals the sum of the Fed's inflation target and the economy's estimated growth rate of real potential GDP.²⁴

²⁴ Potential is determined endogenously using a standard Solow growth model framework, with total factor productivity determined exogenously.

Graph 2 Fitted Versus Actual Federal Funds Rate



Source: <http://www.moodysanalytics.com/>

Graph 2 shows the fitted funds rate determined by the modified Taylor rule and the actual Fed fund rate. The Fed started reducing the funds rate right after the crisis broke out. The rate fell to the 0 to 25-basis point lower bound in December 2008, due to Fed’s announcement on its first large-scale bond-buying program aimed to push down long-term interest rates. In the model, the fitted funds rate falls below zero as QE has expanded the assets held on the Fed’s balance sheet, which has a direct impact on ten-year Treasury bond yields and fixed mortgage rates. Thus the two interest rates have effects of wide range. As an impact of QE, the lower long-term interest rates support stronger economic growth in the macro model via their impact on stock prices and housing values and the wealth effects on consumer spending. They boost investment through a lower cost of capital and improve current account.

4.4. MONETARY POLICY RESPONSE IN THE UK

The Bank of England (BoE) was the first bank to face the negative effects of the financial crisis. A year before Lehman Brothers collapsed, in September 2007 the BoE was compelled to bailout Northern Rock, as it had been unable to acquire liquidity in the markets. As a response to the intensification of the financial crisis, the Bank of England’s Monetary Policy Committee (MPC)

reduced interest rates sharply, with cuts of 3.0 percentage points in Bank Rate during 2008 Q4 and a further one and a half percentage points in early 2009. In early March 2009, Bank Rate was reduced to half percent, to its lower bound. Nevertheless, to meet the 2.0 percent CPI inflation target in the medium term, additional measures had to be taken to increase nominal spending.

Due to intensified liquidity problems, the BoE implemented the Special Liquidity Scheme (SLS) in order to increase the liquidity of the UK banking system in April 2008. In the framework of the Scheme, mortgage-backed securities were allowed to swap for Treasury bills to reduce the risks of the assets. In addition, the Bank widened the range of accepted collateral. Table 3 summarizes the three different sets of collateral that are eligible in the Bank's operations. The Bank only lends in its intraday and short-term monetary policy operations, in which the Bank requires Level A collateral. In its liquidity insurance operations, which provide an effective liquidity insurance mechanism to the financial system, the Bank also lends against Level B collateral and Level C collateral. See Table 3.

Table 3 Eligible Collateral Summary

	Intraday liquidity	Operational Standing Facilities	Short - Term Repo	Indexed Long-Term Repo	Discount Window Facility	Contingent Term Repo Facility
Level A (eg highly liquid high-quality sovereign debt)	➤ ✓	✓	✓	✓	✓	✓
Level B (eg liquid high-quality sovereign, supranational, mortgage and corporate bonds)				✓	✓	✓
Level C (securitisations, own-name securities and portfolios of loans)				✓	✓	✓

Source: <http://www.bankofengland.co.uk/markets/Documents/money/publications/redbook.pdf/pg7>

The SLS was introduced in coordination with the Government. To ensure that the Bank’s monetary policy goals are not endangered, the Treasury bills were being created by Debt Management Office. The drawdown period for the SLS closed on 30 January 2009. Due to the Scheme, the Bank’s balance sheet expanded up to £185 billion in October 2008, when the Bank announced the Discount Window Facilities (DWF). It was designed as an improved Special Liquidity Scheme to facilitate bilateral Lender of Last Resort (LOLR) operations. The Bank’s lending capacity through DWF was estimated at approximately £160 billion. The policy of asset purchases financed by the central bank consequently expanding its balance sheet is referred to as

quantitative easing (QE). The Bank of England's asset purchases were mainly focused on purchasing a large amount of gilts.

The Bank started its quantitative easing programme (QE1) at the beginning of 2009. The Asset Purchase Facility (APF) was announced in January 2009. The program included buying medium-and long-term government bonds from the non-bank private sector with the worth of £200 billion in the period from January 2009 to January 2010. The purchases resumed in October 2011 (QE2), largely in response to the impact of the growing euro crisis. Further £125 billion of purchases were completed in May 2012.

Additional £50 billion was announced in July 2012 and completed in November 2012 (QE3). The value of further purchases took up £375 billion in 2011 and 2012. (Bank of England). The asset purchases represented nearly 30 percent of the amount of outstanding gilts held by the private sector at the time and approximately 14 percent of annual nominal GDP.

The Funding for Lending Scheme (FLS) was launched in July 2012. The FLS is designed give incentive to banks and building societies to increase their lending to the UK real economy. Both the price and quantity of funding provided were linked to their lending performance. The FLS allows participants to borrow UK Treasury Bills in exchange for eligible collateral, which consists of all collateral eligible in the Bank's Discount Window Facility. The FLS was extended in April 2013 and has been modified three times to allow participants to borrow from the FLS until January 2018 with incentives mainly targeting small and medium sized enterprises.

Together with liquidity support measures taken earlier, these purchases expanded the size of the BoE's balance sheet relative to GDP threefold, compared to the pre-crisis period (Cross et al, 2015). The Bank was authorized

by the Government to purchase high-quality commercial paper and corporate bonds the scale of which was significantly smaller than that of gilt²⁵ purchases.

The empirical literature finds that the Bank of England's quantitative easing had remarkable impacts on gilt yields, on corporate bond rates and on the sterling exchange rate. Asset purchases equivalent to one percent of GDP resulted in a 0.18 percentage-point increase in real GDP and in a 0.3 percentage-point increase in CPI after five to eight quarters (Weale and Wieladek, 2014).

4.4.1. The Potential Effects of Asset Purchases Through Transmission Channels

The stimulus from asset purchases to the economy comes in two ways. One is that it stimulates nominal spending thereby inflation generated domestically and expenditure. The other comes through transmission channels. It may affect expectations and can have an influence on bank lending indirectly. The channel may transmit signals on future monetary policy and on the Bank's determination to meet the inflation target. Market participants may expect policy rates to remain low. Portfolio balance channel has its effects through increased asset prices owing to asset purchases by the central bank. Asset sellers are likely to rebalance their portfolios and buy further assets. As a result, asset prices increase leading to lower yields and lower borrowing costs. It works through reducing the spreads of longer-term interest rates over expected policy rates and the required return on risky assets relative to risk-free assets.

Liquidity, as a consequence of central bank's asset purchases, may increase asset prices and have an indirect stimulating effect as well. Higher asset prices generate more confidence thereby consumer willingness to spend. A higher level of liquid assets could encourage banks to extend more new

²⁵ UK Treasury bond

loans. Thus channels may function as transmitters of the effects that asset purchases can have on the economy, such as policy signals, liquidity premia, portfolio, confidence or bank lending effects.

4.4.2. The Impacts of the Unconventional Monetary Policy in the UK

The majority of the Bank of England's asset purchases were of gilts, so the largest initial impact was on the gilt market. Table 4 displays a summary of asset price reactions to the the announcement of BoE asset purchases. The effects of the QE policy can be divided into two main elements: (i) the impact of asset purchases on gilt prices and other asset prices and (ii) the effect of asset prices on demand and inflation. The analysis of the QE announcement effects suggested that asset purchases pushed down medium to long-term gilt yields by about 100 basis points, there was an immediate 70 basis points fall in investment-grade corporate bond yields and a 150 basis points fall in sub-investment grade yields (Joyce et al, 2011). See Table 4.

Table 4 Summary of Asset Price Movements

QE1: total of £200bn purchases over 6 announcements (Feb 09, Mar 09, May 09, Aug 09, Nov 09, Feb 10).		QE2/3: total of £175bn purchases over 5 announcements (Oct 11, Feb 12, May 12, July 12, Nov 12).		
Asset	Change around QE1 announcements	Change 4 March 2009 – 26 January 2010	Change around QE2/3 announcements	Change 5 October 2011 - 31 October 2012
Gilts (5-25 year spot rates)	-104bp	-9bp	+2bp	-45bp
Corporate yields (investment grade)	-69bp	-390bp	-7bp	-200bp
Corporate yields (high yield)	-151bp	-1938bp	-11bp	-354bp
FTSE All-Share	-3%	+46%	+4%	+6%
Sterling ERI	-4%	+4%	1%	+6%

Source: Bank of England, (Joyce, 2013)

It is difficult to quantify the wider macroeconomic effects of QE as other factors have been important in influencing the UK economy let alone the transmission channel effects. To determine the effects of quantitative easing, the reaction of longer-maturity government bond yields is to be examined through using a Small Structural Vector Autoregression (SVAR), which contain the policy rate, a government bond yield, real GDP growth and CPI inflation. Assume that a negative shock to bond yields leads to a simultaneous increase in GDP and CPI inflation without having an effect on policy rates. They are constrained at the zero bound. In the model quarterly UK data are

used. Sample pre-crisis period spreads from 1992 Q1 to 2007 Q2. Have a QE shock of 100 basis points on the ten-year gilt yield. The result is a peak effect on the real GDP level of approximately 1.5 percent and on annual CPI inflation 0.75 percentage points.

Kapetanios et al (2012) use three different time-series models of varying complexity to conduct conditional forecasts under „policy” and „no policy”scenarios and then to attribute the difference in the result forecasts to the effects of the policy.

Averaging across the models suggests that QE had a peak effect on the level of GDP of around 1.5 percent and a peak effect on annual CPI inflation of about 1.25 percentage points.

An alternative method of estimating the effects of QE is focusing on its impact on the money supply. Bridges and Thomas (2011) apply two econometric models: an aggregate SVAR model and a linked set of sectoral money demand systems to calculate how asset prices and spending have to adjust to make money demand correspond the increase in broad money supply. Their model suggests that the higher money supply resulting from QE may have increased the level of GDP by approximately two percent and CPI inflation by one percent.

Table 5 Estimates of the Macroeconomic Impact of QE, Peak Impact on the Level of Output and Inflation

Method	Level of GDP (per cent)	Method (percentage points)
SVAR	1½	¾
Multiple time- series models	1½	1¼
average impact	2	1
Monetary approach	1½ -2½	¾-2½
Range across methods	1½-2	¾-1½

Source: Bank of England, (Joyce, 2013)

4.4.3. Assessment and Comparison of Monetary Policy Responses

This part is a brief summary of the key conclusions I have drawn when studying monetary policy measures of the ECB, the BoE and the Fed. Part five will address the central bank crisis management tools and its outcomes in Asia including the PBC in China and the BoJ in Japan before I go on further comparative analysis of monetary policy responses of these five central banks.

When responding to the crisis as severe and long as the recent one central banks in the US and in Europe took „non conventional” or „non standard” monetary policy measures. As the short-term nominal interest rates have been brought down close to zero and inflation targeting and Taylor rules are not enough to overcome the slow pace of growth or recession. Despite intensive easing in the US and the UK by the Fed and the BoE, they have not yet been able to reduce the output gap down to the levels of 2007.

In the euro area monetary easing has been low compared to the US or the UK. Several major advanced economies got close to a liquidity trap. At that point standard monetary policy becomes ineffective because nominal interest rates hit zero, both money and bills have a close to zero interest rate so they

become close to perfect substitutes and short-term interest rates cannot drop further. Given these circumstances and the economy needs more monetary stimulus, demand is still insufficient to reach full capacity in the medium and long term, the central bank deploys unconventional or non standard monetary policies. Negative interest rates are employed to avoid a recession after reaching a liquidity trap. There are theoretical options that can be considered to escape. Fiscal policy may function better than in „normal” times due to lack of „outcrowding” effect and because its multiplier becomes higher when economies deleverage debt (Eggertson and Krugman, 2010).

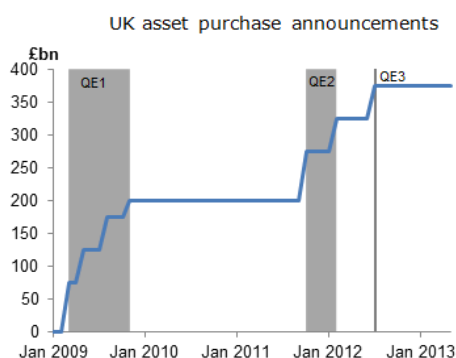
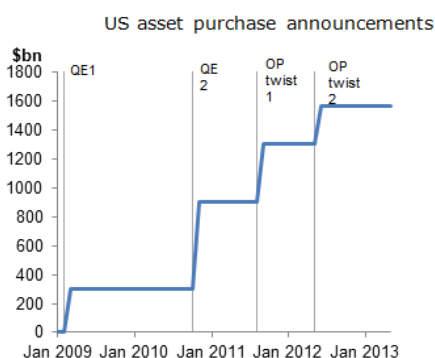
Nonetheless, the political constraints are high in the US and the UK because their debt levels are higher than that of the euro area. Another option is the central bank’s purchasing government debt or private debt in primary or secondary markets. In the US the Fed has been buying Treasury bonds and bills and agency mortgage backed securities (MBS). Congress approval is needed to buy private debt. The BoE has been buying only gilts and no private debt. The ECB has been buying some government debt from peripheral Member States in the secondary markets, but sterilizes these purchases. Raising inflation expectations to lower real interest rates may be a radical but effective solution by allowing inflation to be above the central bank normal target at least for some time.

Having assessed the effects of unconventional or non standard monetary policies I conclude that without a swift deployment of innovative policy tools the meltdown of the financial sector could not have been avoided. These measures mitigated the harsh impacts of the global financial crisis on the real economy in terms of output, unemployment and inflation. As summarized in chapter 2.1., monetary policies display differentiating features in responding to the crisis. It can even be perceived when examining the different transmission channels of the asset purchase policy. The Bank of England’s asset purchase

programme for instance relied on the portfolio balance channel (see subchapter 4.4.1.).

Taking into account its effect, purchases were targeted towards long-term assets held by non-bank financial institutions, like insurance companies and pension funds, which may be encouraged to use the funds to buy other, riskier assets like corporate bonds and equities. Asset purchase announcements have an impact on long-term asset yields, interest rate futures and and measures of financial market uncertainty, which supports the importance of the signalling transmission channel. In the US, asset purchase shocks had an effect on long-term yields and the real exchange rate, underlining the role of the portfolio rebalancing channel.

Figures 3 and 4 display the time and scale of the asset purchases deployed as unconventional stimulus in the US and in the UK.



Graph 3

Graph 4

source: FMOc <https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm>

source: MPC <http://www.bankofengland.co.uk/statistics/Pages/default.aspx>

The summary below presents the main changes the ECB, the Fed and the BoE employed in their monetary policies to respond the challenges of the financial crisis.

The ECB's policy response to the crisis focused on ensuring the liquidity and restoring the bank-lending channel. To achieve its goal the bank modified

its existing monetary policy tools. It includes increasing the average maturity of its refinancing operations, easing the collateral requirements, and allocating liquidity at a fixed rate and full-allotment basis. These measures proved appropriate and effective to deal with the liquidity crisis.

The Securities Market Programme and the Covered Bonds Purchase Programme were aimed to buy particular assets with a scope and impact limited and short-lived.

The Outright Monetary Transactions programme was announced to purchase unlimited amounts of government bonds of member states subject to a European Stability Mechanism (ESM) programme. Although not used, its announcement had an impact on government bond yields within EMU. The programme demonstrated that the ECB is determined to maintain the integrity of the euro area thus it can be considered verbal intervention.

The Federal Reserve and the Bank of England opted for a more radical and unconventional way in terms of monetary policy with their swift decision to respond the crisis by implementing large-scale asset-purchases programmes. These programmes were remarkable in scale, amounting up to 20-25 percent of GDP. The literature suggests the measures had a positive impact on financial variables, on GDP and inflation in the US and the UK.

Unlike the Fed and the BoE, the ECB responded to the crisis in terms of asset purchasing too late and in a limited scale. The Eurosystem had to face a continuous decline of inflation to a level below its definition of price stability of close but below 2.0 percent. To bring inflation back to 2.0 percent in the medium term, the ECB announced a broad package of measures in June 2014 to deal with the deflationary risks. It had been present in the euro area since late 2013. The measures included cutting the MRO interest rate by 10 bp to 0.15 percent, the marginal lending facility rate to 0.40 percent and the deposit rate to -0.10 percent with the corridor, reduced from 75 basis points to 50 basis points and symmetric. Thus, the zero bound had been technically reached. For

first time central bank deposit rates became negative. ECB announced the suspension of the SMP sterilization. Another innovation is the implementation of Targeted Long-Term Refinancing Operations (TLTRO) with a four-year maturity aimed specifically at refinancing all types of loans to non-financial institutions (NFI), except for house purchases and sovereign bonds.

The ECB did not take any explicit measures to address deflationary risks until June 2014 although – based on ECB statistical data– I conclude the evolution of money aggregates and the money multiplier (MM) ought to have been a clear indicator to deflationary risks. As chapter 4.2. presents the period (between September 2008 and April 2010) of intense banking, crisis is characterized by great demand for liquid assets, not only by banks, but by non-financial corporations as well. It is reflected by a portfolio switch from M3 (M2) to M1, the increase of which went up to 14 percent, whereas M3 increase became negative, falling to -2.0 percent. The second period (between May 2010 and August 2011) demonstrates a low growth in all monetary aggregates corresponding the beginning of the credit crunch. Period from August 2011 to May 2013 shows a low growth, below the long run reference for price stability of 4.5 percent (ECB). Yet it was not until 2014 that the ECB announced its measures in June 2014.

Chapter 4.1. highlights the reasons behind monetary policy differences. Turning to these differences in the bankbased financing structure gained from the ECB Statistical Data Warehouse according to which 90 percent of non-autonomous assets on the ECB's balance sheet consists of collateralised loans, while SMP plus CBPPs account for 10 percent, I conclude that this fact can be one that explains the ECB's response to the first phase of the crisis. Simply put, the Bank rather changed the structure of the assets of the balance sheet than did expansion. The fact that the composition of the balance sheet in the Fed is right the opposit, underpins the statement. The ECB was reluctant to act as a lender of last resort until the end of 2011 and in 2012, when the Bank

stated that non-standard measures would be available as long as necessary, and placed EUR1 trillion VLTROs (see chapter 4.2.1.).

The Fed and the BoE had implemented QE long before. The ECB has one primary objective, price stability and the others are subordinated to the first, while the Fed and the BoE have more than one, monetary stability and financial stability. This difference may provide an explanation to ECB's hesitant reaction. The measures implemented by the ECB can be framed as endogenous credit easing because of the focus on relaxing bank collateral requirements and funding liquidity constraints.

In the following parts, I will examine the impact of the global financial crisis on China and Japan and the response measures of their economic policies and central banks: the People's Bank of China and the Bank of Japan. Due to the specific features of the Asian economies, I will analyze this region separately before making my comparative analysis of the five leading central banks.

PART 5 – CHINA AND THE GLOBAL FINANCIAL CRISIS: POLICY RESPONSES, OUTCOMES AND KEY INFLUENCING FACTORS

This part focuses on the impact of the global financial crisis on the largest developing economy, China. I examine its crisis management strategies with special regard of the the People’s Bank of China and assess the effectiveness of the response of the economic policy and the central bank.

The current global financial crisis has had a significant negative impact on the Chinese economy affecting exports, foreign exchange reserves and structural adjustments. Since China is over-dependent on exports to stimulate its economic growth, weakening external demand means an adverse impact on the Chinese economy. In November 2008, China’s continued GDP growth was disturbed by both losses in export-led manufacturing and reduced foreign direct investments from the international capital market. At the end of 2008 the Chinese central bank held foreign exchange reserves worth US\$1.95 trillion,²⁶ the majority of which were denominated in US dollars comprising mainly US treasury bonds and agency bonds (Han, 2014). The deepening of the subprime crisis meant a potential threat of devaluation and downgrade of its US bonds thus eroding the international purchasing power of China’s foreign exchange reserves. In addition, to prevent a slowdown of economic growth, the Chinese government had to consider postponing or even cancelling some structural adjustment policies necessary to ensure the sustainability of the growth of the economy such as bursting the price bubble in the real estate sector and increasing the flexibility of the RMB’s exchange rate mechanism.

²⁶ Although the People’s Bank of China does not disclose the proportion of currency and assets of its foreign exchange reserves, I made a rough estimate based on external data according to the IMF’s COFER statistics. The asset composition of China’s foreign exchange reserves can also be estimated through the statistics disclosed by the US treasury on the overseas holdings of US securities.

The Chinese Government's economic policy reaction to mitigate the impact of the global financial crisis include stimulating household consumption effectively, reducing the pressure of unemployment and diversifying China's foreign exchange portfolio.

From the second half of 2009 the largest developing country managed to regain its previous GDP growth levels while most advanced economies were still struggling to recover. The global crisis affected China only for a limited period, from late 2008 until late 2009. The Chinese Government's reaction had proved effective in boosting short-term economic growth, but was insufficient to ensure sustainable long-term development and to avoid new risks from arising. The structural problems of the economy were exposed further by the he crisis.

China was one of the first major economies to recover from the spillover effects of the crisis. Thus its economic policy responses, particularly those of the People's Bank of China are assumed to have been effective. Nonetheless, the global financial crisis challenged the Bank to such a degree that explicit government intervention seemed to threaten China's continuing market-oriented reforms. While demonstrating proactive risk management, the bank remained constrained by political domination. The Chinese government has intensified direct controls over both the central bank and wider financial markets.

5.1. THE CHARACTERISTICS OF CHINA'S GROWTH PATTERN

China's high export dependency stems from China's export promotion policy, which had been in place for decades prior to the global financial crisis, during the period of 2002–2007 in particular. From macroeconomic perspective it is attributable to China's overcapacity caused by over investment. Fixed asset investment and exports fuelled China's growth with the the average annual growth rate of 24 percent and 29 percent respectively.

The combined contribution of fixed asset investment and net exports to GDP growth was over 60 percent in 2007 (Yu, 2007). The economy had been running current account and capital account surpluses.

The crisis found the Chinese economy in a non-steady state. By definition, a steady state means that (i) aggregate demand is equal to aggregate supply and so are their growth rates; (ii) the growth rates of all components of aggregate demand are equal; (iii) the shares of all components of aggregate demand are constant; (iv) a growth process in a steady state is sustainable. As a result of the expansionary fiscal and monetary policies implemented since the Asian financial crisis the growth rate of gross fixed investments had outpaced the growth rate of GDP. Consequently, excess demand had surfaced gradually since 2002. Sudden acceleration of the growth rate of fixed asset investment will create excess demand for a period of time and when the rate has reached a certain level, the economy will shift from overheating to overcapacity.

Despite the fact that China's overcapacity pressure was building up until the onset of the US financial crisis, the rise in the growth rate of gross fixed investments and the accelerating growth rate of exports on strong external demand were maintained at the expense of a widening imbalance between growth of investment and exports and that of consumption. From the third quarter of 2007 China's inflation rate deteriorated rapidly. The Chinese economy became increasingly reliant on external demand and the share of the current account surplus in GDP had been rising. In 2007, the trade surplus accounted for 10 percent of the GDP (Yu, 2007). The strong external demand prevented overcapacity from surfacing for a relatively long time. Export demand is highly unstable and owing to the expansion of the Chinese economy,

it had become increasingly difficult for the global market to absorb China's excess capacity.²⁷

When external demand collapses, overheating caused by strong investment demand and strong export demand will turn into overcapacity, and inflation into deflation, immediately. It was the case in September to October 2008 since in the second half of 2008 export demand collapsed due to the global financial crisis causing the overcapacity come to the surface.

I conclude that the global economic crisis exposed the vulnerability of China's growth pattern. The overcapacity of its economy would have surfaced and called for correction without the global financial crisis as well. The investment-driven and export-led growth pattern is not sustainable as the investment rate cannot increase forever and the growth rate of China's exports cannot stay persistently higher than that of the global economy.

5.2. CHINA'S FOREIGN CURRENCY RESERVES AND ITS IMPACT ON US-CHINA ECONOMIC RELATIONS

In this chapter, I will analyse the direct impacts of the economic policy responses to the global crisis; the implications regarding the trade, economic and political relations in the long run would exceed the scope of this dissertation. My research aims at examining and comparing central bank responses including the People's Bank of China. To understand the central bank's role and tools in the crisis management the general features of China's economy and the trade and economic relation between the United States and China have to be presented.

As a response to the subprime crisis the US applied loose fiscal and monetary policies. The Troubled Asset Relief Program, stimulus package and trillion financial stability plan together created a record-high fiscal deficit of

²⁷ China had become the world's number one steel producer. 37 per cent of global crude steel was provided by China in 2007 (Yu, 2007).

US\$1.75 trillion in 2009, over 12.0 percent of the US GDP. From the bankruptcy of Lehman Brothers in mid-September 2008 to the end of the year, the Fed's balance sheet has grown from US\$950 billion to US\$2.27 trillion (Hancock & Passmore, 2011). Either issuing more treasury bonds or becoming the buyer of last resort the Fed and the U.S. government's crisis management meant a potential risk for the international purchasing power of China's portfolio of US dollar-denominated assets.

China's response to the crisis had implications for the US - China economic relations. Using its huge foreign currency reserves China has been able to inject massive amounts of capital into its economy to stimulate growth and productivity. As for trade relations with the United States the stimulating package has escalated trade tensions even leading to sanctions by the US to offset the subsidy to domestic industries producing goods for export to the United States. The two economies have fallen into a classic „codependency trap” since they are increasingly reliant on each other for ensuring economic growth. China enabled the US to disregard the perils of insufficient saving, vague household income growth and reckless fiscal policy. Anchoring its currency to the dollar, China has accumulated a significant stake in US Treasuries.

Allowing its currency to float under market conditions or appreciate would increase the price of China's exports and might result in a decrease in exports at a time when China was seeking to increase exports as part of its recovery from the global financial crisis. In addition, critics argue that China is not reciprocating in its trading relationship with the United States. The tension may have determined the relation of the two economies even in the long run.

5.3. EXPOSURE TO THE GLOBAL FINANCIAL CRISIS

China's exposure to the global financial crisis is moderated by its lack of direct exposure to the subprime mortgage issue. The economy applies numerous restrictions on capital flows, particularly outflows of capital. Limiting the ability of the Chinese citizens and private firms to invest abroad, the policies compel them to invest domestically. Even if these restrictions could be evaded by some who invested abroad in subprime mortgages the extent of this investment is unclear and is probably relatively small.

Although the People's Republic of China's (PRC) government made a bulk of foreign investment overseas owing to China's massive foreign currency reserves most of these investments went to safe, low-yielding instruments, such as US Treasury securities²⁸ (Ma and Liu, 2012). PRC officials are cautious and conservative by nature in their investment strategies, they are unlikely to invest in mortgage-backed securities and other innovative financial instruments, which they do not know or may be viewed as speculative.

While China's direct exposure to subprime mortgages seems to have been limited, the impact of the subprime mortgage problem did affect China via its harsh impact on the economies of China's two largest trading partners: the United States and the EU. Economic downturn in the economies throughout the world made the Chinese economy slow down significantly due to their lower purchases of Chinese exports, which began to decline. So did the FDI inflows. In April 2009 the FDI inflows to China fell by 22.5 percent as compared to April 2008, when FDI rose by over 70 percent (Zhang, 2009).

²⁸ In June 2008 the U.S. Treasury Department estimated that China's holdings of U.S. securities totaled US\$1.2 trillion, up from US\$922 billion in June 2007. Of this total, US\$527 billion were in long-term US. government agency securities, US\$522 billion in U.S. Treasury securities, and the remainder in corporate securities and debt.

5.4. THE STIMULUS PACKAGE

In November 2008 the Government introduced a RMB4 trillion stimulus package for 2009 and 2010. See Table 6.

Table 6 Breakdown of the 4 Trillion Yuan Stimulus Package

(billion yuan)

Construction of houses for low-income urban households	280
Increased spending on rural infrastructure and boosting rural incomes	370
Expenditures in transportation network construction	1800
Increased investment in medical services, culture and education	40
Increased spending on ecological protection	350
Technical innovation and economic restructuring	160
Sichuan post-earthquake reconstruction	1000
<i>Total</i>	4000

Source: National Development and Reform Commission (NDRC)
www.ndrc.gov.cn/xwzx/xwtt/t20090521_280383.htm

The amount of the the stimulus is very large at 14.0 per cent of GDP in 2008. In March 2009 the People's Congress approved the Government's new budget for 2009. According to this budget in 2009 total government expenditure (central and local) would be 7.635 trillion Yuan, 22.1 per cent over the previous year. In 2009 the total government deficit would be 950 billion Yuan the highest in six decades, compared with 111 billion Yuan in 2008. The Central Government deficit would be 750 billion Yuan, 570 billion Yuan more than in the previous year. The State Council would allow local governments to

issue 200 billion Yuan worth of government bonds through the Ministry of Finance (Zhang, 2009).

As for the sources of the 4 trillion RMB package the Central Government finances 25 percent in the form of direct grants and interest rate subsidies. Central Government-sponsored projects are financed with the approval of the National Development and Reform Commission (NDCR) and by the Ministry of Finance (MOF). The second most important source of finance is bank credit. Local governments also proposed their own stimulus packages of 18 trillion Yuan worth. The local-government proposed projects were to be financed by Commercial bank credit.

The success of the expansionary fiscal policy found its reason in China's very good fiscal position in the years prior to the stimulus package: the economy ran a small budget surplus in 2007 and a small budget deficit of 0.4 per cent of GDP in 2008.

With a fiscal position like that, China could afford such an expansionary fiscal policy to supplement the lack of demand caused by the fall in export demand and in non-governmental investment.

Before turning to my main research field of analyzing the response of the monetary policy, I will give a short summary of the potential long-term impacts of this expansionary fiscal policy. Based on literature (Zhang, 2009), (Yu, 2007) and statistical data, I conclude that the infrastructure-oriented stimulus package will have a negative impact on China's long-term growth through the fall of investment efficiency. Due to the overcapacity, government-financed investments focused on infrastructure, which takes long time to create revenue. Investment in infrastructure rather than in manufacturing resulted in low investment efficiency. The incremental capital-output ratio became too high: from 4.1 of the previous years it had gone up to over 6.0 in 2009 while in case of Japan it was 3.0. Bold government investments may endanger China's fiscal

position in the future. In addition investment led by local governments may promote a sub-optimal allocation of resources.

5.5. FROM CENTRALLY PLANNED TO MARKET-ORIENTED ECONOMY: THE PEOPLE'S BANK OF CHINA UNDER CHANGE

The People's Bank of China (PBC) was established on 1 January 1948. It is the youngest out of the five central banks in my comparison. This chapter will first review its two-tier relationship under change during China's market-oriented reform before the assessment its crisis management solutions during the global financial crisis.

After three decades of liberalization, the PBC is still a government-owned central bank which, together with specialized regulators, continues to manage China's underdeveloped financial markets. To demonstrate this, I will provide an outline of China's financial sector before the reform. This is followed by an overview of the PBC's reform. China's financial regulatory and supervisory system is argued to have borne structural weaknesses from the outset. By comparing relevant laws and rules one can conclude that China's economic reforms led by the Party embraces selected market principles, which has ensured continued political domination enabling the government to continue its direct control over the central bank and the economy as well.

5.5.1. The PBC under the Soviet Model

China first took over a predominantly Soviet model. The ultimate decision-making power was politically centralized in the central government, representing the Party, and political agencies enterprises were directly controlled by political agencies. In the financial sector, the central bank was the only bank with monitoring responsibilities and it also controlled cash, credits and settlement transactions. Fiscal and monetary management at that time included only the state budget and the cash and credit plans. Money was simply categorized into currency and transfer money. The monetary

management aimed to control cash in circulation and the bank credits to support the state sectors. On one hand, the Bank pursued its task as a central bank, on the other hand, it took deposits and offered short-term loans, i.e. acted as a commercial bank.

5.5.2. The PBC under the Maoist Ideology

When the shortcomings of the Soviet model and structural imbalances became obvious, China rethought its socialist revolution and the Maoist ideology aimed to reshape the economy through organization and modernization reforms between 1966 and 1976. Monetary policies were administratively controlled by the Central Party Committee and the State Council, while the central credit plan was decentralized, with banks, which were required primarily to support local development. The PBC's role was further weakened when it streamlined its organizational structure and halved its staff (Yeung, 2009). The PBC was thus subject to the State Council, with the responsibility for cash management and credit supervision. With the Cultural Revolution, China's economic conditions further destabilized. The PBC was targeted for anti-bureaucratism reform, and repositioned as the MOF's cashier and accountant, while branches were controlled by local governments (Shen et al, 2010).

5.5.3. The PBC During the Economic Reform

Until the late 1970s China had been an isolated economy with low inflation, small budget deficits and minor external imbalance, dominated by political fragmentation, administrative orders, and centrally controlled economic activities (Chow, 1999). This chapter will highlight some key features of China's reform since 1978.

China's reform aimed at building up a socialist market economy with Chinese characteristics, including reforming the economic system and opening up to the world. It is claimed to be a comprehensive transformation including

both financial liberalization and legal reform. Centralized planning would be replaced by market principles and would resolve the problems inherited from the Soviet model and Maoism.

It was not until 1984 that China's financial liberalization was launched, when sudden inflation displayed the distorted pricing system. Up to then, the government had played the role of financial disciplines. Stable market economies require independent central banks, flexible interest rates and efficient revenue systems.

The reform should thus resume the functions of the financial sector to: (i) work as a medium of exchange and a store of value, or simply a payment mechanism; (ii) function as the medium to mobilize savings for productive investment; (iii) resolve difficulties caused by the mismatch of different maturities; and (iv) transform and diversify evident risks. The reformed financial sector was supposed to be more effective in allocating credit and integrating into international markets encouraging greater depth during economic transition.

For decades, the PBC was the only bank controlled by the Ministry of Finance, with limited functions under centralized planning. As required by market economy, it should assume independence to make policy decisions and move towards conducting monetary policy and prudential regulation of the financial markets. The reform started with separating the Bank from the MOF, as well as central banking functions from commercial banking operation.

In 1984, the newly established Industry and Commercial Bank of China (ICBC) replaced the PBC to take deposits from, and make loans to households and to industries for commercial purposes. Then non-banking financial institutions (NBFIs) and foreign banking institutions gradually gained legal approval in Beijing, Shanghai, and Guangzhou. Specialized banks were freed to provide financial services and the PBC began to focus on macroeconomic control by administering interest rates under the central credit plan. The PBC

could only operate to meet the requirements under long-term economic strategies and priorities for funds allocation determined by the MOF (Han, 2015).

To liberalize the markets, the PBC gradually removed credit quotas and pre-specified margins under the central plan, while still administering interest rates by stimulating maximum business loan rates and minimum deposit rates. As regulator and supervisor, without clear authority and sufficient instruments, the PBC and its branches engaged in managing day-to-day operations of specialized banks, policy banks and trust companies, rather than implementing its own monetary policies. The Provisional Regulation 1986, formulated by the State Council, made the PBC subordinate to the State Council in administrative affairs, and the financial markets were made subordinate to the PBC for business purposes.

Provisional Regulation 1986 was replaced by a central bank law from the National People's Congress (NPC) in 1995, paving the way for further market orientation.

The PBC was defined as a state-owned government institution with capital invested and owned by the state; losses were totally compensated by the Treasury.

As a state central bank, it began to have clearer objectives: to design and implement monetary policies, improve macroeconomic management and supervise financial markets with special regard of preventing financial risk, supporting economic development and maintaining domestic currency value.

Under Article 7, the PBC was independent „in fulfilling its duties without disruptions from local governments, other administrative authorities or agencies”. Nonetheless, it did not possess either political or operational independence. The governor and deputy governors were nominated by the Premier of the State Council.

From the late 1990s, domestic reform regarding financial liberalization and globalization was accelerated by external factors, including the Asian Financial Crisis (AFC) in 1997 and China's WTO accession in 2001. In this context, the PBC Law 1995 was amended in 2003 (PBC Law 2003).

In summary, the PBC continued to be a government-controlled central bank with powers of direct intervention in financial markets. China's market-oriented reform was led by the state and characterized by the Party's absolute leadership. The Bank continued to control markets through direct management over prudential regulation. It was in fact identified as an executive of the State Council, and its independence as granted by law but it has been fundamentally weakened by the political system behind.

To assess its functions as the bankers' bank and its nature as the government's banker, it is necessary to understand the conditions under which the global financial crisis reached China: incomplete financial liberalization and government control. This context affected the Bank's policy responses and the subsequent outcomes as well.

The following chapter will address the PBC's performance in managing the crisis.

5.6. THE PEOPLE'S BANK OF CHINA AND THE GLOBAL FINANCIAL CRISIS: POLICY RESPONSES AND OUTCOMES

The bank was challenged by the spillovers from the GFC from late 2008, but China regained significant GDP growth a year later while most advanced economies were still struggling to recover. The previous chapter defined the PBC as a government-owned central bank in China's market-oriented reform. Its relationship with the government and with the market is affected by political domination.

This chapter will provide an overall assessment of central bank crisis management by the PBC. I will demonstrate that the Bank is a proactive

financial regulator under the direct control of the government. Secondly, while Chinese government intensified direct controls over both the PBC and the financial markets, market-oriented financial liberalization was suspended and monetary policy was used to support the fiscal stimulus, the structural problems were further exposed by the global financial crisis.

Between 2003 and 2007, China recorded two-digit GDP growth rates resulting from excessive investment and net exports. In early 2008, fearing of an overheated domestic economy, certain measures were taken to rebalance growth, including slowing the pace of new investment. In this context, the PBC had executed a tight monetary policy prior to the global crisis, but rapidly revised this; for example, both interest rates and required reserve ratios had increased up to June 2008. In September 2008, the PBC reduced both of them: the interest rates then were continuously cut until December 2008, and the required reserve ratios declined to 15.5 percent (Morrison & Labonte 2011).

At the same time, the PBC voluntarily stopped issuing central bank bills, which had until then been purchased mainly by major State-Owned Commercial Bank (SOCBs). Excess liquidity thus caused problems for the interbank market and real interest rates declined further. More remarkably, the loan quota mechanism – introduced to control economic overheating between late 2007 and early 2008 – was removed, in an attempt to encourage further lending. Accordingly, in response to the potential risk from the external shock, the PBC loosened monetary policy by easing lending. The total increase in bank loans was targeted at RMB4 trillion with an extra RMB100 billion allocated to policy banks. Following the announcement of the stimulus package in November 2008, bank loan growth „exploded”. For instance, the first week of 2009 saw a record RMB600 billion bank loans, and the figure increased up to RMB4.6 trillion by the end of March, more than the entire

stimulus package envisaged. M2,²⁹ the broad money supply, increased 27.7 percent, taking up 178 percent of GDP.

5.6.1. The Challenge of the Global Financial Crisis to the PBC

Unlike the central banks in the US and the UK, the PBC was not the centre of intensive criticism nor of massive legal reforms during the financial crisis. This is partially due to China's limited losses in the context of incomplete liberalization, which affected the outcomes of the chosen crisis management solutions. Owing to China's resilience after 2009, the PBC had conducted crisis management solutions for a limited period only, and measures for further financial liberalization, particularly after 2012, were not directly linked to the crisis. Limited losses reduced the challenge for China's financial regulator and supervisor from the origin; both the PBC and the CBRC have strengthened their use of more direct instruments, although they should have developed prudential regulation as required by market-oriented liberalization.

Before the global financial crisis, the PBC was a central bank in a transition economy with incomplete financial liberalization, employing both direct and indirect tools. Due to the GFC, direct controls were reset as risk management solutions, and further market-oriented principles gave way to administered interest rates and exchange policy.

After China's resilience, the PBC's policy instruments included: (i) conventional monetary policy instruments aiming at modifying market liquidity; (ii) re-introduction of certain suspended pilot programmes; and (iii) introduction of new facilities. During the crisis, direct government intervention evidently increased, which continued to limit the PBC and other regulators while brought further uncertainty into China's market-oriented reform. Furthermore, the limits of government intervention also emerged. For

²⁹ Broad money supply: www.pbc.gov.cn:8080/publish/goutongjia/liu/524/2011/20111115190311532831963/20111115190311532831963_.html

example, following downward pressure between July 2007 and 2008, the Chinese property market quickly returned to its previous growth rates, and attracted disproportional commercial loans within the fiscal stimulus package. Without considerable deposit interests and diversified investment products, household savings were continuously invested in the property and stock markets, which made government intervention scarcely successful (Ahuja et al, 2010).

5.6.2. Crisis Management and Financial Sector Development

My hypothesis that one leading goal for central banks in developing countries is to support financial sector development has been testified. During the global financial crisis, China's domestic financial liberalization and marketization continued and a new supranational financial strategy was implemented. Nonetheless, the introduction of market-oriented principles was delayed and low-speed liberalization was employed as an instrument against moderate external shocks.

China's financial liberalization did not develop evenly in terms of institutions, or instruments, or market principles either before or during the global financial crisis. While further reform measures were applied to financial institutions and instruments, marketization in some areas was suspended until the crisis shock was eased. The reform measures in the period of 2009-2014 are summarized below.

The Monetary Policy Department II was established within the PBC in November 2009, and the objective of focusing on RMB issues including exchange rates, as well as cross-border currency trade and cooperation. To improve transparency the PBC began to report financial stability annually.

Regarding the banking sector, reforms were adopted for all major State-Owned Commercial Bank (SOCBs)³⁰ (Cheng, 2009). Restructuring reform was implemented for rural financial institutions and the Postal Savings Bank of China from 2011.

In terms of the instruments, the PBC formally introduced a pilot programme of the Dynamic Adjustment of Deposit Reserve Ratio in early 2011. The ratios were allowed to vary gradually on a quarterly or monthly basis (Ma and Liu, 2011).

With regard of China's slowing economic growth, the PBC designed a range of new and creative tools to affect liquidity. It launched the short-term liquidity operations (SLOs) complementing the Open Market Operations (OMOs), and also the Standing Lending Facility (SLF) in January 2013 to offer financial support in temporary liquidity shortage. In June 2014, the Pledged Supplementary Lending (PSL) was utilised to channel credit to the China Development Bank for low-cost housing. In September the PBC introduced the Medium-term Lending Facility (MLF) to support market liquidity.

The financial market development includes the improvement of the pricing mechanisms in the Shanghai Interbank Offered Rate (SHIBOR), which increased the number of the participants in the interbank market. To assess bad loans disposal, the PBC and the China Banking Regulatory Commission (CBRC) initiated stress tests in 2007, which was completed in 2011.³¹

China's securities market had been underdeveloped and only limited progress has been made. The Growth Enterprise Market (GEM) was launched in May 2009, certain controls over cross-border investment were relaxed, and

³⁰ It began with injecting RMB1.3 billion into the Agriculture Bank of China in November 2008 by the Central Huijin Investment Company Limited (Huijing). From 2011, commercialization-oriented reform extended to restructure rural financial institutions and the Postal Savings Bank of China.

³¹ Data were not accessible.

the China Securities Regulatory Commission (CSRC) relaxed the conditions for qualified foreign institutional investors.

In terms of the bond market, the PBC and the MOF announced that the Bank would initiate creating a market for newly issued critical term bonds, with pilot programmes to trade Treasury bonds.

As for RMB convertibility, the PBC first suspended its gradual reform as a proactive crisis management solution. The RMB had been pegged against a basket of currencies with a 0.3 percent daily fluctuation from 2005, but the PBC pegged it back to the US\$ in July 2008. Further reform was not announced until July 2010, and the floating range of the RMB US\$ rate was widened to 2.0 percent on 17 March 2014 (Morrison and Labonte, 2011). The PBC thus displayed uncertainty about currency liberalization, triggering the expression of concerns, especially from the US (Buckley, 2012).

Interest rates liberalization, which was initiated in 1996, had slowed since 2004, as accumulated liquidity restricted the commercial banks' ability to raise lending rates over the benchmark rate. Interest rates continued to be determined by non-market factors, mainly by the PBC, ensuring that the loan-deposit rate margin was between the loan rate as the floor and the deposit rate as the ceiling. It was changed in June 2012 including gradual narrowing of the floating ranges and in October 2013 the mechanism for loan prime rates was officially announced. It applied to selected banks, while the PBC continued to set basic interest rates for loans as a transition arrangement.

In contrast to the excessive securitization in the sophisticated financial markets, some securitization was initiated in China in 2005 and was suspended at the end of 2008. The PBC resumed and updated the pilot programmes of securitization for high-quality credit assets with the approval of the State Council from 2011 (Wang, 2014).

With regard of law reforms, the PBC clarified that financial behaviour should be regulated. Legal reform occurred with the revision of old rules and

the drafting of new ones and reinforced China's rule-based regulatory framework (IMF, 2011).³²

In summary, while China's market-oriented reform was not terminated by the crisis, certain forms of liberalization were suspended as instruments against external shocks. With further developments occurred unevenly, the reforms regarding interest rates and exchange policy were not resumed before the crisis eased. Direct and indirect tools existed together to ensure the effects as planned, owing to the PBC's direct control over the financial sector.

5.7. THE GLOBAL FINANCIAL CRISIS AND CHINA'S SUPRANATIONAL FINANCIAL STRATEGY

China is the largest creditor of US securities, and the RMB was pegged back to the US\$ in July 2008. It is estimated that a depreciation of the dollar by 20.0 percent would generate a \$300billion loss in China's reserves (Zhang, 2009). To reduce its over-dependence on the US dollar in foreign trade, cross-border capital flows and foreign reserve exchange management, China launched a three-tier strategy, combining RMB internationalization,³³ regional monetary cooperation and the reconstruction of the international monetary regime. In a country conducting gradualist economic reform, such as China, internationalization can be achieved by gradual regionalization (Li, 2004).

Before the global financial crisis, the PBC had participated in two Asian bond funds in 2003 and 2004 by organizing working taskforces so as to promote currency multilateralization. During the crisis, the Bank extended bilateral local currency swap schemes with Emerging Market Economies (EMEs) to central banks in advanced economies, including the BOE in June 2013 and the ECB in October 2013.

³² E.g. financial holding companies (FHCs) were not included in formal legal frameworks despite pilot programmes.

³³ currency internationalization is exercised after full convertibility in both current and capital accounts.

In my view, internationalization helps strengthen and diversify domestic financial markets, and this pathway presents a leading solution in China.

The PBC promoted pilot programmes to use RMB in cross-border trade and formalized the relevant rules between 2012 and 2013. The Bank intensified its two-way flexibility by trading RMB directly with other currencies.

The global crisis called for cross-border cooperation, and the internationalization progress continued towards further Asian regionalization. Trusts and funds were established to offer liquidity support for the systemwide risk, including a Credit Guarantee and Investment Fund (CGIF), an Asian Development Bank (ADB) trust fund and the Associations of Southeast Asian Nations „ASEAN+3” Macroeconomic Research Office (AMRO) (Chin, 2012). The Chiang Mai Initiative (CMI) gradually developed throughout the crisis period, from a bilateral US dollar-denominated exchange arrangement to a multilateral facility.

The establishment of the Asian Infrastructure Investment Bank (AIIB), which has attracted economies outside Asia as well, indicates that China has reached a new stage of financial integration.

As for developing and emerging economies, reform of the international financial architecture has been put on agenda. Certain countries continued to rely on international financial aid in case of liquidity shortage although their selective policy responses focused on such problems as countercyclical macroeconomic policy and international capital flows.

The PBC expressed³⁴ its intention to rebuild the entire international monetary architecture. As a matter of fact fact China had already begun to diversify its reserves, including commodities, strategic petroleum reserves and IMF bonds in particular. The three-tier strategy and the RMB convertibility triggered intense debates, with excessive government intervention in the focus.

³⁴ In the open speech of the PBC Governor, Zhou Xiaochuan, titled „Reflections on Reforming the International Monetary System” (2009)

When pursuing its goal of financial leadership, China has a strong interest in preventing its neighbouring countries, regarding strong trade relationship with them. Nonetheless, its active role in CMI and the initiation of AIIB was taken as a challenge to the IMF and the power of the US in Asia.

5.8. ASSESSMENT OF THE CRISIS MANAGEMENT SOLUTION OF THE PBC

Assessing the monetary expansion of the PBC, I claim that the PBC took some proactive measures. There is little evidence to indicate contagion, as neither exports nor FDI incurred any major losses until November 2008, three months after the first interest rate cut.

The Bank managed to add loanable funds by cutting benchmark interest rates and rates for mortgage loans, as well as by varying chosen preferences and requirements. The lower requirements of reserve ratios applied to other saving institutions before they were extended to major SOCBs. The PBC influenced monetary policies in a gradual and carefully negotiated manner. It also gave preference to agriculture and exports, as well as the countryside and earthquake-struck areas. To some extent, China's central bank still pursues selected quasi-fiscal responsibilities and/or administrative guidance for the wider public welfare (Lardy, 2010).

China's crisis management enabled the economy to achieve the set GDP growth targets in both 2008 and 2009. In January 2010, the GDP growth rate of over 10 percent exceeded previous years on average. The Shanghai Stock Exchange Composite Index rose by 45 percent and, on a year-on-year basis, in April 2010, retail sales rose by 14.8 percent, industrial output by 7.3 percent, and investment in real estate by 6.4 percent (Morrison & Labonte 2011). In this respect, Chinese policy responses to the global crisis appeared to be highly effective.

From the perspective of incomplete economic reform, the PBC's contribution was remarkable. Monetary policy instruments had been employed

prior to the fiscal stimulus package, the package is considered to have stimulated China's GDP growth. From the end of 2008, fiscal and monetary stimuli reinforced each other: the PBC adopted various monetary instruments to make funds available, and the fiscal package channelled loanable funds.

PART 6 – JAPAN AND THE GLOBAL FINANCIAL CRISIS: POLICY RESPONSES, OUTCOMES AND KEY INFLUENCING FACTORS

Modern times have often seen irregular up-and-down fluctuations, with boom generally lasting longer than bust. Japan experienced a decade-long „growth-recession” following more than a decade of prosperity. As a central bank in domestic crisis, the Bank of Japan (BoJ) was first challenged by Non-performing Loans (NPLs) and bank failures, and then by the global financial crisis, deflation and economic recession in particular. The BoJ employed unconventional monetary policy instruments to support the financial markets more directly with fundamental regulators remaining unchanged. The government supported financial markets through fiscal stimulus packages of remarkable sizes and continued to direct the BoJ explicitly.

Having renewed its policy tools to offer liquidity the BoJ promoted better risk management of financial institutions. The crisis management solutions, examined from different aspects and selected by the BoJ during in two periods: during *the domestic crisis between 2001 and 2006* and during *the global financial crisis*, can be seen below.

Economic environment:

- **2001-2006:** Lasting deflation and economic stagnancy after a boom-bust cycle.
- **During the global financial crisis:** Short-lived economic recovery with recapitalized banking sector, uncollateralized overnight call rate maintained at 0.5 percent.

Interest rate reductions:

- **2001-2006:** ZIRP was introduced in 2001 and extended from 2002 with clarified objectives, commitment and timescale.

- **During the global financial crisis:** Virtually zero interest rate policy would be kept at 0–0.1percent from October 2010, the BoJ explicitly linked its ZIRP with inflation and price stability.

Asset purchases:

- CLF; Extended maturities of funds supplying operations, Credit easing by purchasing long-term JGBs, Asset-Backed Commercial Papers (ABCPs) and ABSs; Outright purchases of stocks from banks' equity portfolios.
- **During the global financial crisis:** the BoJ purchased CPs, corporate bonds, ETFs, J-REITs and longer maturity Japanese Government Bonds (JGBs) against a wider range of collaterals; Various facilities to directly support banks and corporate financing, such as CDF, SFO FCF, and loan support programme; Shaped Quantitative and Qualitative Monetary Easing (QQE) in April 2013.

Regulation and supervision:

- **2001-2006:** Dealing with NPLs and bankruptcy through limited on site examination; off-site surveillance and LOLR facilities.
- **During the global financial crisis:** micro-prudential regulation: monitoring liquidity risk at the firm level; macro-prudential regulation: managing financial imbalance.

Framework of monetary policy conduct:

- **2001-2006:** Uncollateralized call rate
- **During the global financial crisis:** the BoJ introduced numerical inflation targeting and shifted to the money base as the target of monetary framework.

Cross-border cooperation:

- **2001-2006:** Not accessible
- **During the global financial crisis:** Swap lines with selected major central banks, acceptance of selected government bonds as collaterals.

Comparing the two periods summarized above, it can be seen that the Japanese government did not launch any massive legal reforms during the global financial crisis, partly attributed to the relative stability of Japanese banks after continuous recapitalization.

As Japan still suffered huge losses, the BoJ was required to pursue unconventional measures. Regarding these two points, the selected crisis management solutions were similar, including interest rate cuts, clarified commitment and asset purchase programmes, but monetary easing was more aggressive during the global financial crisis. In terms of its effect, it is empirically estimated that asset purchases under the QE were aimed at stabilizing financial markets allowing for further monetary easing, while their impact on inflation and outputs was limited.

As for the timing the BoJ was late to deal with the bubble economy and its consequences, but it acted proactively during the 2008 crisis, in cross-border cooperation in particular. During a financial crisis, a central bank is likely to have to sacrifice part of its independence. This was the case with the BoJ while it increased its direct control over financial markets. As the bankers' bank, by taking over credit risks from the private sector, the BoJ directly affected resource distribution. By providing commercial loans to contracted institutions the Bank ensured liquidity while intensified its on-site examination and off-site monitoring in order to assist to improve liquidity risk management at the firm level.

6.1. THE INDEPENDENCE OF THE BOJ AND „A BANK IN CRISIS”

The legal framework strictly restricted the independence of the Japanese central bank and the crisis further intensified the government's direct control. Although the BoJ Act of 1998 made the bank independent in formulating and implementing currency and monetary controls, as well as business operations its overall authority was restricted by this legislation. In practice, its

relationship with the government was more complex than prescribed by the legal provisions. The MOF maintained its authority to an obvious degree (Mikitani and Kuwayama, 1998).

After World War II, the Ministry of Finance (MOF) was Japan's major financial regulator, controlling interest rates and capital flows through regulatory and administrative directions. When dealing with troubled institutions the BoJ made liquidity available and the MOF required that „based on forgiveness and forbearance” stronger institutions would either support the weaker ones or merge with them. (Cargill et al, 2000, pp. 46–47).

The boom-bust cycle caused increasing unemployment and business failures in both private and public sectors. Based on forgiveness and forbearance, Japan's bank system channelled credit to weak corporations and banks and non-bank financial institutions confronted the NPLs problem aggravated by the adoption of the strict capital adequacy ratio of the Basel Accord 1988.

The BoJ had to deal with Japan's domestic crisis since the mid-1990s. The Bank began to directly influence the credit creation of financial institutions and the overall money demand (BoJ, 2003). It reduced interest rates to 0.25 percent in September 1998. On 12 February 1999, the Policy Board decided to reduce the uncollateralized call rate to virtually zero; this was the zero interest rate policy (ZIRP).³⁵

The expectations of recovery appeared to be false, and the Policy Board raised the rate to 0.25 percent in August 2000. As this action resulted in the threat of an economic recession, the ZIRP was brought back March 2001. The ZIRP was to continue until the CPI inflation rate became zero or above for a few months and there was no forecast by the Board members of falling back to deflation.

³⁵ *Data source:* [www.stat-search.boj.or.jp/ssi/cgi-bin/famecgi2?cgi=\\$graphwnd_En](http://www.stat-search.boj.or.jp/ssi/cgi-bin/famecgi2?cgi=$graphwnd_En)

In the context of prolonged deflation neither monetary expansion nor fiscal stimulus can effectively help support economic recovery. Under such circumstances the Policy Board officially announced quantitative easing. Japan's economic recovery stabilized between November 2005 and March 2006, the core CPI inflation turned positive and the BoJ raised the uncollateralized overnight call rate to 0.25 percent. Quantitative easing policy was ended but the Bank continued to keep the call rate at that low level (Cargill et al, 2004).

6.2. THE BANK OF JAPAN UNDER THE CHALLENGE OF THE GLOBAL FINANCIAL CRISIS

Compared with the US and the UK, severe housing collapses or banking failures did not hit Japan during the global crisis. Japanese banks were less innovative and continuous recapitalization rather than profitability created a sound financial environment. The Japanese stock market indicated the external instability by gradual sustained decline. It had a negative impact on balance sheets and the capital adequacy ratios of commercial banks and limited their lending from mid 2008. Exports fell by 12.5 percent in late 2008, with another 36.8 percent drop by 2009 and real GDP shrank by 12.1 percent (Ando and Kimura, 2012).

Owing to its over-dependence on exports thus being vulnerable to external shocks, Japan underperformed its peers and the emerging economies in Asia in 2008 and 2009. (BIS, 2013). As foreign banks largely reduced their investment in the interbank market and their holdings of Japanese stocks, negative outward portfolio investments increased from 2007, while inward portfolio investment turned negative in 2008 and 2009, which lead to a credit crunch on Japan. Japan's economy turned into a serious economic recession from late 2008.

Fiscal stimulus and monetary expansion were employed to deal with the global crisis. The key crisis management solutions can be summarized as ample liquidity provisions, support for credit market functioning, macroeconomic stimulus and injections of public capital and elimination of balance sheet uncertainties (Shirakawa, 2009).

Under the ZIRP, the BoJ maintained the uncollateralized overnight call rate at 0.5 percent until 31 October 2008, and reduced it to 0.1 percent at the year end to maintain quantitative easing until the country came out of deflation (BoJ Statement, 2009). Further cuts were made to around 0 to 0.1 percent by October 2010.

The spillover effects from the global crisis to Japan required the BoJ to explore more Unconventional Monetary Policy (UMP) tools summarized below (Han, 2015).

Between 2008 and 2010:

- *Quantitative Easing* from the BoJ including purchases and sales of JGBs with repo agreements with extended maturities and wider ranges of eligible collaterals;
- *Corporate Financing Support* covered Complementary Deposit Facility (CDF) to pay remuneration to excessive reserves;
- *Special Funds-Supplying Operation to Facilitate Corporate Financing* (SFOFCF) to provide an unlimited amount of funds against the value of corporate debt at loan rates equivalent to the target for the uncollateralised overnight call rate;
- *Outright purchases of corporate financing instruments including commercial papers (CPs) and short-term corporate bonds* against a wider range of eligible collaterals;

From October 2010:

- *Comprehensive Quantitative Easing (CQE)* in the framework of the New Asset Purchase Programme including the BOJ purchasing CPs, corporate bonds, ETFs, JREITs, and longer-maturity JGBs;

March 2011:

- Injecting ¥15 trillion into the interbank market
- *Great East Japan Earthquake Quasi-fiscal support* to provide temporary financial support to affected areas for public welfare;

From 2013:

- *BoJ New Framework* includes numerical price stability target to link monetary policy directly with economic recovery;
- *Quantitative and Qualitative Easing (QQE)*: the BoJ shifted to the money base control as the target of monetary framework;
- Regular assets purchases

6.3. ASSESSMENT OF THE RESPONSES OF THE BOJ

In its UMP tools, the BoJ focused on facilitating corporate financing, while supporting the banking sector and export-led growth. The quantitative and qualitative monetary easing is expected to work through transmission channels, such as longer-term interest rates and asset prices, and change the expectations of markets and economic participants. The QQE would help achieve recovery through both a quantitative increase and qualitative changes in the BoJ's balance sheet. The Japanese recovery strategy demonstrates that the government's plan to achieve economic recovery implies giving the BoJ additional requirements to stimulate growth.

Price stability with inflation targeting was formally introduced by the BoJ from 2013, which reflects an increasing awareness regarding the importance of flexibility in the conduct of monetary policy in Japan. In the meantime, the BoJ began to purchase assets regularly and also expressed its commitment to strengthen cooperation with the government. The principle of the Bank of Japan's monetary policy is price stability, contribution to the sound development of the economy and responsibility for maintaining financial system stability.

With regard of cross-border cooperation, the BoJ made some proactive currency transactions with other central banks and international organizations from late 2007, which were followed by further central bank actions, including large-scale swap lines with the US Fed, as the crisis became more intense. The BoJ actively participated in strengthening the Chiang Mai Initiative (CMI) mechanism in Asia (BoJ, 2012, pp. 206–208). The Basel III was introduced in 2012 and implementation began from March.

Responding to the global financial crisis brought more government intervention to the central bank, and financial markets got under more direct regulation. Under the crisis challenge, the Bank's role as a government-driven monetary authority further strengthened and so did its function to promote the government's strategy.

PART 7 – COMPARATIVE ANALYSIS OF THE FIVE CENTRAL BANKS IN MANAGING THE GLOBAL FINANCIAL CRISIS: POLICY RESPONSES, FINANCIAL REGULATION AND SUPERVISION AND CENTRAL BANK INDEPENDENCE

In the previous parts, I analyzed the environment, in which the global financial crisis challenged central banks. I focused on five banks: the ECB, the Fed, the BoE, the PBC and the BoJ and examined their tools and measures in their responses to the financial crisis. My presentation demonstrates that similar policy instruments applied by central banks did not guarantee similar outcomes. It is evident that the crisis challenged these central banks differently and changed key distinctions between market-oriented and government-controlled central banks.

Since its foundation, the central bank has been the Government's banker and since the late 18th century, it has been banker to the banking system more generally, the bankers' bank. Put it differently, a central bank is positioned within a two-tier relationship: with the government and with the market. (Han, 2015 p.32)

Having studied a wide range of relevant literature I can state that there is still little consensus as to the definition of financial stability. It is widely accepted that systemic risk is a critical threat to financial stability. This became obvious during the global financial crisis. Systemic risk can be analysed from its origins, transmission channels, outcomes, prevention and resolution.

Risks which potentially extend negative effects beyond any individual institution, are regarded as contagion, and thus the degree of probability on which a certain risk will exert a systemic aftermath will determine the nature of the risk (Han, 2014). Such a hypothesis refers to a risk allocation as risk with domino effects. Systemic risks have contagion effects at the core with different forms of externalities. Transmission mechanisms are important factors in understanding systemic risk, In interdependent banking networks,

the strong linkage will increase the chance of a systemic risk, while the weak linkage will reduce its occurrence.

This part will identify the signs of convergence or divergence and the multiple pathways in the character and conduct of these central banks' approaches to facilitating systemic stability. In this part, I will compare some key aspects of the five central banks selected in the dissertation. Comparisons have been made from the perspectives of their independence, monetary policy and other objectives, financial regulation and their crisis management responding to the crisis.

Convergence had often co-existed with divergence in central banks' history. Despite their similar legal frameworks, they had operated with different two-tier relationships, causing some different outcomes in these central banks in the crisis.

The relationship between the central bank and the government is more complicated than the principal legal provision alone. Similar operational independence was granted by law, but the actual levels of autonomy distinguished market-oriented from government-controlled central banks. Less definite differences existed between the US Fed and the BoE, which have been strengthened by the global financial crisis. For decades, without evident statutory changes, the US Fed maintained its independence within the government, while the BoE did not gain operational independence until the late 1990s, with HM Treasury remaining influential upon both monetary policy and financial regulation.

When it came to the global financial crisis, the Dodd–Frank Act left central bank independence intact but with enhanced and extended transparency and oversight from both the Treasury and the GAO. In the UK, however, the power of HM Treasury was explicitly expanded by nationalizing private enterprises and leading the new regulatory regime. In contrast, both the government-controlled BoJ and PBC came under further direct political

control, but their statutes did not reflect their changed relationships with the governments. Overall, the global financial crisis expanded certain divergences between the four countries. Between the US Fed and the BoE, more differences in independency and financial regulatory regimes became evident, while further gaps emerged between market-oriented and government-controlled central banks. Meanwhile, the independence of the ECB is specific. As an autonomous institution, the ECB cannot be instructed by third parties, i.e. governments or international political councils; it is not responsible to any subordinate organization nor to any legitimising body.

The two-tier relationship has changed due to the crisis as follows.

- i.) Before the global financial crisis the five central banks operated within similar legal frameworks but in fact with different levels of independence and at varying distances from the financial markets.
- ii.) During the crisis, crisis management solutions, including monetary policy adjustments and LOLR facilities, simultaneously moved the central banks towards the governments and the financial markets.
- iii.) Following the crisis, reforms have intended to rebuild their two-tier relationships. For the market-oriented central banks, independence was still desirable, with an increasing focus on systemic stability, but the BoJ and the PBC faced domestic challenges, rather than the crisis-driven changes in the US and the UK.

I have concluded that the two-tier relationship is relatively dynamic. The global financial crisis made it evident that in terms of convergent crisis management solutions that the five central banks in the examination had different focuses and approaches.

In summary, within similar legal frameworks, the five central banks operated during the global financial crisis in different relationships with their governments and the markets; they relied on different approaches and focuses

to restore financial stability; and accordingly, their two-tier relationships have been affected by the crisis in different ways.

In order to restore financial stability, central banks apparently tried every possible remedy but applying the rule of law (White, 2010). It was thus argued that legal reforms should limit the US Fed's illegal expansion and improper direct intervention into private sectors. Central banks are generally bound to their legal mandate.

During the global crisis, most banks did not limit themselves to the orthodox policies for crisis management, but explored new unconventional monetary policies. For instance, in the US special rules and procedures exist for bankruptcies of financial institutions. If those known rules had been complied with, the failing institutions should have been acquired or liquidated, rather than bailed out, which had been made by the authority.

Government intervention in Japan and China emerged more visibly and directly, whereas few material statutory changes really affected the core two-tier relationships of their central banks. As a result, the gap between their respective legal frameworks and the real two-tier relationships increased, and their governments have been able to increase the depth of their intervention more easily.

With regard of independence, the legal independence of the ECB is based on four pillars based on the Treaty.

- The ECB is independent as an institution; that is to say, being an institution sui generis it holds legal personality distinct from that of the EU.
- It is independent with respect to its internal personnel policy.
- It is independent from any financiers.
- Most importantly, it is independent with regard to its primary goal of preserving price stability.

The ECB has undertaken extraordinary measures during the financial crisis. In my opinion, independence is not only a question of the legal framework but of the actual implementation of monetary policy as well. The Bank explicitly pledged to do "whatever it takes" to preserve the euro as the common currency. Draghi (July 26, 2012) confirmed that within their mandate, the ECB is ready to do „whatever it takes to preserve the euro.” (see page 48). It has added a second, and potentially contradictory goal alongside its primary mission of achieving price stability. From an economic standpoint, central bank independence is only valuable as long as it helps to improve macroeconomic achievements. While the ECB has to support the economic strategies of the euro area, it can only do so to the extent that the goal of price stability is not threatened.

I have compiled a table, which displays the five central banks in terms of their monetary policies and other objectives, as well as of their financial regulation and supervision reforms. See Table 7.

Having made the comparison of the five central banks, I found that the global financial crisis has widened the existing divergences, as well as the gaps between their respective legal frameworks and prevailing two-tier relationships.

Table 7 Comparison of the Five Central Banks

Central Bank	ECB	Fed	BOE	PBC	BOJ
Monetary policy objectives	Maintaining price stability	Maintaining stable prices and moderate long-term interest rates	Maintaining price stability	Maintaining the stability in the value of the currency	Maintaining price stability
Numerical targeting	Y	N	Y	N	N
Other objectives	Achieving the goal of economic stability and convergence of the member states	Boosting employment and supporting economic growth	Supporting government’s economic policy for growth and employment	Promoting economic growth	Enhancing the sound development of the economy, and achieving an orderly payment and settlement system
Reforming financial regulation and supervision during the Global crisis/ institutional structure	Divisions: Financial Regulation Financial Stability Surveillance Macro-Financial Linkages Macro-Financial Policies	FSOC was established to control systemic stability; OTS was abolished; US Fed extended its oversight scope	FSA was abolished; PRA and FCA were established as a twinpeak model for prudential regulation and conduct of business regulation; BOE embraced macro- and microprudential regulation, and banks’ failures	N	N
/Changed approaches	Single Supervisory Mechanism (SSM)	Macro-prudential regulation focused upon systemic stability;	Macro-prudential regulation focused upon systemic stability; Banks’ failures managed	Political coordination mechanism	Macro-prudential regulation to control financial imbalance

source: Author

PART 8 – CHANGES IN CENTRAL BANK BALANCE SHEETS AND THE EXIT STRATEGY

In this part, I examine the implications of the unconventional monetary policy measures from the aspect of expanded central bank balance sheets and the exit strategy.

In response to the crisis, central banks have expanded and dramatically changed the composition of their portfolios. It may carry the potential for much greater interest rate and credit risk. Who will bear the loss the central bank takes? From this aspect, the risks associated with the balance sheet are important to deal with, when it comes to assessing the non-traditional activities of central banks. Managing the larger and more complex balance sheets also means new challenges to central banking for some time to come. Table 8 displays the structure of the central bank balance sheet.

Table 8 A Central Bank Balance Sheet

A CENTRAL BANK BALANCE SHEET	
Assets	Liabilities and capital
Net foreign assets	Reserve money
Net domestic assets	<i>Currency in circulation</i>
	<i>Reserves of commercial banks</i>
	Non-monetary liabilities
	<i>Central bank securities</i>
	<i>Others</i>
	Equity capital

Source: Author

At normal times, there is relatively little attention paid to central bank balance sheet composition. In normal circumstances, central banks are to hold safe, liquid assets, short-term government securities on their balance sheets and have an impact on the financial system and inflation through monetary policy's

traditional transmission mechanism. With a financial system working properly, the central bank can actually buy any asset necessary to conduct monetary policy. These purchases inject liquid reserves into the system, which find their ways to demand through the intermediaries, which can determine how to allocate credit. Through this traditional mechanism, liquidity and credit can flow relatively freely to its highest-valued uses.

In case of a breakdown of financial intermediation, the liquidity provided by the central bank may not generate credit that flows to its highest-valued uses, thus its impact on the system becomes less as the reserves do not move to generate credit flows through the system. Owing to this, the central bank must inject liquidity directly into where demand is high and where it can ensure the stability of the system the most. The conventional way of buying short-term government securities to provide more reserves to the banking system does not seem to be plausible and the central bank may need to use non-traditional tools to give new strength to the functioning of the financial system. Non-traditional measures result in not only an increase in the size of the central bank balance sheet but cause significant changes in its composition as well.

8.1. THE IMPLICATIONS OF THE NON-CONVENTIONAL ACTIONS FOR CENTRAL BANK BALANCE SHEET

The implications include broadening the range of collateral, extending the maturity of lending and the issue of eligible counterparties. The appropriate collateral for lending includes instruments with low credit and interest rate risk, such as short-term government securities. In case of a breakdown of financial intermediation, however, the central bank may have to broaden the range of collateral to provide liquidity directly, thus exposing itself to more credit risk. This was the case for the Fed with asset-backed commercial paper, mortgages, and commercial properties. The ECB accepted different types of government paper. Risk to the central bank can be mitigated by overcollateralization, higher

interest rates, and other charges. Consequently, other institutions could get into a first-loss position. Let's take the example of the Term Asset Lending Facility (TALF) in the US. The Fed provided financing into a facility that was capitalized with funds from the Troubled Asset Repurchase Program (TARP), which put the Treasury in the first-loss position by providing a 10.0 percent cushion against potential losses.

Extending the maturity of lending is a sensible response to lack of liquidity during the crisis, but it certainly involves greater risks for the central bank including default risk, collateral or interest rate risk. At normal times, central banks provide short-term – typically overnight – financing against proper collateral to institutions experiencing liquidity pressures.

As far as the eligible counterparties are concerned, most of the central banks were constrained in terms of entities to whom they could lend: in general, they provided lending to institutions with commercial bank charters only.

The size and composition of the balance sheet can become a primary tool of monetary policy when interest rates are at or near the zero-lower-bound. However, only very few central banks provided a detailed guidance in a timely manner, concerning their forecasts of how the size and composition of the balance sheet were to change over time. Since the portfolio is important to monetary policy, giving information on the different types of securities, e.g. mortgage-backed securities and on the maturity of government debt as well as central bank intentions would be just as much sensible as forward guidance on interest rates.

8.2. THE ROLE OF CENTRAL BANK BALANCE SHEET

As a credible lender of last resort, the central bank can create monetary liabilities, which can be used to provide liquid assets to a bank in difficulty during times of financial turmoil. Contrary to the 2008 global financial crisis,

in the 1930s, the major central banks failed to tackle the consequences of debt deflation. They could not use their balance sheets sufficiently to lower long-term rates, which contributed to the deepening of the Great Depression.

Balance sheets got out of the focus of central bank monetary policies in advanced economies by the 90s. During the time the “Great Moderation” inflation was low and stable and monetary policy focused on policy interest rates. Balance sheets rather played an operational role in the implementation of policy. The change came with the shocks. The Asian financial crisis of 1997–98 resulted in a massive increase of foreign exchange reserves to build protection against future crises. Forex reserves held by central banks in Asia (China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand, Japan is excluded) rose from \$2 trillion to over \$5 trillion from January 2006 to December 2011 exceeding 45 percent of GDP (IMF, International Financial Statistics).

The extended build-up of the assets side of central bank balance sheets also required an increase in domestic liabilities, changing the process of domestic financial intermediation. Due to the potential implications of these alterations for monetary and financial stability, central banks had to structurize their local liabilities carefully as their foreign assets increased. The recent financial crisis, which had its origin in the advanced economies, ruined confidence in financial institutions and products thus destroying global financial markets. The financial markets’ normal function got damaged and the transmission of lower policy rates to the economy stopped. Central banks reacted to this by buying „unconventional” assets. In the beginning, they bought short-term lending or short-term assets then moved to purchasing long-term papers.

Large-scale asset purchase programmes became the primary tools to avoid havoc, as the effective zero lower bound for policy rates was reached. These policies gave additional monetary stimulus by lowering the long-term

interest rate on government bonds when short-term interest rates were close to zero.

8.3. THE RISKS OF THE EXPANDED BALANCE SHEETS

Large balance sheets have longer-term implications. The central bank's balance sheet becomes more exposed to changes in the market. The value of their assets can be reduced due to a fall in the value of foreign assets or an increase in long-term interest rates, while the value of their liabilities will remain unchanged. If the capital of the central bank is put at risk, it does not only undermine the central bank's credibility but threatens the financial strength needed to perform its functions. It is not the matter of profit - or loss implications for the central bank's balance sheet.

It is important to analyze balance-sheet-related risks as it can help design proper „exit strategies”. It implies risks that the *expanded* balance sheets can create, such as inflation, financial instability, financial market distortions or government debt issues.

Regarding the inflation, central banks so far have been able to expand their balance sheets without losing their credibility for price stability. Nevertheless, the very high and growing levels of public debt in many economies raise the issue of creditworthiness or dominance of the sovereign. Sizeable balance sheets made base money increase significantly relative to GDP. Very liquid banking systems require the appropriate tools and their timely use for draining liquidity in order to decrease central bank balance sheets. In my opinion, a smooth and gradual exit can be expected by the financial markets, but an unprecedented size of drain of excess bank reserves require considering dimensions of financial conditions, expectations, political economy or pressures, which would be too much for a challenge for central banks even if they have the techniques to perform the task.

Central bank balance sheets may carry financial stability risks as well. Excessive credit expansion can be fostered by the increase in the banks' local currency assets, which are the major counterpart of the rise in the foreign currency reserves. If sterilization is incomplete, the risk will be sustained. Relying on reserve requirements to limit the expansion of bank credit impose a big burden on banks, which may also drive intermediation out of the regulated sector into the unregulated sector, the „shadow banking”. If the central bank issues higher-yielding, longer-maturity paper, which makes sterilization more effective, holdings of such paper by the banks may tend to crowd out bank loans to the private sector. Central bank actions on asset markets impact financial market outcomes with cross-border spillover effects. For instance, extended asset purchases by the Fed have lowered US long-term yields, which made the yields sink in overseas markets as well.

Conflicts of interest may also arise when the central bank purchases or sells longer-term sovereign debt. Strong coordination of monetary authority actions and sovereign debt issuance is needed to manage these occurrences, which underpins the significance of considering central bank balance sheets when formulating policy. Put it differently, the implications of balance sheet developments cannot be ignored.

8.4. THE EXIT STRATEGY FROM THE UNCONVENTIONAL POLICIES

Based on my research on the unconventional measures introduced by the Fed, I have concluded that a natural, market-driven exit is likely to make the particular facility decline if the exit strategy is thought about and the policies are structured even from the beginning. This statement is underpinned by the fact that all of the short-term lending facilities that the Fed introduced at the end of 2008 and resulted in a rapid growth of Fed balance sheet from \$800 billion to \$2.4 trillion disappeared by mid-2009. No action by the Fed was needed as the new liquidity facilities were structured with charging an

extraordinary premium for market players to borrow from the Fed. In extraordinary times, if the risk premiums in the private markets were higher than the very high premia charged by the Fed, market participants rather borrowed from the Fed. As soon as markets normalized, market players would turn to private sources, which were cheaper. These programs were consciously structured and could go down without the Fed taking any other action.

The Fed's balance sheet became higher due to the large-scale longterm asset purchases subsequently. Nevertheless, it can become a lot more difficult for central banks to get out of these programs as political pressure tries to make them continue a program and support a certain area of the markets, unless the program is structured to run off, when pressure is less likely to maintain it.

8.5. ISSUES RELATED TO THE EXIT STRATEGY FROM EXTRAORDINARY MONETARY POLICY

The Exit Strategy from Extraordinary Monetary Policy raises the questions whether flexible inflation targeting will remain the preferred strategy for central banks and how they will remain independent in a world, where their responsibilities concern areas that are inevitably political.

In normal times, the central banks ensure sufficient reserves for commercial banks given the interest rate, thus the size of central bank balance sheet is chosen by commercial banks. When markets „disappeared” during the crisis, central bank balance sheets played the role of substituting them. This role is maintained until the markets return to their normal function. Central banks will have to shrink their balance sheets so as to let markets do their job. Or will they have to decrease it in order to be ready for the next crisis?

The transition means challenges and will have economic and political aspects. Shifts in the direction of policy is a sensitive issue, particularly when they are changes from accommodative policy stances toward tightening. Timing and pace of tightening can have large impacts on financial stability, the

fiscal stance of the government and capital allocation. In addition, central banks will be exiting at different times, according to the needs of their individual economies. The exit will also have spillover effects, risks and impacts will be global in character.

Exit requires two connected decisions: when to stop easing, then when to start tightening. The first would mean a decision to stop expanding the portfolio, the second decision would mean to raise the short-term policy interest rate and begin the portfolio adjustments. They are separate decisions. These decisions should be determined by economic and financial conditions. When the central bank can see that the inflation is moving back toward its target and the economy is on a path towards better use of resources in a sustainable way, portfolio expansion may be stopped. It is important to spell out the exit, as early as in the „entry” stage of policy.

Central banks can deploy different tightening techniques. The main method for starting a tightening of policy for the central bank is to raise the interest rate on the deposits they hold. This rate forms a floor for the overnight interbank rate.

In the US the tool has not been used before. The federal funds rate, however, has traded below the rate on deposits at the Federal Reserve, therefore it would require draining of great amounts of reserves simultaneously to tighten control over the policy rate. The Fed has invented to do the draining by converting overnight central bank deposits into longer-term obligations as a new technique.

Central banks can limit the duration of the new securities added to their balance sheets so that the assets can be non-existing quickly when policy shifts. Adjusting the balance of supply and demand for reserves when tightening begins is to increase demand by raising reserve requirements. In the US, the reserve requirement „tax” has been reduced by the payment of interest on reserve deposits, which makes this option attractive. Central banks with assets

of long duration in their balance sheets will need to decide whether to sell excess securities as they exit from zero interest rates, or let them mature. Tightening policy does not require selling securities and decreasing the balance sheet. Increasing the rate paid on reserves thus raising short-term rates tighten financial conditions and slow the growth of demand. If the central bank opts for keeping the longer-duration securities, it may need to rely on shorter-term reserve draining techniques to keep closer control over the policy rate. These techniques change the composition of liabilities from bank reserves to other types without reducing the size of the balance sheet.

The option of the central bank will impact the term structure of rates and the reaction of longer-term interest rates to the exit. Selling securities will raise long-term interest rates faster than letting the securities run off. Expectations on selling also make the rates increase, which means tightening financial conditions. The effectiveness of exit will depend on the sequence in which the steps are taken. It is also important to communicate the steps clearly to public and reduce confusion and uncertainty.

Exchange rates will also be affected by the exit strategy and the timing of exits. As the exchange rate is a transmission channel of monetary policy, international coordination has become an important issue. Considering the expansionary policy of Japan, it can be stated that when a depreciation is the way to increase inflation, other economies may experience an extreme exchange rate appreciation. This is the case for the US if the Fed is the first to exit.

Considering the timing of phasing out of extraordinary monetary policies, the optimal exit would be that the fiscal authorities phase out earlier. They should tighten their budget to generate a surplus to avoid destabilizing the debt-to-GDP ratio when the central bank starts increasing the interest rates. I conclude that the longer the central banks maintain the accommodative monetary policy, the more difficult the exit will be. From this aspect it means

that through the low interest rates, the central bank places no pressure on the fiscal authorities to do so.

8.6. BALANCE SHEETS ARE STILL INCREASING

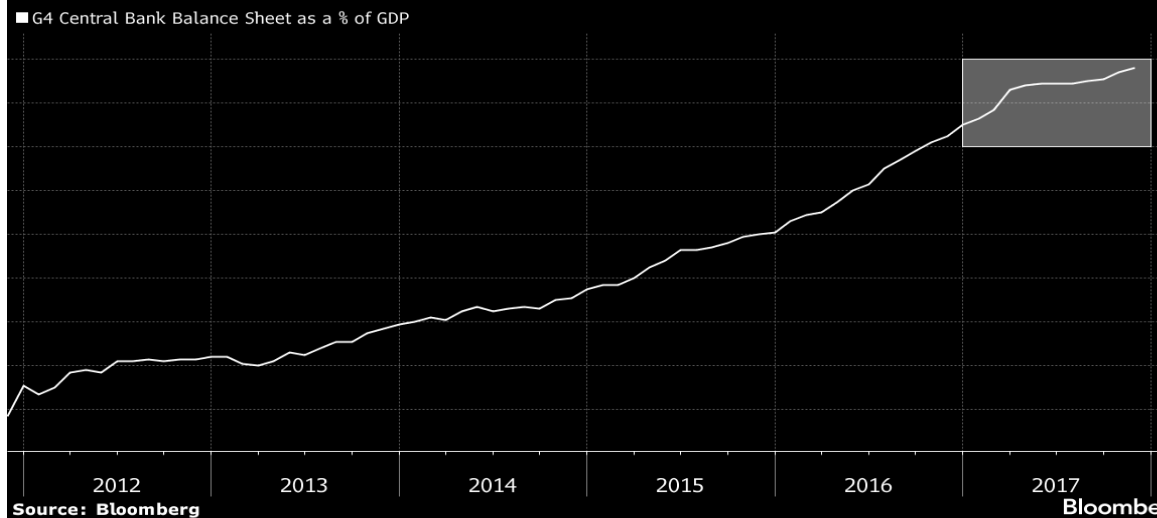
At the end of 2017, global central banks had \$21.7 trillion in assets. (YCharts). Figure 5 displays G4 central bank assets between 2012 and 2017 as a percentage of GDP. According to Thomson Reuters datastream, the Fed's total assets take up 23.0 percent of GDP, this is 40 percent for the European Central Bank and 93.0 percent for the Bank of Japan. The Swiss National Bank's assets account for 127 percent of GDP.

The Fed has not only the least amount of assets relative to gross domestic product, but there is very little credit risk in its holdings as well, owing to the composition of its portfolio. It includes mostly US Treasuries, government agency debt and agency mortgage-backed securities. In June 2017, at its policy meeting, the Fed announced it would start reducing its balance sheet by \$10 billion a month (Fed, FOMC, 2017). As a result, its assets dropped from \$4.476 trillion to \$4.439 trillion, which does not represent a significant decrease with regard of the over \$3 trillion increase between 2008 and 2017.

The Swiss National Bank's (SNB) assets total 127 percent of GDP (Yardeni Research, Inc.,2018). Apart from the Fed, there is a growing risk in the assets of these central banks. For instance, approximately 94 percent of the Swiss National Bank's balance sheet assets lie outside the country, 20 percent is invested globally in equities, including \$88 billion in US stocks (SNB). In case of the ECB, both the size and the composition is a risk factor. While its assets total \$5.2 trillion (Yardeni Research, Inc.,2018), the Bank has been purchasing corporate bonds since 2016 now amounting \$152 billion. It holds 26 bonds rated below investment grade, or „junk”, in the value of \$21.2 billion.

On the Rise

G4 central bank assets continue to climb as a percentage of GDP



Graph 5 G4 Central Bank Assets as a Percentage of GDP

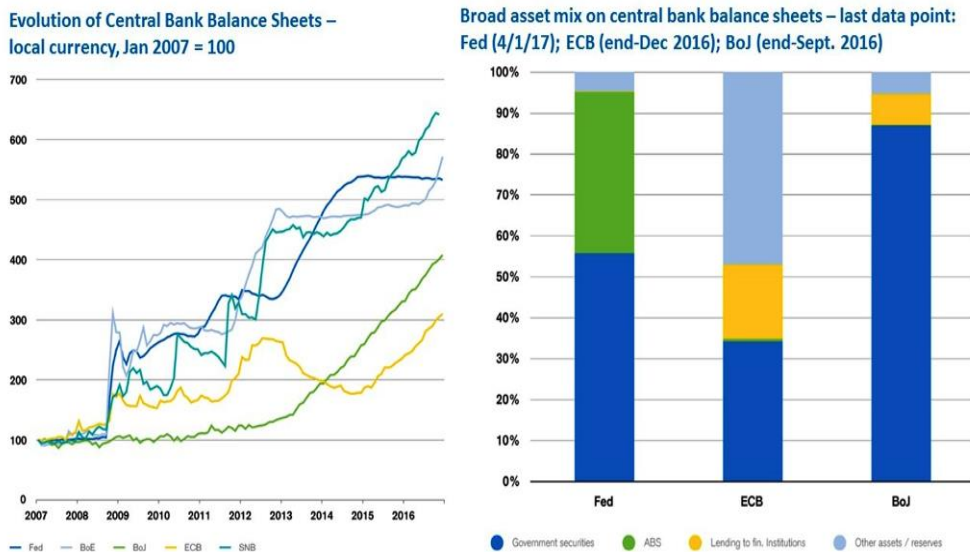
source: Bloomberg <https://www.bloomberg.com>

One important impact of the crisis will be the emergence of an area where fiscal dominance may arise when inflation starts to be driven by fiscal policy. The Euro area has not managed to create an institution that would act as a single fiscal authority. The crisis shed light on its consequences. It means that having a monetary union requires more integration than economies entered into, when they adopted the euro.

Exit from the unconventional monetary policy back to ordinary or „normal” policy would require reducing the size of the central bank balance sheet and raising interest rates. The Fed and the BoE have already stopped expanding their balance sheets and the Fed started reducing it, which could be regarded as the first stage of an exit strategy. Nevertheless, their balance sheets have increased to such an extent, that even a gradual reverse does not seem to be feasible. As far as the inflation outlook is concerned, in normal economic conditions, the inflation is around 2.0 percent per year. Due to the structural changes in the globalized economy, it is the risk of deflation rather than inflation which is likely to threaten. The exit process and normalization takes longer than

expected. Steps regarding putting an end to quantitative easing or rate increase have been delayed. The risk of low real growth rather than that of high inflation has become central bankers' main concern.

Graph 8 displays the increase in balance sheets of five central banks: the Fed, the BoE, the BoJ, the ECB and the SNB in the period of 2007 and 2016 and the composition of assets for the Fed in the first quarter of 2017 and the end of 2016 for the ECB and the BoJ.



Graph 6 Increasing Central Bank Balance Sheets and Composition of Assets

source: *BIS Statistics*

Assets comprise Government securities, Asset-backed securities (ABS) in case of the Fed, Lending to financial institutions in the ECB and the BoJ, Other assets and reserves in all the three central banks.

Prior to the crisis, central bank assets mainly comprised foreign exchange, but by 2016 most major central banks became holders of Treasuries. As a response to the crisis, they used their balance sheets in a similar way.

The expansion of central bank balance sheets affected the financial markets in different ways as follows. Central banks are the main holders of

sovereign bonds. The expected excess returns of stocks over bonds is due to the extraordinarily low bond yields. The equity risk premium is high and the reason is not the returns they are expected to produce, but rather the difference in yields compared to bonds. The short- and medium-term volatility of asset prices were also affected by central bank actions by lowering the risk and thus the risk premia, connected with owning assets. As a result, the link between monetary policy and asset prices have been strengthened. The increasing impact of central banks is reflected by their determinant role in prices and market expectations.

8.7. THE EXIT STRATEGY AND THE FUTURE OF MONETARY POLICY

As shown in chapter 8.6., central bank balance sheets are still increasing. If exit strategy were associated to returning to the monetary policy prior to the crisis, it would imply shrinking the size of their balance sheets and raising interest rates to the Taylor rule level. Nonetheless, the size of assets has grown to a level – five to nine times as large as previously in case of the BoE and the Fed respectively– that it could hardly be moved backwards, even if they have put an end to increasing their balance sheets.

As explained in chapters 8.3., 8.4., and 8.5, exiting unconventional policy involves risks – and the greater the size of QE, the riskier the exit.

As far as the inflation outlook is concerned, normally, the inflation rate is around 2.0 per cent a year. Due to structural changes in the world economic environment, the risk of deflation is more threatening than the risk of inflation. With potential growth remaining lower, long term interest rates are unlikely to hike.

Some central banks have begun purchasing assets other than government bonds, for instance, the ECB owns bonds of non-bank corporations, while the BoJ has been buying equity and real estate Exchange-traded Funds (ETFs), as part of its Quantitative and Qualitative Monetary Easing programme. It refers

to a move from quantitative easing to qualitative easing. It implies placing the emphasis on the character of assets purchased instead of their amount.

Changing the composition of liabilities from bank reserves to other types of liabilities, allows more space to set the short-term interest rate. The option of selling longer-term securities will have an effect on the term structure of rates and on the response of longer-term interest rates to exit. The fall in term premia is to turn around, while long-term interest rates are to rise faster than by just running off over time. Expectations relating to their selling may increase their rates as exit is closer, which equals tightening financial conditions.

Nevertheless, not selling securities and preventing long-term rates from rising implies a need to increase short-term rates faster to reach the same macroeconomic results, which means there is a certain trade-off between them.

In case of a return to short-rate targeting and follow that with actions to redesign and shrink the portfolio, clear communication to public and reducing confusion and uncertainty about exiting from unconventional policy actions is inevitable.

The fifth hypothesis that central bank balance sheets have got a special emphasis in their role as the new tool of monetary policy instead of interest rates has been partly supported by the examination of the exit strategies and the role of the central bank balance sheet in this part, as there is a trade off between holding on to the balance sheet portfolio and increasing short-term rates. Monetary policy has come to a new stage, which is characterized by the special role of balance sheets with diversification of the assets held on them. It does not mean giving up tightening by hiking short-term rates even if it has special implications due to the post crisis economic environment.

PART 9 – AUTHOR’S STATISTICAL RESEARCH. RESULTS AND THE ASSESSMENT OF THE HYPOTHESES

9.1. THE SCOPE AND OBJECTIVES OF STATISTICAL RESEARCH

Within the framework of this research, first I examined the economic performance of the economies subject to my dissertation during the global financial crisis and in the subsequent years. The aim is to present the impact of the central banks’s unconventional measures on the economies of these countries.

Then my research focuses on central banks’ macroprudential tools in ensuring financial stability through examining the data of financial statements of nine systemically important banks. The aim is to display to what extent the ratios indicate the changes of the past five years concerning capital adequacy rules and reducing risks that is how central bank performs its new task of ensuring financial stability.

9.2. MEASURING ECONOMIC PERFORMANCE IN THE PERIOD OF 2009 - 2016

This chapter presents the changes in economic performance indicators - the Gross Domestic Product (GDP) and the unemployment rate - during the global financial crisis and in the subsequent years.

9.2.1. The Methodology of Research

When measuring economic performance during secunder research, I used open data sources and a database of financial statement data of nine systemically important banks in Hungary. Open access to data sources comprising data of eight years was limited, which made the research more difficult to conduct. Both the GDP and the unemployment data were gained by country for each year. Breaking the interval of nine years to two parts was necessary to show the period of the financial crisis (2008-2011) and the

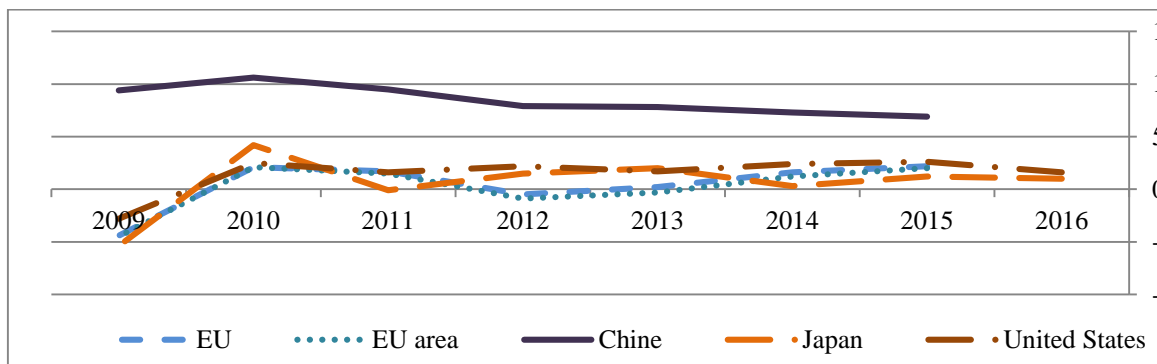
subsequent period (2012-2016) separately. Measuring economic performance includes EU, China, Japan, the US and EMU member states.

Besides GDP, I collected data on the unemployment rate of the selected economies. Gross domestic product and unemployment are affected by different factors. Nevertheless, referred to as Okun's law, changes in unemployment have a consistent and predictable relationship with changes in GDP, which became a standard tool for monetary policymakers.

9.2.2. Gross Domestic Product

The graphs in this chapter display the changes in the GDP in EU, EU area, China, Japan, and US between 2009 and 2016; in EMU between 2009 and 2011 and in the period of 2012-2016. See graphs 1, 2, 3. The graphs made by the author are based on data of:

- http://ec.europa.eu/eurostat/statisticsexplained/index.php/National_accounts_and_GDP;
- <http://appsso.eurostat.ec.europa.eu/nui/setupDownloads.do> respectively.



Graph 7 Gross Domestic Product at Market Prices (EU, EU area China, Japan, US 2009-2016

source: Author

US GDP amounted US\$18 624.48 billion in 2016. As the leading economy – taking up 25 percent of the world economy – precedes the economies of China with its GDP of US\$11 232,11 billion and Japan with a GDP of US\$4 936.54 billion (<https://tradingeconomics.com/united-states/gdp>.) The economy of China is special from many aspects. While in 2018 one-fifth of the world population lives in China (1.39 billion), the US population is 328 million. Producing GDP concentrates in the developed regions of North America and Western Europe with a smaller proportion of population, while the majority of world population lives in the developing regions of South-and East Asia. These significant differences in GDP per capita result in anomalies in particular regions and the standard of living within the country. Despite the dynamically increasing economic performance of China, the value of GDP per capita is lagging behind that of the US or the EU.

Graph 8 displays the changes in GDP in the economies of EMU:³⁶

³⁶ **EA-11** (1 January 1999 - 31 December 2000): Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (DE), Ireland (IE), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT), Spain (ES);

EA-12 (1 January 2001 - 31 December 2006): EA-11 + Greece (EL)

EA-13 (1 January 2007 - 31 December 2007): EA-12 + Slovenia (SI)

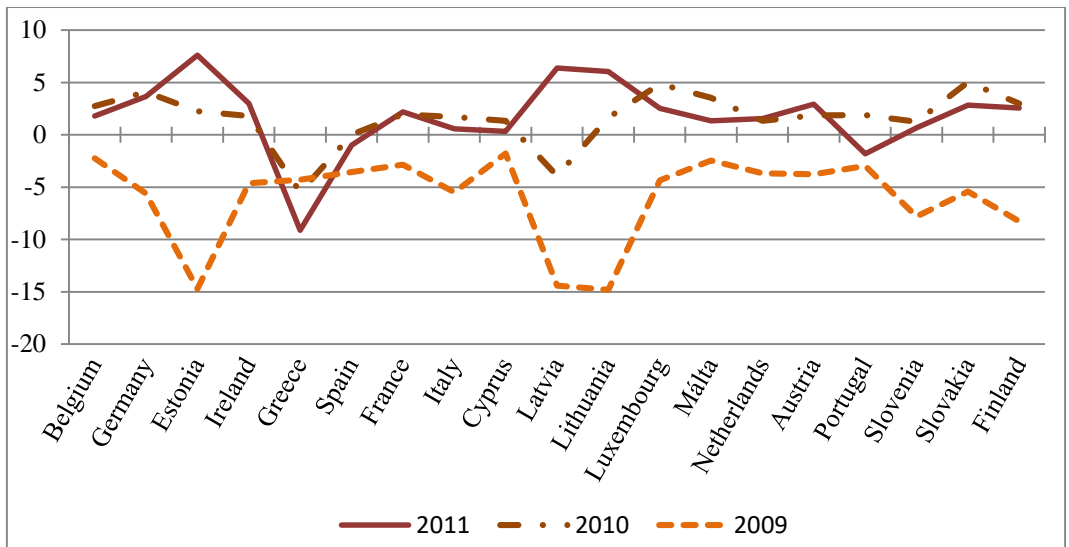
EA-15 (1 January 2008 - 31 December 2008): EA-13 + Cyprus (CY) and Malta (MT)

EA-16 (1 January 2009 - 31 December 2010): EA-15 + Slovakia (SK)

EA-17 (1 January 2011 - 31 December 2013): EA-16 + Estonia (EE)

EA-18 (from 1 January 2014): EA-17 + Latvia (LV)

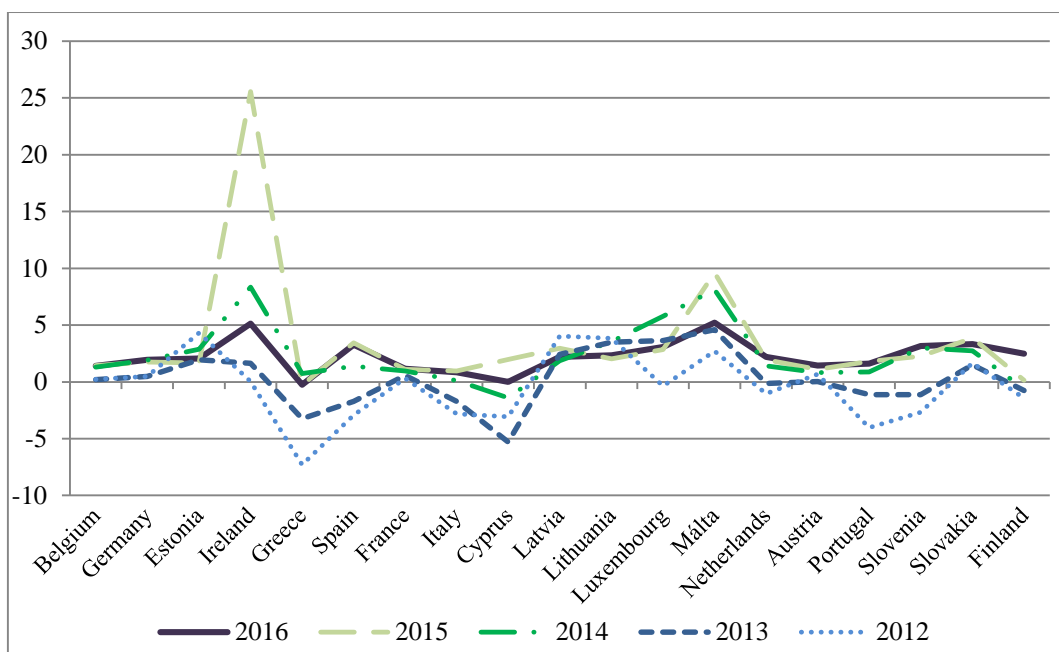
EA-19 (from 1 January 2015): EA-18 + Lithuania (LT)



Graph 8 Gross Domestic Product at Market Prices in EMU 2009-2012

Source: Author

The global financial and economic crisis reached the EU economies in the second half of 2008. It resulted in a fall in GDP value in all EMU member states in 2009 compared to the previous year and was followed by slight upturns in the next period.



Graph 9 Gross Domestic Product at Market Prices in EMU 2012-2016

source: Author

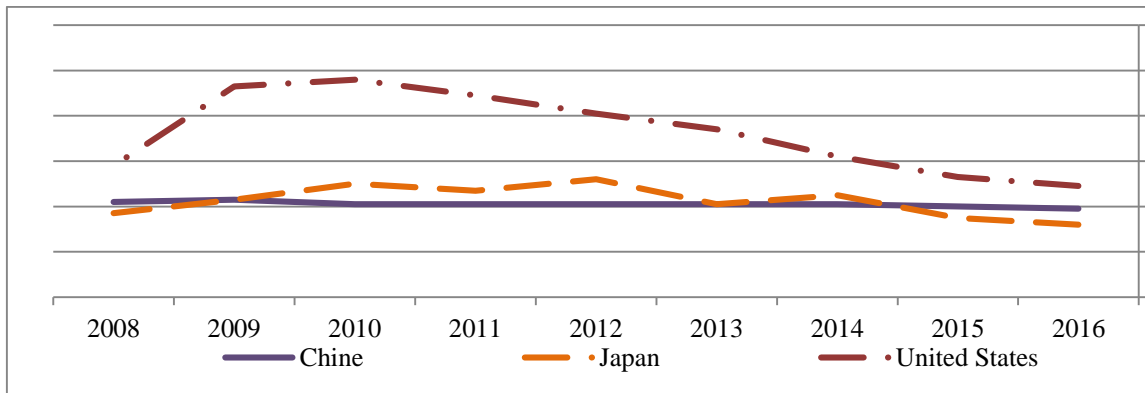
Year 2012 did not see significant results, while 2013 - following sovereign crises and slight upturns and downturns - showed a modest increase, which accelerated by 2015. In general, it was due to the effectiveness of the measures aiming to mitigate the negative impacts of the financial crisis. Despite visible differences in the performance of the member states, year 2016 can be regarded as the year of stabilization.

9.2.3. Unemployment

The graphs in this chapter display the changes in the unemployment in China, Japan, and US between 2008 and 2016; in EMU between 2008 and 2011 and in the period of 2012-2016. See graphs 4, 5, 6 . Graph 10 shows unemployment in EMU in 2008 and in 2016. The graphs made by the author are based on data of:

- <https://www.japanmacroadvisors.com/page/category/economic-indicators/labor-markets/unemployment-rate/>

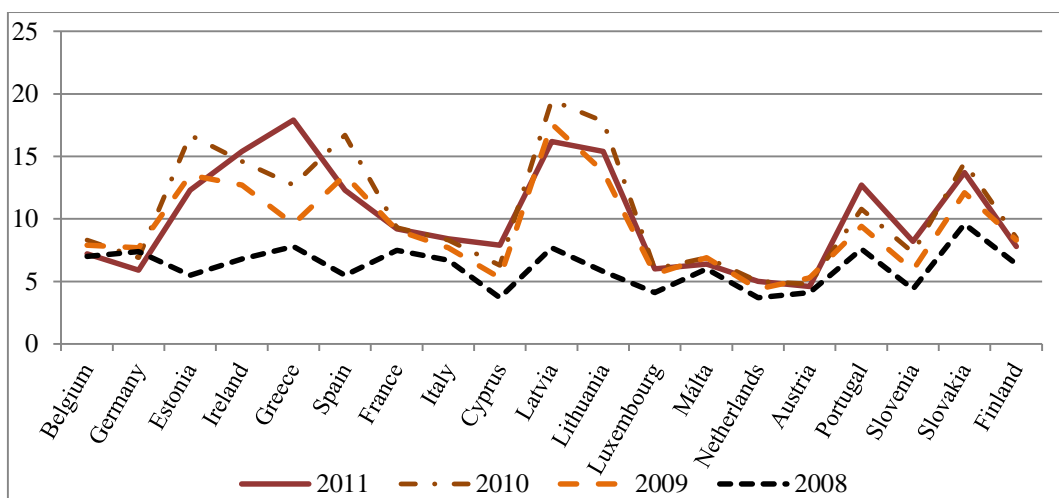
- <https://www.statista.com/statistics/193290/unemployment-rate-in-the-usa-since-1990>
- <https://knoema.com/atlas>



Graph 10 Unemployment Rate in China, Japan and United States 2008-2016

source: Author

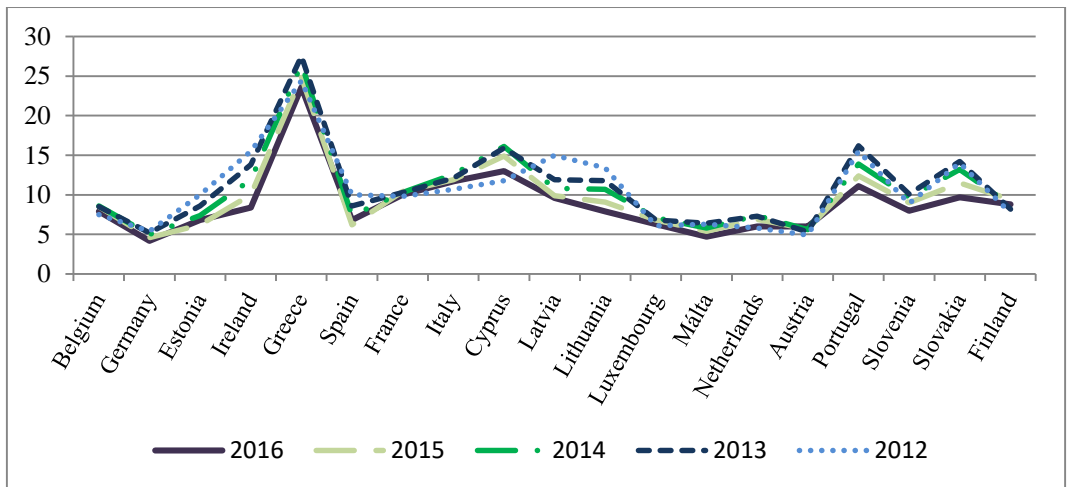
While the US economy was adversely affected by high unemployment rate reaching its peak of 9.6 percent in 2010, the rate in China with 3.9 percent the lowest and 4.3 percent the highest and in Japan 3.2 percent the lowest and 5.2 percent the highest showed a stable value. Due to its relatively closed banking system, the crisis did not affect China through its financial sector. The performance of the Chinese economy is basically determined by its export and import, being the leading exporter of the world since 2009.



Graph 11 Unemployment Rate in EMU 2008-2011

source: Author

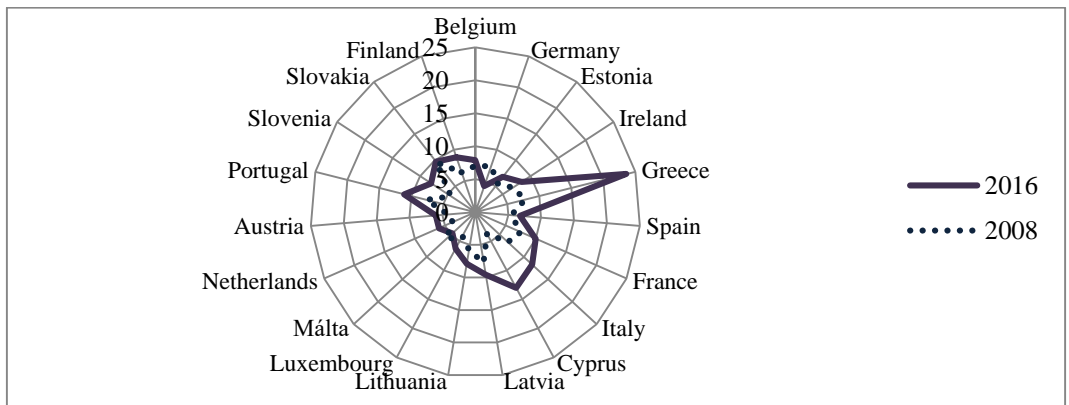
Unemployment rate in EMU member states in 2008 varied between 3.7 percent and 7.7 percent . Slovakia was the outlier with its rate of nearly 10 percent (9.6). 2009 is regarded as the first year of the crisis. Despite the differences in the member states, the increasing rate of unemployment in consequence of the crisis shows apparently. The rate varied between 3.7 percent and 7.7 percent in Germany, Malta, Austria, Luxembourg and the Netherlands, while in Estonia, Greece, Spain, Latvia, Lithuania and Slovakia it was as high as 15 percent or over. The responses of economic policies were of two kinds: they included austerity measures or fiscal expansion.



Graph 12 Unemployment Rate in EMU 2012-2016

source: Author

Following the crisis, in the period of 2012-2016, unemployment rate decreased gradually to values under 10 percent again by 2016, except for Greece, Italy, Cyprus and Portugal.



Graph 13 Unemployment Rate in EMU in 2008 and in 2016

Source: author

Graph shows the rates' taking up values closer to those prior to the crisis, which policy measures seem to have been successful.

A period from the mid-1980s to the mid-2000s is known as the Great Moderation. Economies in the world saw a decline in the volatility of output and a reduction in inflation at the same time. The Okun correlation typically

was large before the Great Moderation, which means that one percentage point increase in the unemployment rate was associated with approximately a three-percentage-point in output growth. Countries, however, showed great differences within the average value.

During the 1990s and early 2000s, the average Okun correlation gradually dropped to nearly one-to-one at its lowest point and differences across countries narrowed remarkably (Gordon 2011).

The global financial crisis both raised the country Okun correlation and increased its variability across-countries as countries adopted different labor market policies to adjust output. The global financial crisis affected labor markets differently. In the US, the Okun correlation is lower than in some European economies, e.g. in Greece or Spain. In the US, the unemployment rate nearly doubled from its level before the crisis. In 2009, the observed decrease in GDP corresponded to a higher increase in the unemployment rate than Okun's law would predict.

The unemployment rate increased much less in the UK and hardly changed in Germany, despite larger drops in gross domestic product.

Relationships between output and unemployment were more homogeneous across countries since the 1970s. The global financial crisis, however, turned the cross-country convergence of the Okun relationship backwards. It reflects the different pathways countries responded to the crisis.

9.3. EXAMINATION OF FINANCIAL STABILITY SUBSEQUENT TO THE FINANCIAL CRISIS IN THE PERIOD OF 2012 – 2016

Central banks are increasingly responsible for meeting both „traditional“ monetary objectives and macroprudential objectives aimed at ensuring financial stability. Financial stability is a state in which the financial system is resistant to economic shocks and can smoothly fulfil its basic functions: the intermediation of financial funds, management of risks and the arrangement of payments. An unstable financial environment can hinder the sound and sustainable development of the economy even if shocks do not result in crises.

The ultimate goal of macroprudential policy is to mitigate excessive systemic financial risks.

Significant progress has been made in this field. At the structural level, policies have been designed to alleviate the „too big to fail” problem. A set of common rules has been agreed on at the international level; the measures have been implemented. At the cyclical level, the countercyclical capital buffer is the instrument of choice at the international level (Basel III). Systemic risk can be defined as „a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy” IMF (2009 October, p.2). Systemic financial risks can be divided into two types: cyclical and structural systemic risks. Market imperfections in financial intermediation and vague risk perception lead to excessive risk-taking, which may be, in a financial crisis, replaced by excessive risk aversion. Cyclical systemic risks refer to this phenomenon. Structural systemic risks refer to the contagion effects, which means that the crisis can spread fast due to the interconnectedness of financial participants.

The new macroprudential responsibilities had to bring new policy tools, which raised principal policy design problem for central banks. Based on systemic risk phenomena, **macroprudential policy objectives** can be defined as follows:

- i. Preventing excessive credit growth
- ii. Managing liquidity risks
- iii. Restricting excessive concentration
- iv. Dealing with SIFIs to avoid moral hazard
- v. Strengthening the resilience of financial infrastructures.

Countercyclical prudential policies that reduce systemic risks and include countercyclical capital regulation and loan loss provisioning requirements are the components of the new framework. This research aims to

examine how macroprudential policies can strengthen the resilience of the global financial system.

The prevailing EU bank regulatory framework is based on the regulation on *prudential requirements* for banks and financial institutions (Capital Requirements Regulation – CRR, and on the directive on the *prudential supervision* of these institutions (Capital Requirements Directive IV – CRDIV).

9.3.1. The Methodology of Research

This chapter examines the effectiveness of capital adequacy rules through financial statement data. Limited access to accounting databases of central banks made the research difficult. Nevertheless, I managed to get access to financial statement data to nine systemically important financial institutions (SIFIs) with headquarters in Hungary, the national bank of which (MNB), as macroprudential authority, uses its reinforced mandate proactively. Using that database enabled me to analyze the annual changes in the relevant ratios in each of the selected banks.

Although the research does not create a basis to international comparisons, in view of the findings, its extension to other economies may be reasonable.

I examined 11 ratios, out of which I dealt with two profitability indicator ratios: the Return on Net Assets (ROA) and the Return on Equity (ROE) in detail. They are commonly used in the international practice. I used R statistical software and adapted panel regression to make my analysis. Analyzing panel data enabled to reveal the cause-effect relation in financial statement data of the selected banks. As a particularity of the method, it enables us to divide the dependent- and independent variables relation i.e. to examine idiosyncratic effect.

Based on balance sheet and profit and loss statement data, my research aimed to find out whether there is significant divergence in the stability and

risk-taking of the examined banks. The interval of the analysis spans five years. I set 2012 as a base year, as the impact of the crisis was quite strong then. The interval of five years allows to present the changes in relevant ratios both by years and banks. Thus heterogeneity could be examined in terms of banks and years.

Panel data analysis is a statistical method, widely used in econometrics to analyze two-dimensional, typically cross sectional and longitudinal, panel data. Panel data or longitudinal data are multi-dimensional data involving measurements over time. Panel data contain observations of multiple phenomena obtained over multiple time periods for the same firms or individuals. It is a useful tool in modelling complex economic relations. These are models that combine cross-section and time-series data.

In panel data the same cross-sectional unit (industry, firm and country) is surveyed over time, so we have data which is *pooled* over space as well as time (Wooldridge, 2010). It is better in detecting and measuring the effects which cannot be observed in either cross-section or time-series data. Panel data enables the study of more complex behavioral models – for example the cause-effect relation in financial statement data of the selected banks that I examined. It makes detecting and measuring the effects which cannot be observed in either cross-section or time-series data possible. A further reason for using panel data is that by combining data in two dimensions, it provides more data variation, less collinearity and more degrees of freedom.

Panel data analysis has three techniques:

- (i) **Fixed effects models:** fixed effects model is used when there are unique attributes of individuals that do not vary across time.
- (ii) **Between effects models:** between effects model is employed when there are unique attributes of individuals that vary across time.
- (iii) **Random effects models:** random effects models can be regarded as the combination of the models mentioned above, and the key assumption is that the variables observed are constant over time, but there are differences across units; or the opposite: they vary over time but are constant across.

Fixed effects (i) and Random effects models (ii) take the form of:

$$y_{it} = \alpha_{it} + \beta_{it}^T x_{it} + u_{it} \quad (i)$$

where

y_{it} = dependent variable

x_{it} = independent variable

$i = 1, \dots, n$ indice for individuals

$t = 1, \dots, T$ indice for time

u_{it} = the individual (x_i) error term

When modelling individual-specific effects, the assumption is that error term in the model consist of two independent parts, one out of which depends on individual and do not vary over time.

$$y_{it} = \alpha_{it} + \beta_{it}^T x_{it} + u_{it} + \varepsilon_{it} \quad (ii)$$

where

ε_{it} = idiosyncratic error term

The algorithm applied to the model depends on the properties of the two error terms. The ε_{it} idiosyncratic error term is assumed not to correlate with the x_{it} independent variable or the u_{it} error term. Contrarily, u_{it} error term either correlates or does not correlate with the x_{it} independent variable. The method

for estimating the model is determined by whether there is a correlation between the u_{it} error term and the x_{it} independent variable or not (Greene, 2012, p. 383). In case of correlation, it is a fixed model, put differently, a Least Squares Dummy Variables (LSDV) model, and the Ordinary Least Squares (OLS) method is applied to estimate it. If the u_{it} error term and the x_{it} independent variable do not correlate, random effects model is useful, with the Generalized Least Squares (GLS) or Feasible Generalized Least Squares (FGLS) estimation methods, which use the estimated variance-covariance matrix (Croissant and Millo, 2008).

One advantage of *the random effects model* is that it can manage the autocorrelation between the two error terms ($v_{it} = u_{it} + \varepsilon_{it}$), with the help of the two methods mentioned above. The estimation of the random effects model is more difficult than that of the fixed effects model, as with no correlation between the variable observed and the u_{it} error term, strong assumption of exogeneity should hold. (Wooldridge, 2013). According to the strong assumption of exogeneity, the probability that the current values of the data in the sample are influenced by errors from the past, can be excluded. In this regard, the fixed effects model is less restricted than the random effects model.

The Hausman specification test (Hausman, 1978) helps evaluate if a statistical model corresponds to the data. According to the alternative hypotheses of the Hausman test (see table 9), fixed effects model is consistent, while random effects model is inconsistent. The test evaluates the consistency of an estimator when compared to an alternative, less efficient estimator, which is already known to be consistent.

Table 9 The Hypotheses of the Hausman Test

	H₀ is true	H₁ is true
REestimator	Consistent Efficient	Inconsistent
FEestimator	Consistent Inefficient	Consistent

source: Tarnóczy, T. – Fenyves, V. – Bács, Z. – Bácskei, E. (2015)

In the null hypothesis of the Hausman test, with no correlation between the error term and independent variable, the Ordinary Least Squares (OLS), the Least Square Dummy Variable (LSDV) and the Feasible Generalized Least Square (FGLS) methods are consistent, out of which, the first one is inefficient.

In alternative hypothesis, the Least Square Dummy Variable (LSDV) method is consistent, the Feasible Generalized Least Square (FGLS) method is inconsistent (Greene, 2012, p. 420).

The alternative hypothesis is rejected when the Hausman test p-value is higher than 0.05, which means that the random effects model is consistent.

The coefficient of determination (R-squared) is used to assess the goodness-of-fit of panel models, put it differently, to measure how close the data are to the fitted regression line. It is the percentage of the response variable variation that is explained by a linear model:

$$R\text{-squared} = \text{Explained variation} / \text{Total variation}$$

R-squared is always between 0 and 100%:

- 0 percent indicates that the model explains none of the variability of the response data around its mean.
- 100 percent indicates that the model explains all the variability of the response data around its mean.

In general, the higher the R-squared, the better the model fits the data.

9.3.2. The Examination of the ROA and the ROE Ratios of SIFIs with Headquarters in Hungary

Statistical analysis was made for the nine relevant SIFIs with headquarters in Hungary based on their financial statement data for the period of 2012-2016. The institutions are as follows.

- Budapest Bank
- CIB Bank
- ERSTE
- FHB
- Unicredit Bank
- MKB
- OTP
- Raiffeisen Bank
- Sber Bank

I used R statistical software *plm* module to do panel regression for financial ratio relations. Both fixed effects and random effects panel regressions were run with calculating their unidirectional and two-directional versions. R includes different variance estimation methods for random effect panel regression: the default method Swar (Swamy and Arora, 1972), Walhus (Walace and Hussain, 1969), Amemiya (Amemiya, 1971) and Nerlove (Nerlove, 1971) methods. I employed Swar and Amemiya methods. I used the Hausman test to select the panel model best corresponding to data in the examination.

Table 10 The Effect of Total Ratios of the Banks in the Examination

	Effect	Degree of freedom	Pillai test	F estimation	Numerator degree of freedom	Denominator or degree of freedom	Significance P-value	Significance
Effect of total ratios	Bank	8	3,751 6	3,002 5	80	272	0,000%	***
	Residuum	36						

source: Author, based on the database of the banks (with R software)

Based on their financial statement data, I examined the most relevant indicators of the 9 SIFIs in the examination. One objective of the research was to demonstrate to what extent the ratios indicate the changes of the past five years concerning capital adequacy rules and reducing risks of the banks. Based on examining the effect of total ratios of the banks in the examination, the result shows significant differences between banks.

Table 11 The Effect of Individual Ratios of the Banks in the Examination

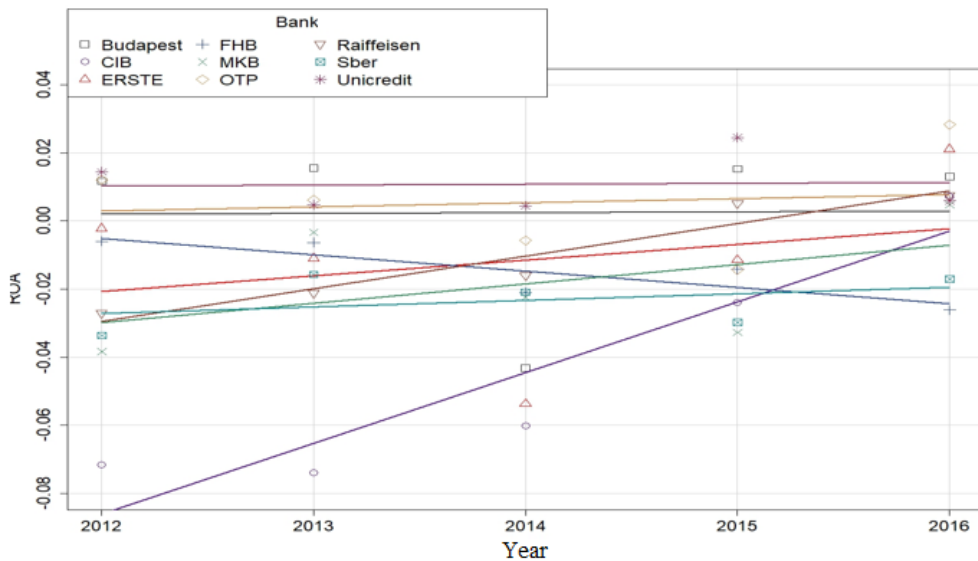
Ratio	Effect	Degree of freedom	Sum of squares	Mean squared deviation	F-test value	Significance P-value	Significance
ROA	Bank	8	0,0113	0,0014	3,43	0,494%	**
	Residuum	36	0,0148	0,0004			
ROE	Bank	8	1,4900	0,1862	2,97	1,168%	*
	Residuum	36	2,2581	0,0627			
Loan / Deposits	Bank	8	7,2112	0,9014	3,04	1,024%	*
	Residuum	36	10,6768	0,2966			
Loans / Total assets	Bank	8	0,3945	0,0493	4,75	0,049%	***
	Residuum	36	0,3738	0,0104			
Net interest income / Total income	Bank	8	0,6971	0,0871	5,02	0,031%	***
	Residuum	36	0,6250	0,0174			
Cash / Total assets	Bank	8	0,1175	0,0147	6,36	0,004%	***
	Residuum	36	0,0831	0,0023			
Provisions/ Liabilities	Bank	8	0,0005	0,0001	0,52	83,006%	
	Residuum	36	0,0043	0,0001			
Loan capital / Equity	Bank	8	1,3255	0,1657	3,86	0,227%	**
	Residuum	36	1,5449	0,0429			
Intangible assets and goodwill / Total assets	Bank	8	0,0005	0,0001	4,96	0,035%	***
	Residuum	36	0,0005	0,0000			
Total operational income/ Total assets	Bank	8	0,0716	0,0090	13,09	0,000%	***
	Residuum	36	0,0246	0,0007			
Net provision and fee income / Total income	Bank	8	0,3864	0,0483	12,78	0,000%	***
	Residuum	36	0,1361	0,0038			

Source: Author, based on the database of the banks (with R software)

Examination refers to 11 ratios. Significant differences are displayed except for Provisions/Liabilities ratio. My research deals with two relevant profitability ratios: ROA (Return on Net Assets) and ROE (Return on equity) in detail.

9.3.2.1 The Examination of the ROA Ratio

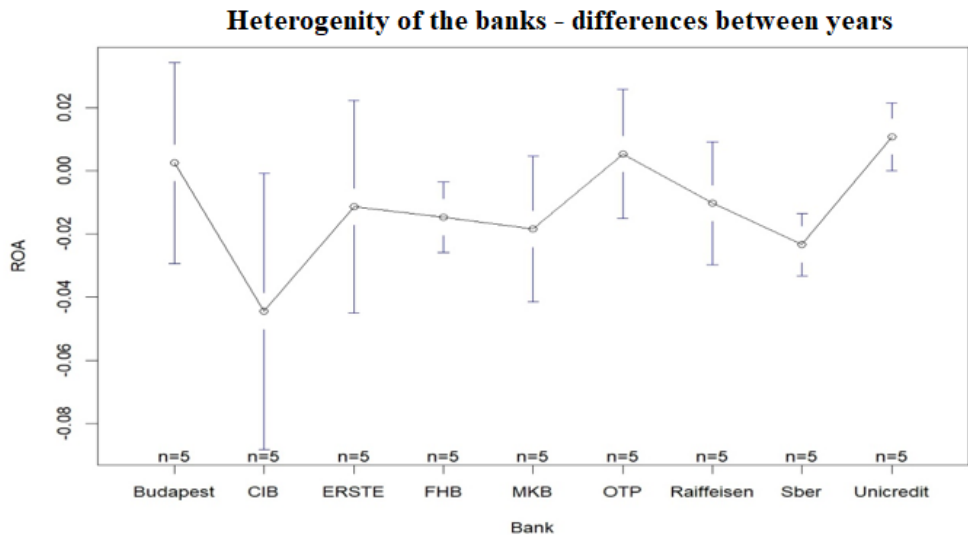
The ROA ratio is the most common profitability indicator used internationally. It is calculated to see how effectively a company deploys assets to generate sales and eventually profits. It measures the net income produced by total assets during a period by comparing net income to the average total assets.



Graph 14 The Value of ROA Ratio of the Banks in the Examination

Source: Author, based on the database of the banks (with R software)

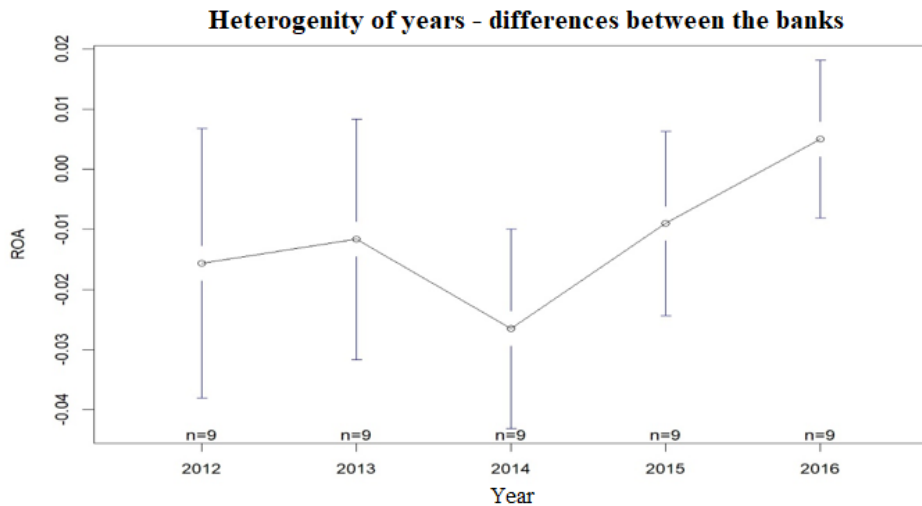
The trend lines fitted to ROA ratio values clearly demonstrate that the ratios of the Unicredit and the Budapest Banks stably present values above 0.00. The most dynamic rise was produced by CIB; by 2016, it had approached the earning ability of the other banks starting from the value of -0.08 . The FHB is the only bank to show a declining trend, which demonstrates that the earning ability of its assets constantly decreased between 2012 and 2016.



Graph 15 Heterogeneity of the Banks Related to the Value of the ROA Ratio

Source: Author, based on the database of the banks (with R software)

Graph 15 on the heterogeneity of the banks clearly demonstrates the rising trend of the ratio in case of the CIB. The least deviation can be seen in case of the Unicredit, the Sber and the FHB. For the latter one, however, the ratio deteriorated, though slightly.



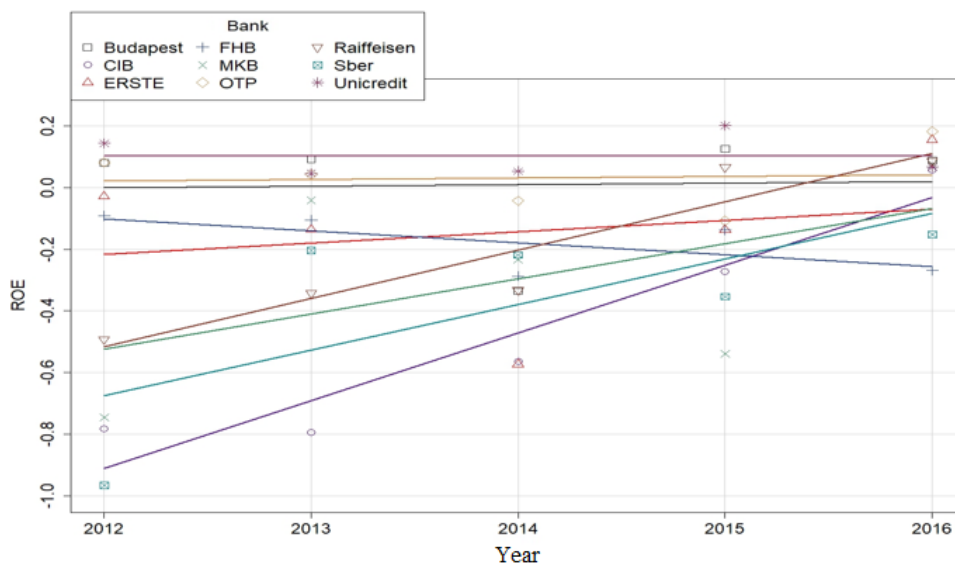
Graph 16 Heterogeneity of the Years Related to the Value of the ROA Ratio

Source: Author, based on the database of the banks (with R software)

Yearly examination of heterogeneity shows a decrease in the deviation of the ratio relative to the base year of 2012; furthermore it presents an improving value. In 2014, however, there was a slight break owing to the low value of the FHB, as the the ratio worsened the most in that year.

9.3.2.2. The Examination of the ROE Ratio

Return on equity (ROE) is the amount of net income returned as a percentage of shareholders' equity (net income/average shareholder's equity). ROE is useful when comparing the profitability of a company to that of other firms in the same industry. It shows how effectively the company turns the cash put into the business into greater gains and growth. The higher the return on equity, the more efficient the company's operations. The ratio measures a corporation's profitability by revealing how much profit a company generates with the money the shareholders invested.

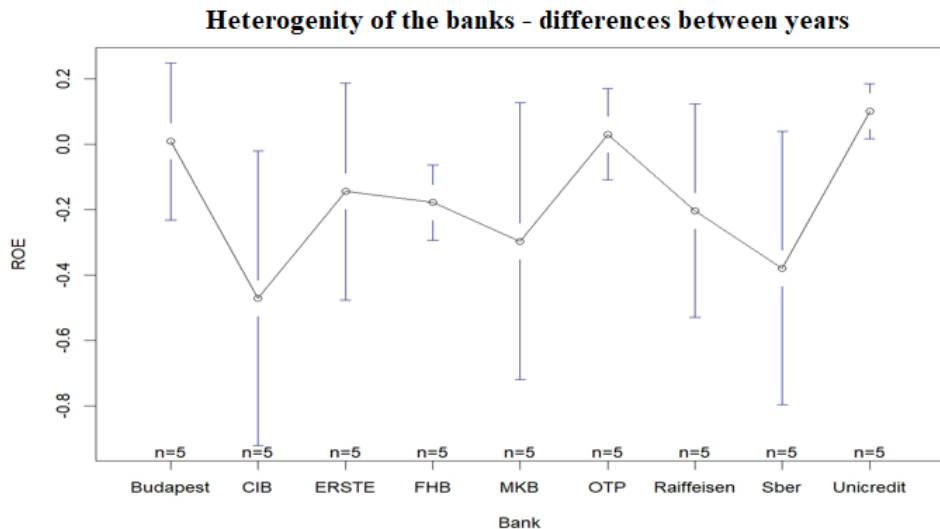


Graph 17 The Value of ROE Ratio of the Banks in the Examination

Source: Author, based on the database of the banks (with R software)

When analyzing this ratio, it is useful to follow the change related to the previous years. Similarly to the ROA ratio, the value of the ROE ratio shows a steady increase in the years of the examination. Regarding this ratio, the FHB is the only bank to present a declining trend contrary to the other banks in the examination. The trend lines fitted to ROE ratio values clearly illustrate that the ratios of the Unicredit and the Budapest Banks present steady values above 0.00.

In terms of both ratios, year 2012 still reflects the effects of the financial crisis, while the subsequent years show a progressive improvement.

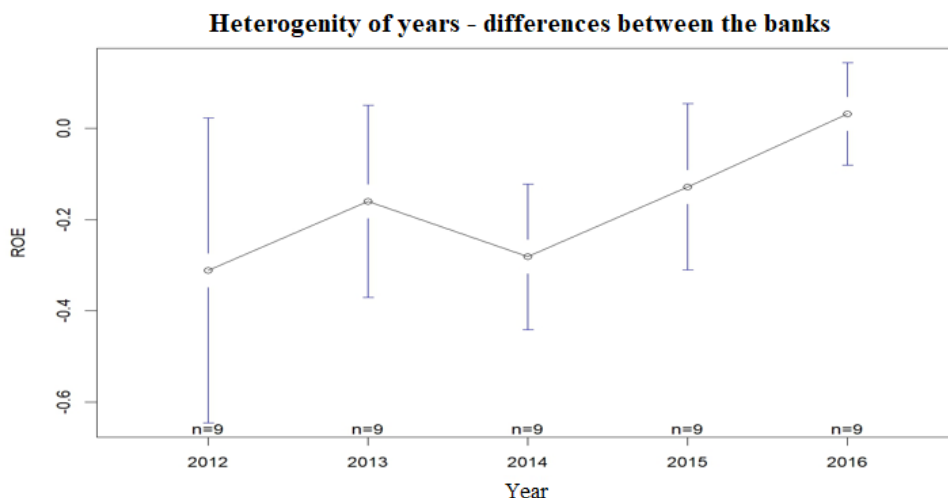


Graph 18 Heterogeneity of the Banks Related to the Value of the ROE

Source: Author, based on the database of the banks (with R software)

ROE values are outstanding for the Unicredit, the Budapest Bank and the OTP, regarding that deviation was the least in case of the Unicredit and the OTP. Deviation was similar in FHB, nevertheless, similarly to the ROA ratio, the ROE ratio presents a deteriorating trend in this bank. Minus values of this ratio in the CIB, the Sber and the MHB (-0.8; -0.7) indicate that their investments carried a relatively high risk, however, they have moderated by now.

The most dynamic rise was achieved by the CIB, while the MKB and the Sber produced a remarkable pace of growth as a result of which, the MKB could show a positive value of the ratio by 2016.



Graph 19 Heterogeneity of Years Related to the Value of the ROE

Source: Author; based on the database of the banks (with R software)

The examination of the heterogeneity of the years supports the results presented above that banks' capital adequacy ratio shows a clear improvement. Its value is close to 0.00 on the whole, with slight standard deviation. Findings obviously underpin the improving trends of the past years. This mainly stems from the prudential regulation of solvency capital, which gained special importance by the development of measuring and managing risks. It is the level of capital requirement that is able to face all quantifiable risks to which a financial institution is exposed and sets limits to excessive risk-taking. Basel III is intended to strengthen bank capital requirements by increasing bank liquidity and decreasing bank leverage. Furthermore, Basel III introduced two additional capital buffers:

- i.) A mandatory „capital conservation buffer”, equivalent to 2.5 percent of risk-weighted assets
- ii.) A discretionary „counter-cyclical buffer”, allowing national regulators to require up to an additional 2.5 percent of capital during periods of high credit growth.

The impact of prudential regulation is clearly seen in the performance of the banks; in 2017, all large banks became profitable in Hungary. The improving trend even had an impact on institutions that had been typical loss-makers since the financial crisis. At the end of 2017, only seven institutions of all banks and branches reported losses after-taxation, which is an improvement compared to the nine institutions at end of 2016. The share of loss-making institutions weighted by balance sheet total fell from 5 percent to 3.3 percent in annual terms (MNB 2018).

As macroprudential authorities, the central banks have the opportunity to enhance the shock resilience of the financial system and to address or prevent the build-up of systemic risks.

9.4. THE ASSESSMENT OF THE HYPOTHESES

My first hypothesis that the global financial crisis has widened the existing divergences, as well as the gaps between the respective legal frameworks and prevailing two-tier relationships of the central banks has been testified by comparing the selected five central banks. The prevailing two-tier relationship has been changed by the financial crisis: by sacrificing some independence, the central bank moves closer to government, while increases its direct control over the markets. The two-tier relationship has changed due to the crisis as follows.

- i.) Before the global financial crisis the five central banks operated within similar legal frameworks but in fact with different levels of independence and at varying distances from the financial markets.
- ii.) During the crisis, crisis management solutions, including monetary policy adjustments and LOLR facilities, simultaneously moved the central banks towards the governments and the financial markets.

iii.) Following the crisis, reforms have intended to rebuild their two-tier relationships. I have concluded that the two-tier relationship is relatively dynamic. The global financial crisis made it evident that in terms of convergent crisis management solutions, the five central banks had different focuses and approaches.

In summary, within similar legal frameworks, the five central banks operated during the global financial crisis in different relationships with their governments and the markets; they relied on different approaches and focuses to restore financial stability; and accordingly, their two-tier relationships have been affected by the crisis in different ways.

My research has provided evidence to *the second hypothesis* of the study that the incomplete design and the structural weaknesses of the EMU constrained its fiscal and monetary policy maneuvering. The euro was designed in response to the „old” trilemma of the impossible maintenance of free capital flows, stable exchange rates and independent monetary policies at the same time. Countries with independent currencies can in principle turn to money creation to support their financial systems in times of stress. Countries without independent currencies, in the same way as countries that borrow in foreign currency, are more prone to default. At the core of EMU’s vulnerability stands the impossible trinity of strict no-monetary financing, bank-sovereign interdependence and no co-responsibility for public debt.

The examination of the central banks from different aspects supports *the third hypothesis* that with the global financial crisis in general and its impact on financial stability in particular, the independence of central banks was weakened by their respective governments. Reduced independence can mitigate the central banks’ market-oriented principles.

The relationship between the central bank and the government is more complicated than the principal legal provision alone. Similar operational independence was granted by law, but the actual levels of autonomy

distinguished market-oriented from government-controlled central banks. My research revealed that the global financial crisis expanded certain divergences between the five selected economies including EMU. Between the US Fed and the BoE, more differences in independency and financial regulatory regimes became evident, while further gaps emerged between market-oriented and government-controlled central banks, the BoJ and the PBC. For the market-oriented central banks, independence was still desirable, with an increasing focus on systemic stability, but the BoJ and the PBC faced domestic challenges, rather than the crisis-driven changes in the US, the UK and the European Monetary Union. The crisis enhanced the triangular relationship, i.e. the government and the central bank worked more closely towards controlling financial markets, and the changed two-tier relationship became characterized by reduced central bank independence and increased government intervention in the markets.

The study on the PBC, the BoJ and their environment evidenced *the fourth hypothesis* on the main goals of central banks in developing countries. This crisis has brought central banks closer to the broader policies of their governments, and also to the financial markets. In my dissertation, I focused on two Asian economies with some specific features in common: both had state-led economic growth: they had progressed from underdeveloped financial markets, weak legal systems, dysfunctional governance and unbalanced industry policies, and their governments played an active role in their rise.

The recent crisis has forced changes that have reshaped the role of central banks, challenging the ways in which they continue to commit to their orientations.

It has been further confirmed as a reform principle for developing countries in the post-crisis era that one leading goal for central banks in developing countries is to support financial sector development.

The examination of central banks' exit strategies from the unconventional monetary policies and the study on the role of central bank balance sheet supports *the fifth hypothesis* that central bank balance sheets have got a special emphasis in their role as the new tool of monetary policy, but does not support that setting interest rates will be replaced by balance sheet portfolio actions. More precisely, I conclude that the short-term interest rate will continue to be a monetary policy tool, which can be effectively exercised by changing the composition of liabilities from bank reserves to other types of liabilities. In addition, it is the central bank's option whether to sell longer-term securities and affect the term structure of rates or to raise short-term rates. Although there is a certain trade-off between the two techniques, the right order of their employment is vital to achieve the same macroeconomic goals.

9.5. SUMMARY AND CONCLUSIONS

In terms of the euro area, the search for solutions to the euro crisis is based on a partial diagnosis and a misdiagnosis. The first overemphasises the lack of enforcement of existing fiscal rules. The second places the blame on government profligacy. It is true that the euro area has suffered from a lack of fiscal discipline. But this is not the source of the crisis. Non-effective solutions stem from these two mistakes. The vulnerability of the euro area is caused by the impossible maintaining of no co-responsibility for public debt, no-monetary financing and sovereign interdependence: the „trinity”.

Governments in the euro area are individually responsible for the debt they have issued. This principle, known as the „no bail-out” clause is to prevent moral hazard. The philosophy behind suggests a definite separation between fiscal and monetary policy. The ECB does not have a strong financial-stability mandate that could justify intervention. Whereas the euro area is integrated monetarily, banking systems are still national. It implies that the member states are vulnerable to the cost of banking crises.

There are legal and political obstacles to broadening the mandate of the ECB similar to other major central banks.

The new governance instruments for the euro area comprise the EU's fiscal response to the crisis. Its main elements are rescue plans, reinforcement of fiscal discipline and macroeconomic surveillance represented by the Six Pack, the European semester, the Euro Plus Pact for economic policy convergence and the European Stability Mechanism. All those response measures to the crisis could not prevent it from expanding, and were unable to curb the spiral of the euro crisis.

The instruments addressed wide range of fiscal and macroeconomic issues, which could threaten the sustainability of the economic and monetary union. The measures have one thing in common: they seem to have avoided the core problem i. e. the level of political and economic integration the euro area member states are prepared to accept. The crisis let real structural weaknesses come to the surface and be perceived.

The incomplete nature of EMU and the member states' refusal to commit to a closer political integration is an aggravating element in the crisis. In addition, the fact that the member states are differently involved in EMU indicates that the different elements of the new governance cannot be integrated in an overall project due to different levels of constraint and commitment. Consequently, all the stages of the management of the crisis have focused on austerity, discipline, surveillance and sanctions.

It is not budgetary indiscipline that was at the origin of this crisis. The pre-crisis figures compared with those after its emergency clearly show that. In 2007, the average budget deficit of the 27 member states was 0.9 percent of GDP, substantially below the 3.0 percent threshold. The rise of this level to above 6.0 percent in 2009 and 2010 was due to the the financial crisis and its economic consequences. The average public debt of the member states from 1999 to 2007 went from 65.7 percent of GDP to 59.0 per cent, which is also

below the threshold. From 2008 to 2010 the crisis raised it to 80.1 percent (De Grauwe, 2011).

It is likely that the wrong diagnosis of the reason for the crisis led to austerity measures and later to the austerity spiral. In my opinion austerity might be a tool as long as it counterbalance profligacy. Generalized austerity only serves to deteriorate the sovereign and private debt crisis. If the main goal was to reassure the financial markets so that they would trust in the euro area again, the new European economic governance and budgetary rigour were effective.

To see whether the goal of economic stability was achieved, the euro area economies need to be analyzed in terms of the macro stability pentagon i.e. economic growth rate, unemployment rate, inflation rate, budgetary balance and current account balance. Research has revealed some improvements in budgetary and current account balance (Żuchowska, 2013), (Armingeon and Baccaro, 2012), (Hurduzeu and Lazar, 2015) nonetheless, the euro area faces inflation that is too low, with several countries registering negative rates, that is expected to last and high unemployment according to Annual Growth Survey 2015.

Central Banks in general were set up to deal with the inherent instability of capitalism. They were not created to maintain price stability. The instability of capitalism arises because financial institutions are involved in the cycles. The central bank as lender of last resort provides liquidity not only to the banking sector but to the government bond markets as well. When problems in government arise, sovereign bond prices drop extending the problem to the banks causing insolvency resulting in a vicious circle.

Optimal currency area theory considers exogenous shocks rather than the endogenous dynamics of capitalism. Endogenous dynamics of booms and busts effect on the level of national economies even within the Monetary

Union. Central bank as the lender of last resort is supposed to counterbalance the instability of capitalism stemming from its nature.

Countries with independent currencies can turn to money creation to support their financial systems in times of stress. Economies with a common currency as well as economies that borrow in foreign currency are more prone to default.

My argument is that the turmoil in the world economy and in the euro area in the period after the outburst of the crisis stems from the financial vulnerabilities of the incomplete design of the Economic and Monetary Union. I argue that financial integration and independent national fiscal policy does not create financial stability.

Central banks have developed around their changed two-tier relationships. Increasing independence, they have moved away from strict banking regulation and supervision, and their two-tier relationships have generally been changed by financial crises, enhancing interaction between the government, the central bank, and the banking sector.

With more frequent cross-border financial crises, central banks have had to increase regional and international financial cooperation.

To deal with systemic risk, both private and public solutions can be viewed as inevitable. Public resolution techniques may include preventive solutions, which focus on reducing risks before they undermine banks by monitoring their management, capital, solvency, liquidity standards, and large exposure limits. These are protective skills, also called „rescue packages”, which in practice target the most affected parts within financial markets. Prudential regulation is widely employed between these two systems.

With strong authority and the proper means to manage financial systemic risks, central bank commitment in terms of financial stability implies:

- i.) Monetary policy instruments are primarily aimed at monetary stability;
- ii.) Rising lending under the lender of last resort facility enables support of financial institutions and the markets;
- iii.) Prudential regulation to maintain systemic stability.

Central banks operate different policy instruments during financial crises and at other times, but their tasks are similarly related to financial stability.

The traditional role of central bank balance sheets, which is to ensure interbank liquidity through open market operations, has changed since 2008. To avoid the risk of a credit crunch and mitigate the negative impacts of the fall in economic growth, central banks applied unconventional tools. These measures include using negative rates and expanding and changing the composition of their balance sheets. Owing to central banks' increasing impact and changed role, I conclude, prices and market expectations rather depend on central bank actions than on fundamentals of the real economy.

9.6. THE NEW SCIENTIFIC RESULTS OF THE DISSERTATION

The crisis brought about important changes and reforms to the central banks and beyond. Demanding reinforced central bank regulation in order to achieve system-wide stability, the financial crisis changed their pre-existing two tier relationships, and also modified the ways in which the five selected main central banks converged with and diverged from each other.

The crisis has changed the government–market relationship in the West, while raised the level of direct government intervention in Japan and China, which requires a re-examination of the market or government orientation for these central banks.

Central banks are first and foremost institutions responsible for designing and implementing monetary policies. Further developing their organizational structures and replacing the strict hierarchy through functional

reorganization, they can be more diverse towards flatter management to deal with financial stability.

Central bank orientation can be affected by domestic vulnerabilities or external shocks; in the example of China it is rather domestic vulnerabilities that continue to affect the PBC's orientation.

The crisis has confirmed the importance of transparency with regard of the financial markets; most central banks have been required to improve their communications and transparency, the optimal level of which is difficult to determine due to the discretion granted by law.

The dissertation has revealed the factors lying at the core of the vulnerability of the euro area and aimed to find options ensuring its sustainability. I have concluded that EMU's fiscal and monetary policy maneuvering was constrained by its structural and operational weaknesses.

As for the ECB, the central bank of euro area member countries, it is fundamentally different from those of the other four selected central banks. Consequently, its legal governance as a supranational central bank for Europe's single currency places outside the same framework of the two-tier relationship.

The Fed and the BoE had implemented QE long before the ECB did; it has one primary objective, price stability and the others are subordinated to the first, while the Fed and the BoE have more than one, monetary stability and financial stability. This difference may provide an explanation to ECB's hesitant reaction.

The new governance instruments for the euro area comprise the EU's fiscal response to the crisis. The instruments addressed wide range of fiscal and macroeconomic issues, which could threaten the sustainability of the Economic and Monetary Union. Further coordination of the macroeconomic policies of the member states is necessary to promote the convergences of these economies. Owing to its specific status, the ECB can only be successful in

conducting monetary policy, which is burdened with additional responsibilities stemming from the crisis, if it relies on the fiscal policy to a greater extent in order to achieve the goals mentioned above.

Related to the macroprudential responsibility, the independence of central banks was weakened by their respective governments. Reduced independence can mitigate the central banks' market-oriented principles.

Relationships between output and unemployment were more homogeneous across countries since the 1970s. The global financial crisis, however, turned the cross-country convergence of the Okun relationship backwards. It reflects the different pathways countries responded to the crisis.

Central bank balance sheets have got a special emphasis in their role as the new tool of monetary policy. Due to the limits of central bank balance sheet expansion, qualitative easing is likely to replace quantitative easing in shaping the monetary policy.

9.7. FURTHER RESEARCH WORK

The assessment of the responses of the monetary policies conducted by the five central banks examined in this study opens new avenues for further research work from many aspects.

With respect of interest rates, I presume that there is a connection between the ECB and the Fed in terms of their interest rate decisions. I would use statistical analysis to demonstrate this relation. Further research is necessary to reveal whether the ECB interest rate decisions could be explained by the influence of the Fed's interest rate decisions or vice versa. I would go beyond statistical analysis in explaining the reasons.

My further research work will address the role of the common inflation target in a monetary union added to the various costs and benefits of forming a monetary union. Data collection will precede quantifying the ECB's optimal

inflation target. Country-specific data on price adjustment and estimates of members' optimal stand-alone inflation targets are necessary to obtain.

The global financial crisis has questioned the optimal model for central banking regarding the requisite institutional environment and design with good governance and institutional structures.

The essential relationship between central bank regulation and financial stability would require more comprehensive interdisciplinary study to analyze central bank regulation with special attention of maintaining financial stability.

One outcome from the post-crisis reforms confirms that central banks have taken up a reinforced macro-prudential regulation role with enhanced focus upon systemic stability. Further research questions may address the „twin-peak” model of market regulation.

9.8. PUBLICATIONS RELEVANT TO THE PRINCIPAL RESULTS

„Managing Financial Crises: Responses, Lessons, Prevention” In: Katarina Holla, Michal Titko, Jozef Ristvej (Editors) Crisis Management-Theory and Practice InTechOpen, London, UK, 2018 Print ISBN 978-1-78923-234-9, Online ISBN 978-1-78923-235-6, doi: 10.5772/intechopen.71641 pp.135-156.

„Risk Management at Global Level: Strengthening the Resilience of the Global Financial System” 25th Annual EUROMA Conference Proceedings 2018 June 24-26, Budapest <http://euroma2018.org/euroma-2018-proceedings/>.

„Monetary Policy Responses to the Global Financial Crisis. Shaping the Next Stage for the European Monetary Integration.” In: Tomas Klietnik (ed.) Globalization and its Socio-Economic Consequences, 16th International Scientific Conference Proceedings, October 5-7 2016 PTS I-V University of Zilina, pp. 2043-2051. (2016) ISBN: 978-80-8154-191-9.

„The Quest for the Stability of the Global Financial System”, Procedia Economics and Finance 2015 Vol.34 485-492, doi: 10.1016/S2212-5671.

„Is it the Crisis to Blame?”, Periodica Politechnica, Vol 22 No1 (2014) pp. 37-45 Online published: 16-05-2014 doi: 10.3311/PPso 7427.

„Responsibility and the Global Financial System. Quest for Stability”, Social Responsibility, Sustainable Economy, International Scientific Conference Proceedings, November 13 2013, Sopron ISBN: 978-963-334-144-5, pp.100-109.

„Will a „European Monetary Fund” be capable of Maintaining the Stability of the Eurozone?”, Regional and Business Studies, vol 3 suppl 2, ISSN 2061-2311, Kaposvári Egyetem, Kaposvár, 2011.

„The Financial Crisis and its Impacts on Government Debt”, Technological Educational Institute of Crete, Greece, Research Seminar, September 23-28, 2010.

„The Criteria and the Date of the Euro-adoption in Hungary, and its Impacts on the Economy”, 48th Georgicon Scientific Conference, Keszthely, September 21-22 2006.

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11. CURRICULUM VITAE

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Solt Eszter graduated from Marx Károly University of Economics on the Faculty of Foreign Trade and Business in 1982, then she was awarded doctorate in finance in 1987. The title of her dissertation: The Role of the World Bank in Financing Economic Development with Special Regard of Projects in Hungary.

Besides teaching she was active in business as well, among others, she worked at the Commercial Section of the Embassy of the United States in Budapest and was the managing director of ECOMAT Ltd. – a Swedish - Hungarian trading and consulting company.

She has been working in higher education since 2001, at present, she teaches finance at the Department of Finance at the Budapest University of Technology and Economics (BME).

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She is a proficient user of English and has advanced-level business state language exams in English and Russian and at intermediate level in Swedish.

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