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The Crisis Management of the ECB

Fritz Breuss

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A sequence of crises – the global financial crisis in 2008, the "Great Recession" in 2009 and the subsequent Euro crisis – constituted a major challenge for policy makers. After the fiscal policy had used up its powder in fighting the 2009 recession, monetary policy remained the only expansionary player in the policy arena. The ECB reacted to the crises with applying conventional (interest rate) and unconventional (qualitative easing) measures, however, with a considerable delay to the US Fed. The interest (main refinancing operation) rate was set to zero in September 2014 (the Fed already in December 2008) and the proper QE programme started not until March 2015 (the Fed shortly after the Lehman brothers crash). In evaluating the crisis management of the ECB one must state a clear failure in reaching its own medium term inflation target of 2 percent. However, it was successful in bringing down interest rates for government bonds after Draghi's famous "whatever it takes" speech in July 2012 and the following announcement of the outright monetary transactions programme. Whether ECB's QE programme 2015-2017 will be successful in reaching its primary goal, namely regaining the inflation target of 2 percent is an open question. Simulations with the Global Economic Model of Oxford Economics indicate that it will be able to reach the inflation goal but only with a considerable lag. The impact on the real economy will not be as large as QE experiments in the USA. Other unintended effects – e.g., the creation of bubbles on the stock markets – are larger than the intended effects. In contrast to the usual dynamic stochastic general equilibrium exercises our simulations of ECB's QE with the global economic model can not only quantify the effects for the Euro area as a whole but also for its member countries and it can identify the possible spillovers to countries outside the Euro area.

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Abstract

A sequence of crises – the global financial crisis (GFC) in 2008, the “Great Recession” in 2009 and the subsequent Euro crisis - constituted a major challenge for policy makers. After the fiscal policy had used up its powder in fighting the 2009 recession, monetary policy remained the only expansionary player in the policy arena. The ECB reacted to the crises with applying conventional (interest rate) and unconventional (QE) measures, however, with a considerable delay to the US Fed. The interest (main refinancing operation) rate was set to zero in September 2014 (the Fed already in December 2008) and the proper QE programme started not until March 2015 (the Fed shortly after the Lehman brothers crash). In evaluating the crisis management of the ECB one must state a clear failure in reaching its own medium term inflation target of 2%. However, it was successful in bringing down interest rates for government bonds after Draghi’s famous “whatever it takes” speech in July 2012 and the following announcement of the OMT programme.

Whether ECB’s QE programme 2015/17 will be successful in reaching its primary goal, namely regaining the inflation target of 2% is an open question. Simulations with the Global Economic Model of Oxford Economics indicate that it will be able to reach the inflation goal but only with a considerable lag. The impact on the real economy will not be as large as QE experiments in the USA. Other unintended effects – e.g. the creation of bubbles on the stock markets - are larger than the intended effects. In contrast to the usual DSGE exercises our simulations of ECB’s QE with the global economic model can not only quantify the effects for the Eurozone as a whole but also for its member states and it can identify the possible spill overs to countries outside the Eurozone.

Keywords: European Integration; Monetary Policy, Quantitative Easing, Model simulations

JEL Classification: E32, E44, E52, F15; C52.

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1. Introduction

After the Lehman Brothers crash on 15 September 2008 the industrialized world witnessed a succession of crises. The global financial crisis (GFC) in 2008 triggered the “Great Recession” in 2009 which was followed in Europe by the Euro crisis in 2010. Interestingly, the main causer, the USA recovered much quicker from the Great Recession than the European countries and Japan. Many factors may have contributed to the better performance in the USA than in Europe.

In contrast, however, to the “Great Depression” in the 1930s the policy reaction was much better and more appropriate in the present crisis (see Eichengreen, 2015; Baldwin and Giavazzi, 2015; BIS, 2015a; Breuss, 2016). After the shock about the deepness of the recession in 2009 fiscal and monetary policy acted together to mitigate the negative consequences of the crisis on output and employment. Yet, the high Keynesian fiscal engagement had a high price in terms of public debt accumulation which quickly became unsustainable. Due to the limits of further fiscal expansion monetary policy was the only option to continue with an expansionary stance. Hence, the ECB became – in particular in the Euro area – the most important player in the still unresolved Euro crisis.

In this paper, the focus lies on the ECB’s crisis management and the valuation whether it reached its goal. In contrast to the Fed, which has two objectives (price stability and full employment), the EU Treaty (TFEU, Article 127) assigns the ECB only one primary goal: *“The primary objective of (monetary policy) the European System of Central Banks (hereinafter referred to as ‘the ESCB’) shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union (secondary objective) with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union.”*

After describing the policy reaction of the major central banks to the crises we discuss the dominant role of the ECB in the crises and the challenges it is confronted with^{*)}. The ECB had successes but it also failed – in particular it lost control over inflation since the Great Recession. After reaching the zero lower bound of interest rates the central banks – also the ECB, a little bit delayed – switched from standard to non-standard measures. The most important non-standard measure, quantitative easing is then analysed in detail concerning its impact on the major macroeconomic variables since 2009. In particular, the QE programme

^{*)} This paper is a revised and extended version of my lecture *“Did the ECB-Anti-Crisis-Measures Reach their Goals?”*, given at the International Conference “The ECB in the Institutional, Political, and Economic Framework of the Post-crisis EU”, organized by ECSA Austria at the Centre of European Union Studies, University of Salzburg, 5-6 November 2015.

of the ECB in 2015/17 is evaluated quantitatively with global macro model simulations and its results are compared with simulated effects derived from DSGE exercises in the US and UK.

2. Policy reactions to the crises

The succession of crises since 2007 (see Breuss, 2016) – subprime crisis in the USA – GFC – Great Recession – Euro crisis was a big challenge for policy makers. Governments in most industrial countries intervened massively with fiscal interventions to mitigate the deepness of the recession and its negative consequences (see European Commission, 2009; OECD, 2009A, 2009B; Breuss et al, 2009). Also monetary policy was quick to intervene, firstly with standard measures (interest rate cuts) and then with non-standard measures after realising the danger of a deep recession¹. During the Great Recession in 2009 advantageously we witnessed a coordination of fiscal and monetary policy. The following strong increase in public debt – in particular in the periphery of the Euro area – triggered the Euro crisis, starting with Greece in early 2010. Subsequently, fiscal policy turned to austerity in the Euro area. What remained expansionary was monetary policy. This helped the ECB to become the major dominant policy player in the Euro area. Yet, everybody knows that monetary policy is not able to create sustainable economic growth. It can only create a favourable financial environment which animates private agents to invest. Sustainable growth of an economy can only be created by structural reforms.

2.1 Fiscal policy and its limits

The exploding public debts and deteriorations of budget balances much above the targets of the Stability and Growth Pact (SGP) of 60 (debt) and 3 (deficit) in percent of GDP called for an overhaul of the governance of EMU (see Breuss, 2016)². The fiscal rules of the SGP (with Six and Two pack) were tightened and debt brakes were additionally introduced with the Fiscal compact. The problem of macroeconomic imbalances was tackled by a new procedure in the Six pack. Whereas the USA already were on a recovery path out of the Great Recession, Europe created its unique Euro crisis. Due to the continuous recovery since 2009/10 the level of real GDP in the USA overpassed already the pre-crisis level of 2007. In contrast, the EU and in particular the Euro area experienced a double-dip recession in the

¹ As a lesson from the Great Depression in the 1930s, monetary policy in the Great Recession in 2009 directed its stance to expansion (see Bernanke, 2015).

² The Five President's Report (see Juncker et al., 2015) take a new step forward to initiate further reforms of EMU.

years 2011-2013, and hence, the GDP did still not yet reach the pre-crisis level in the Euro area.

The Euro area crisis consists of multiple crises, a vicious circle of debt (Greece, Ireland, Italy, Portugal, Spain and Cyprus), macroeconomic imbalances (loss of competitiveness of the periphery countries vis à vis the core Euro countries) and a banking crisis (Cyprus, Ireland and Spain).

Following the reform of the economic governance of the Euro area the Euro crisis called for new rescue packages and mechanisms not available before. Starting with bilateral credit facilities of the Euro partners for Greece in 2010, new funds were installed, firstly the EFSF (European Financial Stability Facility) which was succeeded by a permanent fund, the ESM (European Stability Mechanism)³. The rescue operations had to be expanded to other so-called programme countries: Ireland, Portugal, Cyprus and Spain. For each of these countries rescue packages were granted under strong conditionality to reform the country, formulated in a memorandum of understanding (MoU) and supervised by the “Troika”, now called “institutions” (European Commission, ECB and IMF). Whereas Ireland, Portugal, Cyprus and Spain already left these programmes, Greece is the remaining case to be rescued. On 12 July 2015 an agreement was reached on the third Economic Adjustment Programme for Greece. Greece will get a loan up to EUR 86 billion, which shall be handed to Greece – conditional to the implementation of reforms – gradually from 2015 until June 2018.

In the light of the strong conditions in the reformed SGP and Fiscal compact and the still unsustainable public debt positions in the periphery countries the Euro area as a whole changed from expansion in the “Great Recession” to austerity after the Euro crisis (see in’t Veld, 2013)⁴. This tighter fiscal policy stance together with the still less crisis proven banking system⁵, may be responsible for the less successful recovery from the Great Recession in comparison with the USA⁶. Given the restrictions from the stricter rules of the SGP and the Fiscal Compact, the only stimulus for investment should come from the Juncker Plan

³ The crises in Europe forced the EU to switch from a normal to a crisis management modus. At the beginning there was a shift from the usual community methods to intergovernmental agreements. Although the EU Treaty did not change (except for the inclusion of the ESM into Article 136, TFEU), a lot of EU law has been implemented since the Euro crisis started in 2010 (Six Pack; Two Pack; Fiscal Compact).

⁴ According to in’t Veld (2013) the simultaneous budgetary consolidation in the years 2011-13 resulted in a dampening of real GDP in the Euro area of around 1% per annum. Hence, the stimulating effect of the budgetary intervention against the recession in 2009 was more or less offset by the following austerity policy.

⁵ According to Langfield and Pagano (2015) Europe’s financial structure has become strongly bank-based – far more so than in other economies like the USA. An increase in the size of the banking system relative to equity and private bond markets is associated with more systemic risk and lower economic growth,

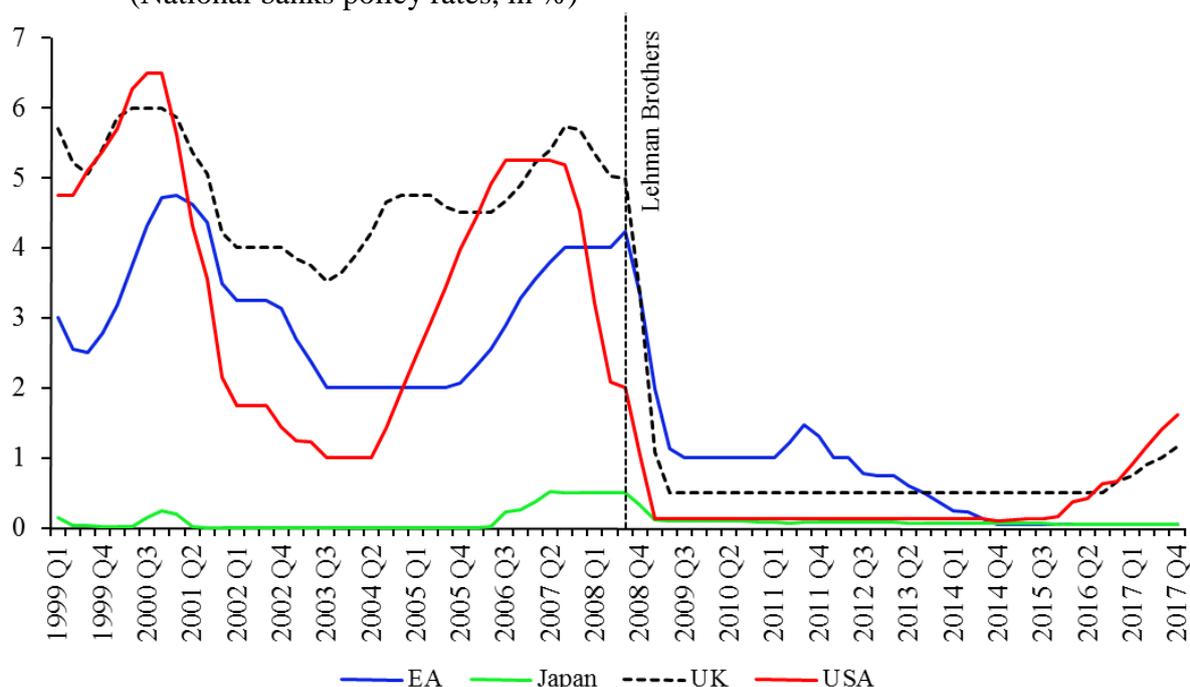
⁶ A further building block of the New Economic Governance of the Euro area after the crisis is the creation of the European Banking Union (see Breuss et al., 2015).

(Juncker, 2014) which should mobilise investment in Europe amounting to EUR 315 bn in the next three years.

2.2 Monetary policy expansionary without limits

The crash of Lehman brothers on 15 September 2008 was the signal for the central banks of the main industrial countries to intervene, firstly with conventional or standard measures (cutting their interest rates) and after reaching the zero lower bound (ZLB) of interest rates with unconventional or no-standard measures (see Reichlin and Pill, 2016).

Figure 1: The end of standard measures – interest rates at the zero lower bound
(National banks policy rates, in %)



EA (Euro area) = Main Refinancing Operations (MRO); Japan = Overnight Call Rate; UK = Base Rate (Repo Rate); USA = Federal Funds Rate.

Source: Oxford Economics

2.2.1 From conventional ...

As the subprime crisis evolved in 2007, the US Fed reacted already before the Lehman brother's crash with a step by step downward reduction of its monetary policy interest rate (Federal Funds Rate) from 5% in September 2007 to 0-0.25% in December 2008 (see Bernanke, 2009). The ECB reacted only delayed to the crisis⁷. In July 2008 it even increased its monetary policy interest rate (Main Refinancing Operation) from 4% to 4.25%. Only after the Lehman brothers crash in started to downgrade its interest rates, lastly in September 2014

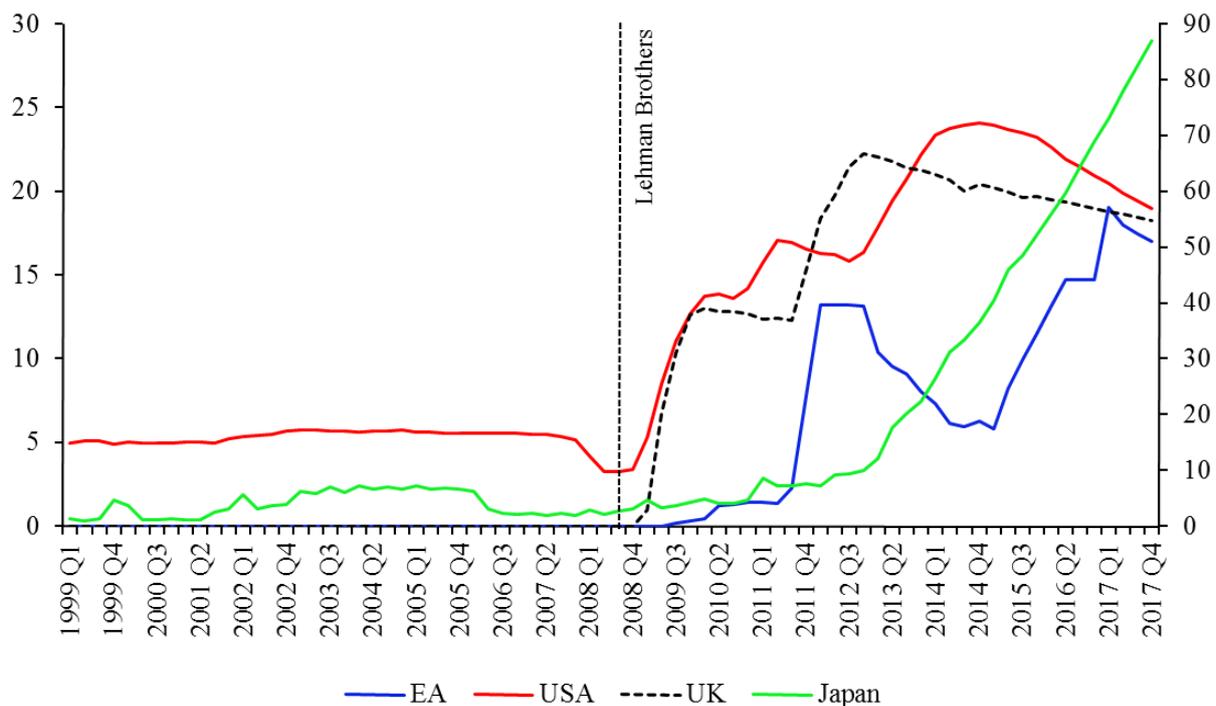
⁷ As one can see from Figure 1, the ECB, since the inception of EMU in 1999, reacted always with a lag to the interest rate decisions of the Fed (see Breuss, 2002).

to 0.05%. The deposit facility rate was set to a negative value (-0.2%; since 3 December 2015, -0.3%). The other major central banks (BoJ and Bank of England) reacted quicker than the ECB (see Figure 1)⁸.

2.2.2 ... to unconventional measures

As soon as the interest rates of the central banks reached the zero level bound (ZLB) they switched to unconventional or non-standard monetary policy measures⁹. The US Fed – not only with conventional but also with unconventional measures (QE) - reacted shortly after the Lehman brothers crash, followed by the BoE. The ECB followed later.

Figure 2: Unconventional measures get fashionable – quantitative easing (QE)
(in % of GDP)



Japan, right scale; the others left scale.

Source: Oxford Economics

⁸ One could argue that the western world since embarking into a zero-interest rate phase – starting with Japan a decade ago, and followed by the major industrial countries (USA, UK and Euro area) – unintentionally has introduced a kind of “Islamic banking”, where one of the major rules prohibits the acceptance of specific interest or fees for loans of money (known as *riba*).

⁹ Ellison and Tischbirek (2013) recommended a coordination of unconventional and conventional monetary policy in order to reap the full benefit of monetary policy in a crisis. This means that the short-term interest rate should respond to inflation while the central bank's purchases of long-term debt should respond to output. Unconventional monetary policy plays an even more important role if the central bank is additionally concerned about interest rate volatility. Kara and Sin (2014), using a New Keynesian model with liquidity frictions, study how the central bank should act in a liquidity crisis. They find that optimal policy in a liquidity crisis requires a temporary deviation from price stability.

These unconventional measures were called quantitative easing (QE). Oxford Economics make regularly consolidated estimations of all measures subsumed under QE and comes to the result that – although Japan and the USA practised this policy already before the GFC – the “Great Recession” in 2009 initiated a huge increase in QE measures. The Fed and the BoE increased their QE programme up to 20% and 25% of GDP, whereas the ECB’s respective interventions reached only around 13% of GDP. However, the BoJ – after the policy change to “Abenomics” – started to increase its QE programme massively since 2013 and will reach nearly 90% of GDP at the end of 2017 (see Figure 2).

2.3 Cooperation gains abandoned

From theory we know that cooperation of fiscal and monetary policy would lead to higher welfare gains¹⁰. The USA more or less follow this line with an expansionary fiscal and monetary policy. In the Euro area, however, the public debt crises and the stricter rules of the New Economic Governance to regain fiscal sustainability make such an optimal cooperative solution impossible. Fiscal policy is on an austerity path, only monetary policy by the ECB is expansionary comparable to that followed by the Fed in the USA. The missing cooperation policy solution may also contribute to the suboptimal recovery in the Euro area.

2.4 Transatlantic divergence in monetary policy

The ECB lagged behind the Fed in the crisis management since the GFC 2008 and the Great Recession in 2009. This constellation will also persist in the near future. Whereas the ECB on 3 December 2015 reinforced its expansionary policy stance by reducing the deposit facility rate to -0.3%, the Fed already started the exit of the ultra-expansionary zero-interest rate policy. On 16 December 2015 Janet Louise Yellen, since 1 February 2014 the new Chair of the Board of Governors of the Federal Reserve System (Fed) announced the turnaround of US monetary policy by increasing the Federal Funds Rate with a bandwidth of 0% to 0.25% up to 0.25% to 0.50%.

In contrast to the ad hoc announcement of “tapering” of the QE programme (the scaling down of the monthly bond purchases) in June 2013 by the former Fed Chairman Ben Bernanke the announcement of the turnaround of the zero interest rate policy by Chair Yellen was a good example of successful “forward guidance” because this step was prepared carefully in advance.

¹⁰ For an overview of the respective literature, see Breuss (2006), chapter 13.

However, the first-mover step by the Fed in December 2015 leads to a transatlantic divergence in monetary policy with uncertain implications. If the Fed continues to increase its interest rates this will have fundamental consequences for the Euro-Dollar exchange rate, the economic development and inflation performance on both sides of the Atlantic and it will have an important impact on international capital flows – out of Europe and also out of the developing world and into the USA.

3. The dominant – multitasking - role of the ECB

After the retreat of fiscal policy when the Euro crisis loomed in early 2010, the ECB occupied the dominant role as the most important policy player in the Euro area. The crisis gave the ECB an institutional empowerment. Since then it intervenes in multiple capacities (monetary policy, Banking supervision, ESM-Troika).

The ECB not only adopted – more or less by copying the behaviour of the Fed and other important central banks (BoJ, BoE) – an extraordinary expansionary monetary policy stance. At the same time, it also took over more and more tasks like the supervisory task (SSM) within the project of the European Banking Union (see ECB, 2014b; Breuss et al., 2015). It was also part of the Troika missions (together with the European Commission and the IMF), intervening during the Euro crisis in the so-called programme countries (Cyprus, Greece, Ireland, Portugal and Spain)¹¹. Some observers (e.g. the German Council of Economic Experts, 2012) suspected that with this multitasking role the ECB could come into conflict with its competence for monetary policy according to the EU Treaty.

3.1 The challenges of the Eurozone

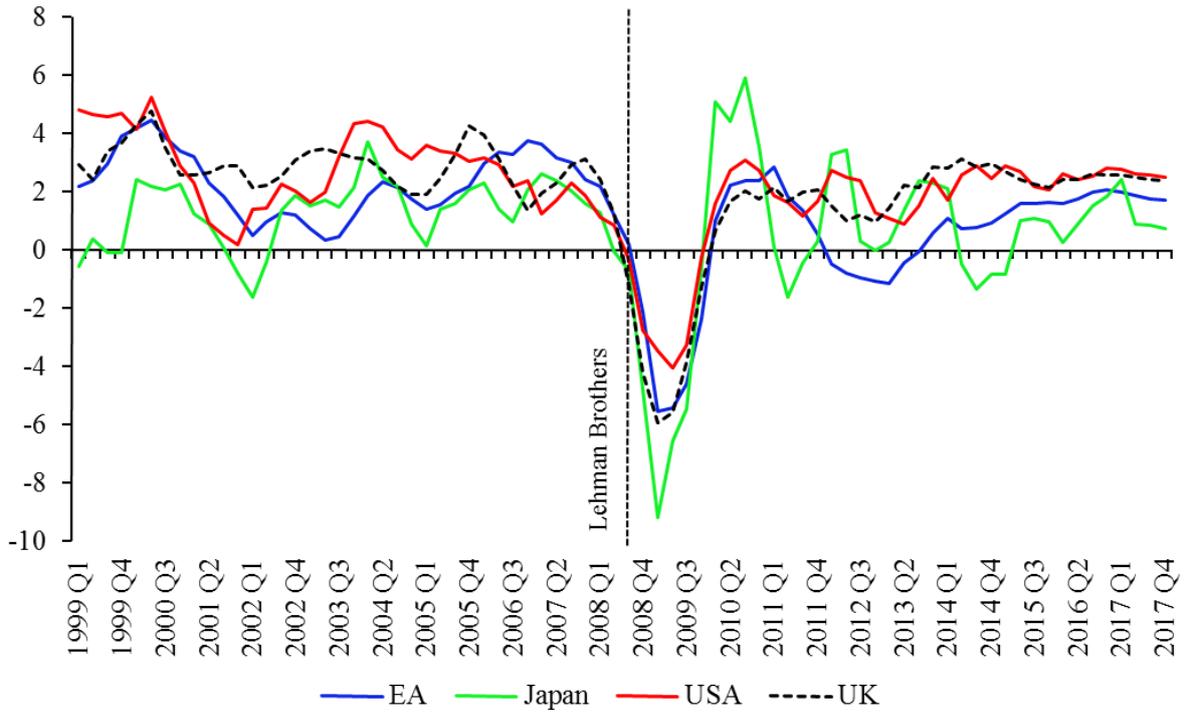
The challenges faced by economic policy makers since the Great Recession and the inception of the Euro crisis are considerable and can probably not be solved alone by monetary policy. After fiscal policy refrains from being helpful in stimulating growth, structural reforms (see Breuss, 2015) should be an alternative to monetary stimulations alone.

3.1.1 The crises amplify Euro area's heterogeneity

The Great Recession hit all major industrial countries, deepest Japan (see Figure 3). Whereas the USA quickly recovered and embarked into a normal growth path, the Eurozone plummeted into a double-dip recession during 2011-2013. Recovery was interrupted and takes place since then only on a very modest pace.

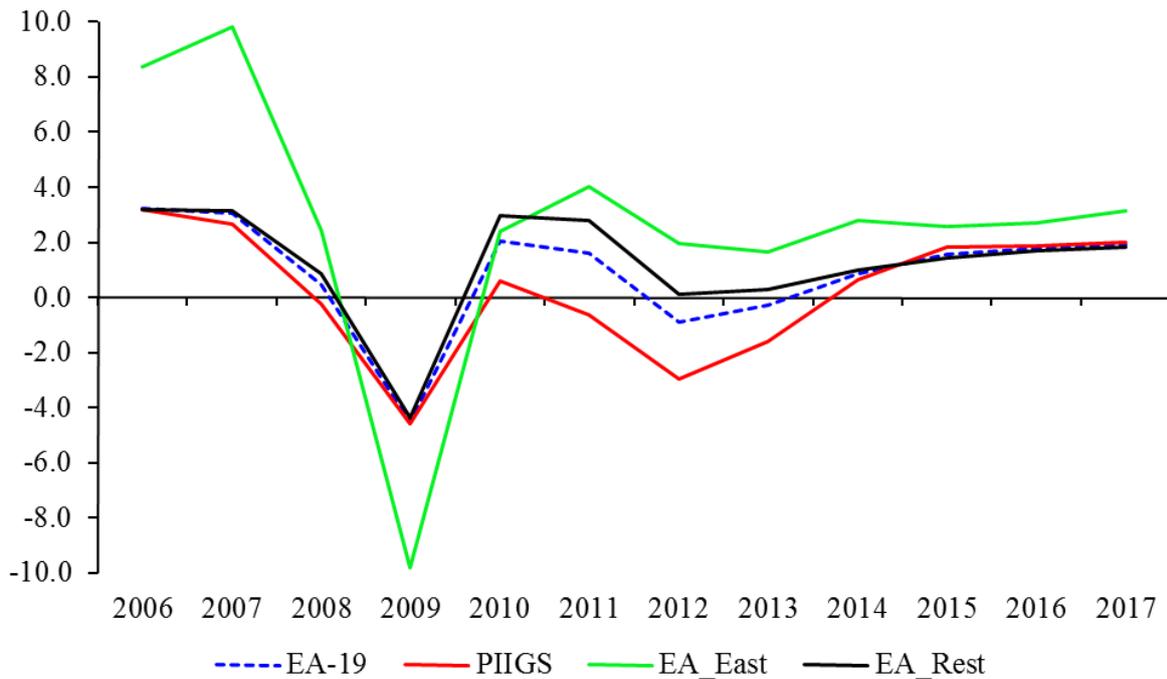
¹¹ The ESM Treaty mentions the ECB several times as an important partner (e.g. "... the Commission, in liaison with the ECB...") when negotiating, with the ESM Member States concerned, a memorandum of understanding (an "MoU") (see Article 13).

Figure 3: The Great Recession in 2009 and its different overcoming
(Real GDP, % change)



Source: Oxford Economics

Figure 4: Heterogeneity in the real sector of the Euro area
(Real GDP, %)



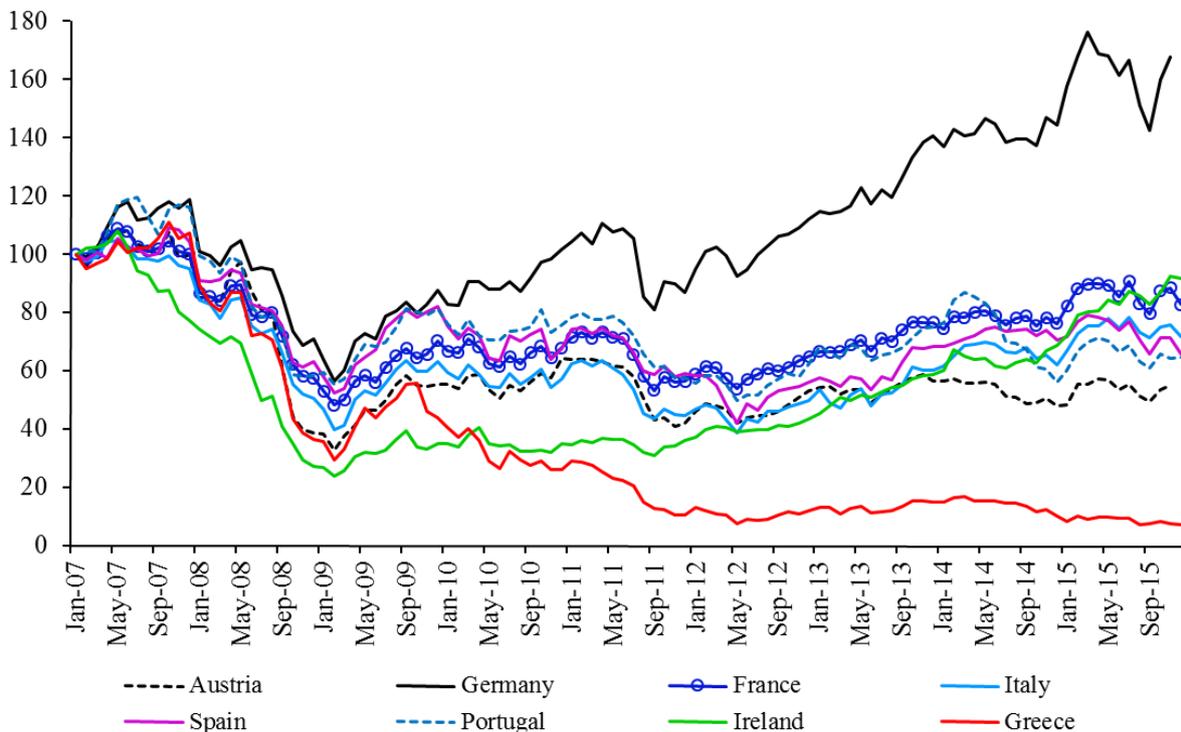
PIIGS = Portugal, Ireland, Italy, Greece and Spain; EA(Euro area)_East = Estonia, Latvia, Lithuania, Slovakia and Slovenia; EA_Rest = Austria, Belgium, Cyprus, Finland, France, Germany, Luxembourg, Malta and Netherlands.

Source: AMECO database of the European Commission.

Besides the general weak recovery of the Eurozone since 2009, the shock of the Great Recession amplified the already inherent heterogeneity of the Eurozone economy – in the real sector as well as in the financial markets. The cyclical downturn in 2009 was strongest in the Eurozone countries of the East. They, however, gained also the strongest momentum in the recovery process thereafter. In contrast, the periphery countries, the PIIGS (Portugal, Ireland, Italy, Greece and Spain) are the laggards in the recovery, primarily due to the seven years long stagnation in Greece. The rest of the Eurozone (the core) performs better than the Eurozone on average (see Figure 4).

The heterogeneity in the financial markets – core versus periphery of the Euro area – is a mirror image of the divergent developments in the real sector. Stock market indices performed best in Germany and worst in Greece. The other programme countries improved considerably in the recent years (see Figure 5).

Figure 5: Heterogeneity in the Financial Markets in the Euro area
(Stock market indices: 1M2007=100)

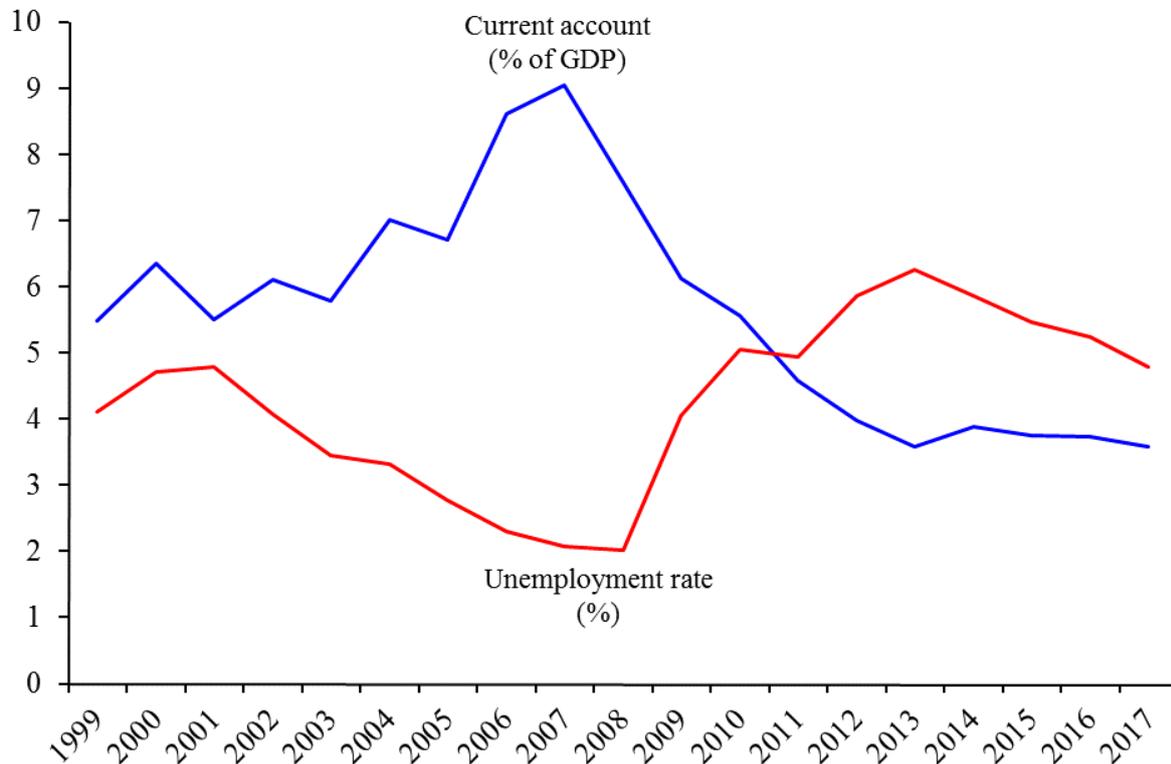


Source: MACROBOND

Further indicators of the heterogeneous development of the Eurozone are the macroeconomic imbalances in terms of competitiveness (the core is more competitive than the periphery), which is reflected in the divergent development in the current account balances. The macroeconomic imbalances in the Euro area can be demonstrated with the dispersion of the

current account balances and the unemployment rates since the inception of EMU in 1999 (see Figure 6).

Figure 6: Macroeconomic imbalances in the Euro area: current account and unemployment (Standard deviations)



Data source: AMECO database

Until the Great Recession in 2009 the accumulation of imbalances in competitiveness is reflected in the increase of the standard deviations of the current account balances. Since 2009 – due to adjustment programmes in the periphery countries of the Eurozone – we witness a convergence. In contrast, the unemployment rates of the Eurozone countries converged up to the crisis and diverged strongly thereafter¹².

3.1.2 The ECB lost control over inflation

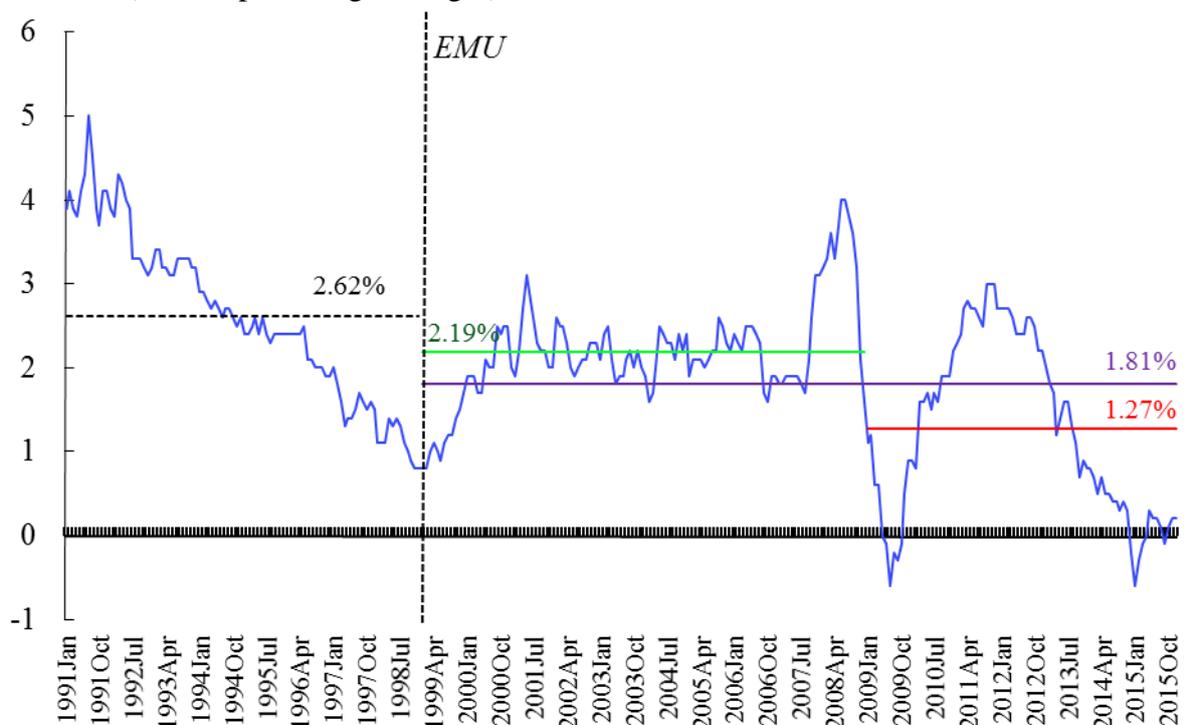
The primary objective of the ECB is to maintain price stability. In 1998, the Governing Council of the ECB defined price stability: *“Price stability shall be defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%. Price stability is to be maintained over the medium term.”* In the light of the Japanese experience with a long-lasting deflation, in May 2003 the Governing council made it clear

¹² The process of real convergence and divergence in the Euro area since the inception of EMU is analysed in ECB (2015b).

that, within this definition, it aims to keep inflation rate below but “close to 2% over the medium term”¹³.

Overall the ECB was able to keep inflation at the announced target of 2%. Since 1999 it was only 1.81%; in the sub period before the crisis (1999-2008) the average annual inflation rate was 2.19%. Before the inception of EMU (1991-1998) the average annual inflation rate was 2.62% (see Figure 7).

Figure 7: HICP inflation in the euro area – ECB lost control over inflation
(Annual percentage changes)



Source: ECB. Data prior to 1996 are estimated on the basis of non-harmonised national Consumer Price Indices (CPIs).

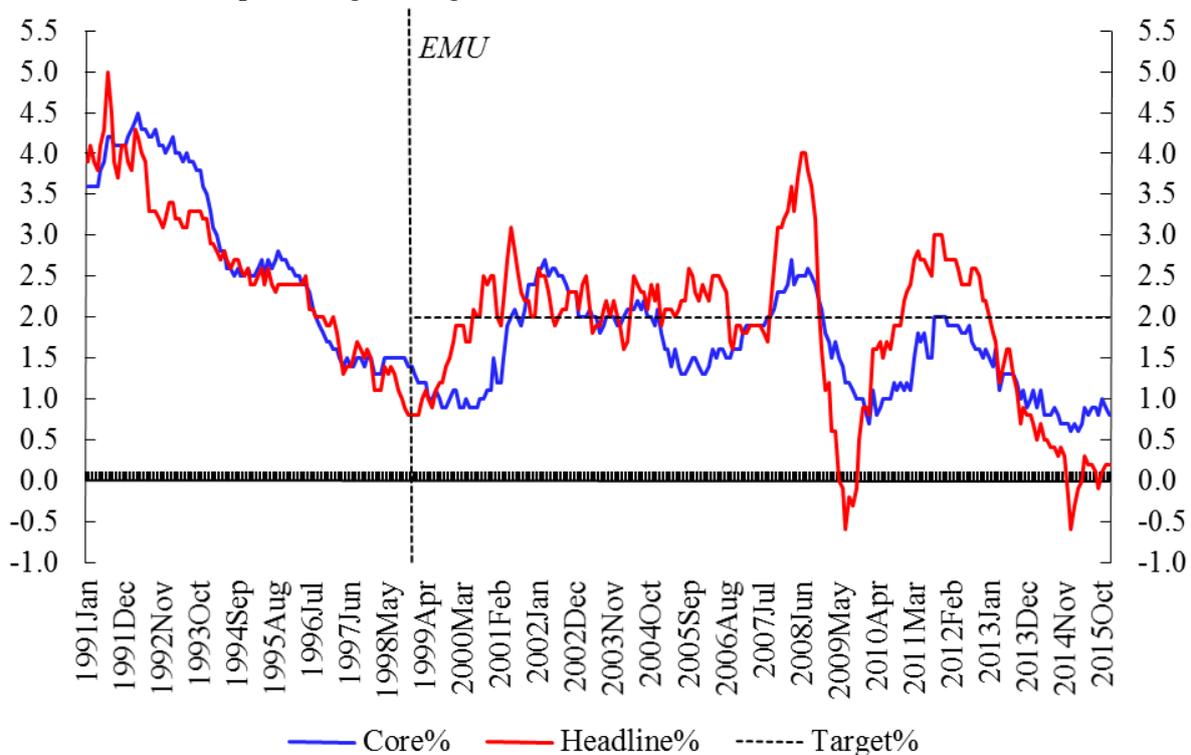
However, since the Great Recession in 2009 the ECB lost control over its inflation target. On average since then, the annual inflation rate was only 1.27% with negative phases in 2009 and 2015 (see Figure 7).

Behind this Eurozone average there is a huge heterogeneity: In November 2015, still 8 member states (in September 2015, 11) experienced a deflation with negative inflation rates (highest in Cyprus with -1.5%), whereas some countries exhibited inflation rates much above Eurozone average of 0.2% (Belgium, 1.4%; Malta, 1.3%; Austria, 0.5%). In December 2015 HICP inflation in the Euro area was still not higher than 0.2% (average 2015: 0.02%).

¹³ See: <https://www.ecb.europa.eu/mopo/strategy/pricestab/html/index.en.html>

The ECB seems not only have lost control over its inflation objective it seems also to target the wrong index¹⁴. The definition of price stability of the ECB refers to headline inflation of the HICP. However, it cannot control all components of headline inflation, in particular not energy and food price developments which are determined on the international raw material markets and, hence are out of control of the ECB.

Figure 8: Euro area inflation rates – core and headline inflation
(Annual percentage changes)



Source: ECB

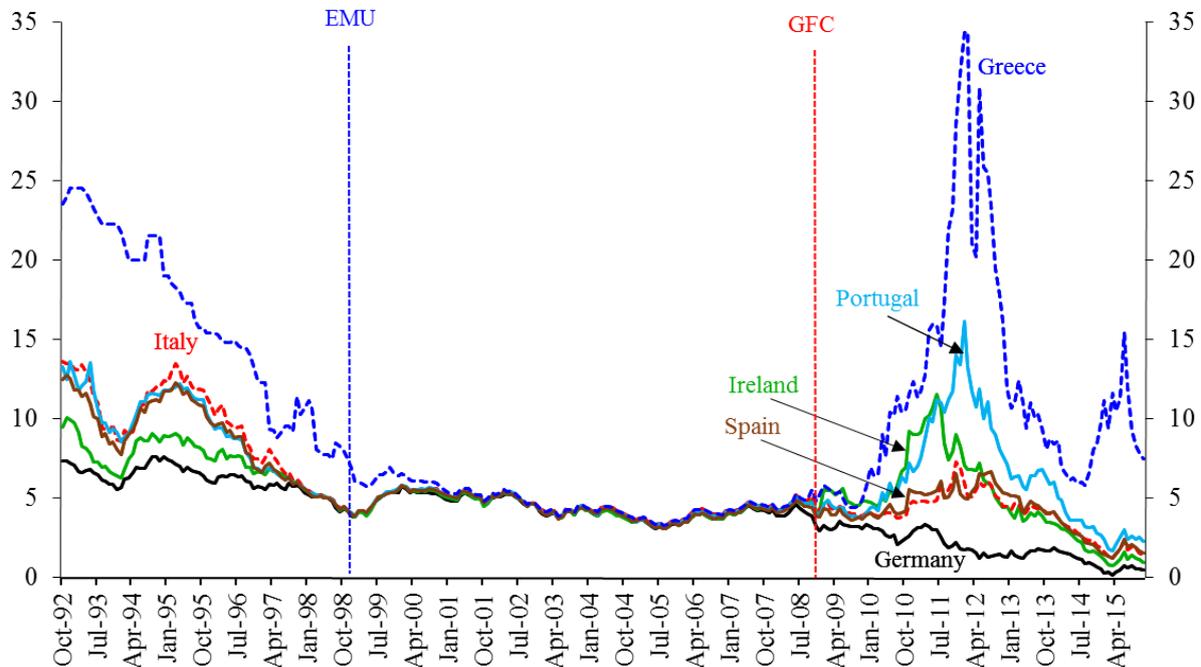
Therefore, it would be much wiser when the ECB only would control core inflation (HICP exclusive energy and food prices). In particular, in times of highly fluctuating petrol and raw material prices as in 2008 (boom) and again in 2014/15 (trough), the core inflation rate would be closer to the self-defined objective of price stability (see Figure 8). The core inflation rate steadily increased from 0.6% in March 2015 to 0.8% in December 2015. But even in the modest increase of the inflation rate which the ECB is able to gear one cannot see much of a success of the QE programme, which started in March 2015 (average 2015: 0.8%).

¹⁴ This has been criticised already very early as non-optimal when EMU started (see Breuss, 2002).

3.1.3 Revelation of the risk illusion in the Eurozone

Until the GFC financial markets had the illusion that all government bonds would have the same default risk. In the pre-Euro phase the government bond yields reflected the “true” risks of default and exchange rate risks (see Figure 9) which was demonstrated in the high (low) yields of the periphery (core) countries of the following Euro area. After the entrance into the Euro area the exchange rate risks were eliminated but one could have expected that the default risks should have persisted. In contrast, the yields of 10 years’ government bonds converged to the low levels of the core countries (Germany) which implies that the participants of the financial markets succumbed the illusion that the no-bail out clause would not be applied in case of default.

Figure 9: Misperception of Sovereign Default Risks in the Euro area
(Government bond yields, 10 years, in %)



GFC = Global financial crisis.
Source: MACROBOND

This misperception of the true risks of government bonds came to a halt after the GFC and in particular when the Greek crisis broke out after the faked budgetary figures came to light end of 2009. Only then the rating agencies corrected their misperception of Greece and the other periphery countries. The bond yields exploded to unsustainable heights. Then in 2010 the rescue operations of the Euro area partners set in because the governments of the Eurozone periphery countries were no longer able to refinance their deficits at the financial markets because they passed over the so-called “deadly” zone of 7% (see Figure 9).

3.2 Successes and failures of the ECB

The greatest success of ECB's monetary policy after the crisis was due to an announcement by ECB President Mario Draghi made more or less off the record in his speech at the Global Investment Conference in London, 26 July 2012 (*"Within our mandate, the ECB is ready to do whatever it takes to preserve the euro". "And believe me, it will be enough"*). This statement and the following announcement, made on 6 September 2012 to start with the programme of Outright Monetary Transactions (OMT) helped to reduce the probability of a breaking-up of the Eurozone¹⁵.

Although the OMT programme was not implemented because no programme country (Cyprus, Greece, Ireland, Portugal and Spain) has ever made use of it, nevertheless it was sued at the Bundesverfassungsgericht in Karlsruhe¹⁶. The European Court of Justice of the European Union, however, sees the OMT in conformity with EU law¹⁷. As a direct effect of Draghi's statement and the announcement of the OMT programme, the yields of government bonds of the periphery countries came down considerably (see Figure 9).

Acharya et al. (2015) showed in an econometric analysis that the OMT announcement indirectly recapitalized periphery country banks by increasing the value of their sovereign bonds. This led to an increased supply of loans to private borrowers in Europe. The authors show that firms that receive new loans from periphery banks use the newly available funding to build up cash reserves, but there is no impact on real economic activity like employment or investment.

The main failure of ECB's monetary policy since the crisis is the loss of the control of its own inflation target of 2% (see Figures 7 and 8).

¹⁵ The OMT programme included a strict and effective conditionality. Only Euro crisis programme countries were the targeted group of Euro area countries (see ECB, 2012).

¹⁶ Since June 2013, the OMT programme is a legal case at the German *Federal Constitutional Court* in Karlsruhe (Bundesverfassungsgericht) because many German experts brought a complaint to the court. In a preliminary ruling as of 7 February 2014 the German Court of Justice came to the conclusion that the OMT programme has two legal caveats: (1) it is an infringement of Article 123 TFEU (although the ECB would buy government bonds only on the secondary market); and (2) it would intermingle monetary and fiscal policy by the ECB (its objective is only "price stability"). The Court made a referral for a preliminary ruling to the Court of Justice of the European Union (CJEU).

¹⁷ On 16 June 2015 in the ECJ Judgement Case C-62/14 Gauweiler and others, the Court of Justice of the European Union ruled that the OMT programme announced by the ECB in September 2012 is compatible with EU law. This programme for the purchase of government bonds on secondary markets does not exceed the powers of the ECB in relation to monetary policy and does not contravene the prohibition of monetary financing of Member States. Now, the Bundesverfassungsgerichtshof has to make a final decision. However, given that the OMT was never used, the legal fight against it is more of a legal shadowboxing.

4. Monetary policy in the crisis

After the GFC some central banks (first the Fed in 2008, later in 2013 the ECB) introduced a new instrument, the so-called “forward guidance”, i.e. a preannouncement of the future path of monetary policy. This should give the financial markets and its participants a guideline.

Table 1: Monetary policy in the crisis – unconventional measures

ECB	Fed	BoJ
2008 – Fixe-rate full allotment – FRFA	2008 – Term-Auction Facility – TAF; Term Securities Lending Facility - TSLF	2008 – Securities Lending Facility - expansion
2008/2009/2011 – Long-term Refinancing Operations (6m, 1Y, 3Y) – LTRO	2008 – Primary Dealer Credit Facility – PDCF	2008 – Outright purchases JGBs
2009/2011/2014 – Covered Bonds Purchase Programme (s) – CBPP 2010 – Securities Markets Programme - SMP	2008 – Asset-Backed CP MMMF Liquidity Facility – AMLF (and MMIFF)	2008 – CP repo operations - expansion; Outright purchases CP
2012 – Outright Monetary Transactions (announcement) – OMT	2008 – Commercial Paper Funding Facility – CPFF	2008 – Special Funds-Supplying Operations to Facilitate Corp. Financing
2013 – Forward guidance	2009 – Term Asset-Backed Securities Loan Facility (ABS CMBS) – TALF	2009 – Outright purchases Corporate Bonds
2014 – Targeted Long-term Refinancing Operations - TLTROs	2009 – Liquidity to credit markets – consumer, small businesses CMBS – TALF	2010 – Asset Purchase Programme - APP
2014 – ABS and Covered Bond Purchase Programme – ABSPP, CBPP	2008/2010/2012 – Large-scale Asset Purchases – QE1, QE2, QE3 – LSAP	2012 – Loan Support Programme
2015 – Expanded Asset Purchase Programme – APP – QE: 3/2015 to 3/2017: €60 bn per months = €1500 bn. (“QE” = PSPP)	2008/2011/2012/2013/2014 QE4 – “tapering” Forward guidance (qualitative and quantitative)	2013 – Quantitative and Qualitative Monetary Easing (70 trillion Yen a year) under “Abenomics” 2014 – Expansion of QE (80 trillion Yen a year)

ABCP = High-quality Asset-Backed Securities; ABS = Asset-Backed Securities; ABSPP = Asset-Backed Securities Purchase Programme; AMLF = Asset-Backed Commercial Paper (CP) Money Market Mutual Fund Liquidity Facility; APP = Asset Purchase Programme; CBPP = Covered Bond Purchase Programme; CMBS = Commercial Mortgage-Backed Securities; JGB = Japanese Government Bonds; LSAP = Large-Scale Asset Purchases; MMIFF = Money Market Investor Funding Facility; PSPP = Public Sector Purchasing Programme; SMP = Securities Markets Programme; TALF = Term Asset-Backed Securities Loan Facility.

Source: Constancio (2015a).

Because the interest rate option was very quickly exhausted because the central banks’ interest rates fell to their zero lower bound (ZLB; see Figure 1) a series of unconventional or

non-standard measures were applied. In such circumstances monetary authorities made use of quantitative easing (QE) to further stimulate the economy by buying assets of longer maturity than short-term government bonds, thereby lowering longer-term interest rates further out on the yield curve (see Table 1).

4.1 Forward guidance

In 2008, when the GFC began to evolve the Fed was the first central bank to introduce “forward guidance”¹⁸. Forward guidance about the Federal Reserve’s target for the federal funds rate should be a clear communication about the timing of its policy stance. The Fed has two objectives: maximum employment and two percent inflation.

Since December 2008, the Federal Reserve's target for the federal funds rate has been between 0 and 1/4 percent. Through "forward guidance," the Federal Open Market Committee (FOMC) provides an indication to households, businesses, and investors about the stance of monetary policy expected to prevail in the future. By providing information about how long the Committee expects to keep the target for the federal funds rate exceptionally low, the forward guidance language can put downward pressure on longer-term interest rates and thereby lower the cost of credit for households and businesses and also help improve broader financial conditions.

Whereas the turnaround in conventional (interest rate) monetary policy announced in December 2015 was a successful example of good “forward guidance”, the previous ad hoc announcement of “tapering” the QE programme (e.g. the scaling down of monthly bond purchases from before USD 80 billion to 65 billion) by the former Fed Chairman Ben Bernanke in June 2013 was badly prepared. In January 2014 this winding down of monetary (QE) stimulus was implemented. The 2013-14 Fed announcement relating to tapering of asset purchases had considerable reactions on the financial markets, in particular on the exchange rates, government bond yields, and stock prices for 21 emerging markets (see Mishra et al, 2014)¹⁹.

Since July 2013 the Governing Council of the European Central Bank (ECB) has been providing forward guidance on the future path of the ECB’s policy interest rates conditional

¹⁸ See: http://www.federalreserve.gov/faqs/money_19277.htm

¹⁹ The impact of Fed’s “tapering” (wind down the QE programme) and increase of its interest target rates will not only be restricted to the USA. During low-interest rate policy in the U.S. and Europe financial capital looked for more profitable investments in developing or BRICS countries. After the announcement and implementation of U.S. “tapering” of QE capital is flowing back into the industrial world causing problems in some of the developing or BRICS countries (incl. Turkey and Argentina; see NZZ, 2014). Also in general, changes in Fed’s target interest rates influence the rates on other national banks around the globe (see NZZ, 2015b).

on the outlook for price stability (see ECB, 2014a). Overall, the ECB's forward guidance is aimed at clarifying the Governing Council's assessment of the inflation outlook in the Euro area and its monetary policy strategy based on that assessment. The evidence suggests that forward guidance has so far served the ECB's intentions well by providing greater clarity on the Governing Council's conditional monetary policy orientation.

*4.2 Quantitative easing – *così fan tutti**

A central bank implements “quantitative easing “ (QE) by buying financial assets from commercial banks and other financial institutions, thus raising the prices of those financial assets and lowering their yield, while simultaneously increasing the money supply. QE can help ensure that inflation does not fall below a target or to avoid deflation. Risks include the policy being more effective than intended in acting against deflation (leading to higher inflation in the longer term, due to increased money supply), or not being effective enough if banks do not lend out the additional reserves.

QE has a long history²⁰. Some form of QE was used by the US Federal Reserve in the 1930s and 1940s to fight the Great Depression. A policy termed “QE” was first used by the Bank of Japan (BoJ) to fight domestic deflation in the early 2000s. But QE on a big scale was only applied during and after the GFC 2008 and the “Great Recession” in 2009. The major central banks applying QE since 2008/09 were the Fed²¹, the BoJ (resumed QE under “Abenomics”²² since 4 April 2013) and the ECB (see Table 1).

On 9 March 2015 the Eurosystem launched its public sector purchase programme (PSPP) which was decided on by the Governing Council on 22 January 2015 (see ECB, 2015a). With the PSPP the ECB launched an addition to its suite of tools, popularly referred to as “quantitative easing” (see Constancio, 2015b; Cœuré, 2015). Together with a programme of targeted liquidity provision and a programme of private sector asset purchases, the PSPP marked a new phase of the ECB's unconventional monetary policy (Details see the “Box: ECB's QE programme 2015/17”).

Previous non-standard measures (see Table 1 for an overview) were mainly aimed at redressing impairments in the monetary policy transmission mechanism and fostering a regular pass-through of the monetary policy stance. Their implications for the ECB's balance

²⁰ See https://en.wikipedia.org/wiki/Quantitative_easing

²¹ The US Fed acted with a succession of QE programmes starting early in 2008/09 which were nicknamed QE1 to QE4. The latest started on 12 December 2012 when the FOMC announced an increase in the amount of open-ended purchases from \$40 billion to \$85 billion per month.

²² “Abenomics” refers to the economic policies advocated by Shinzō Abe since the December 2012 general election, which elected Abe to his second term as prime minister of Japan. (see: <https://en.wikipedia.org/wiki/Abenomics>).

sheet were accommodated in a merely passive way to satisfy the liquidity demand created by banks. In contrast, with the new measures implemented since June 2014, the Governing Council is more actively steering the size of the ECB's balance sheet towards much higher levels in order to avoid the risks of too prolonged a period of low inflation (and the danger of "deflation") in a situation where policy rates have reached their effective lower bound.

Box: ECB's QE programme 2015/17

Decision and implementation:

On 22 January 2015, the Governing Council decided that asset purchases - the programme initiated on 4 September 2014²³ - should be expanded to include a secondary markets public sector asset purchase programme (hereinafter the 'PSPP')²⁴. Under the PSPP the NCBs, in proportions reflecting their respective shares in the ECB's capital key, and the ECB may purchase outright eligible marketable debt securities from eligible counterparties on the secondary markets. This decision was taken as part of the single monetary policy in view of a number of factors that have materially increased the downside risk to the medium-term outlook on price developments, thus jeopardising the achievement of the ECB's primary objective of maintaining price stability. The PSPP was launched on 9 March 2015.

Components:

The ECB does not call its *Expanded Asset Purchase Programme (APP)* explicitly an quantitative easing (QE) programme. It consists of three components:

- a) the third covered purchase programme (CBPP3),
- b) the asset-backed securities purchase programme (ABSPP), and
- c) the public sector purchase programme (PSPP).

Constancio (2015b) calls only the PSPP a so-called QE programme.

Dimension:

In terms of the *size of the PSPP, the ABSPP and the CBPP3*, the liquidity provided to the market by the combined monthly purchases will amount to EUR 60 billion²⁵. According to the March 2015 decision (see ECB, 2015a) purchases were intended to be carried out until the end of September 2016 (from March 2015 to September 2016 totalling EUR 1140 bn.)²⁶. The Governing Council has kept the programme open-ended by committing to keep it in place until the ECB sees a sustained adjustment in the path of inflation that is consistent with its medium-term inflation objective (below, but close to 2%).

²³ On 4 September 2014, the Governing Council decided to initiate a third covered bond purchase programme (hereinafter the 'CBPP3') and an asset-backed securities purchase programme (ABSPP). Alongside the targeted longer-term refinancing operations introduced in September 2014, these asset purchase programmes are aimed at further enhancing the transmission of monetary policy, facilitating credit provision to the euro area economy, easing borrowing conditions of households and firms and contributing to returning inflation rates to levels closer to 2 %, consistent with the primary objective of the ECB to maintain price stability (see ECB, 2015a).

²⁴ See: ECB (2015a).

²⁵ ECB's documentation of the ongoing purchases under the Expanded Asset Purchase Programme (APP), See: <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>

²⁶ Cœuré (2015) discusses the concerns about the potential scarcity of bonds in the Euro area over the lifetime of the programme. Indeed, the European Commission forecasts that the aggregate euro area public budget deficit will fall to -2.2% in 2015 and -1.9% in 2016. As a result, the net issuance (defined as new debt minus redemptions) of medium- and long-term securities by the euro area debt management offices (DMOs) in 2015 was expected to be around €200 billion.

On 3 December 2015 the ECB decided to extend the asset purchase programme (APP). The monthly purchases of €60 billion under the APP are now intended to run until the end of March 2017 (totalling EUR 1500 bn), or beyond, if necessary²⁷.

Purchase limits:

Issue share limit:

At the start of the PSPP, the issue share limit was set at 25%, to be reviewed after six months (Article 5(1) of the decision of 4 March 2015 states that “the limit will initially be set at 25%, for the first six months of purchases and subsequently reviewed by the Governing Council”). On 3 September 2015, the Governing Council decided to increase it to 33%, subject to a case-by-case verification that it would not create a situation whereby the Eurosystem would have a blocking minority for the purposes of collective action clauses in which case the issue share limit would remain at 25%.

b) Issuer limit:

The issue limit refers to the maximum share of a single PSPP-eligible security that the Eurosystem is prepared to hold. The issuer limit refers to the maximum share of an issuer’s outstanding securities that the ECB is prepared to buy. The issuer limit of 33% is a means to safeguard market functioning and price formation as well as to mitigate the risk of the ECB becoming a dominant creditor of euro area governments. To this end, the 33% limit is applied to the universe of eligible assets in the 2 to 30-year range of residual maturity.

Risk sharing – decentralised allocation of portfolios:

The programme aims to maintain market neutrality by purchasing assets across the whole maturity spectrum between two and 30 years. The purchases are allocated across countries according to the ECB’s capital key and any losses emanating from the programmes would be shared between the national central banks and the ECB in an 80%/20% ratio.

The NCBs' share of the total market value of purchases of marketable debt securities eligible under PSPP shall be 92 %, and the remaining 8 % shall be purchased by the ECB. The distribution of purchases across jurisdictions shall be according to the key for subscription of the ECB's capital as referred to in Article 29 of the Statute of the ESCB (see Figure B1).

The purchases of eligible marketable debt instruments by the Eurosystem under the PSPP should be implemented in a decentralised manner, giving due regard to market price formation and market functioning considerations, and coordinated by the ECB, thereby safeguarding the singleness of the Eurosystem's monetary policy.

Of the total value of purchased marketable debt securities eligible under PSPP, 12 % shall be purchased in securities issued by eligible international organisations and multilateral development banks²⁸, and 88 % shall be purchased in securities issued by eligible central

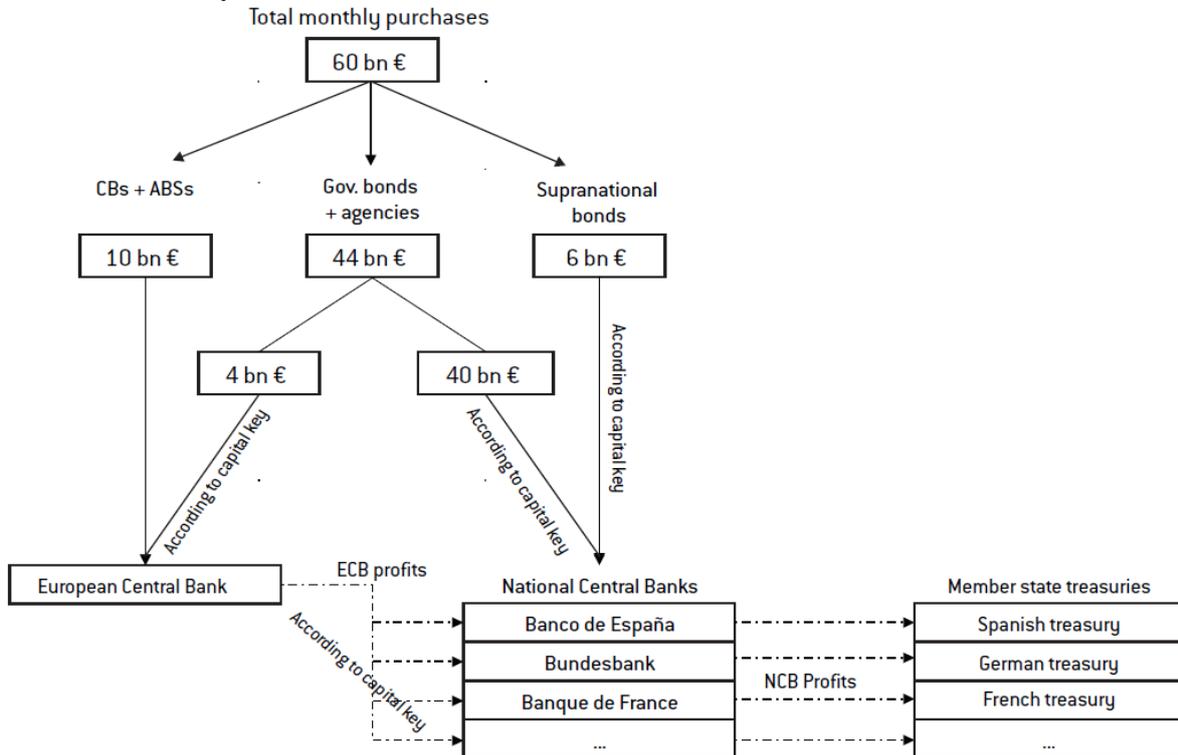
²⁷ See the introductory statement to the press conference by Mario Draghi on 3 December 2015:

<https://www.ecb.europa.eu/press/pressconf/2015/html/is151203.en.html>. The Governing Council took the following five decisions in the pursuit of its price stability objective: (1) Conventional monetary policy measures (key ECB interest rates): the interest rate on the deposit facility was lowered by 10 basis points to -0.30%. The interest rate on the main refinancing operations and the rate on the marginal lending facility will remain unchanged at their current levels of 0.05% and 0.30% respectively. (2) Non-standard monetary policy measures (QE): the asset purchase programme (APP) is extended. The monthly purchases of €60 billion under the APP are now intended to run until the end of March 2017, or beyond, if necessary to achieve inflation rates below, but close to, 2% over the medium term. (3) Reinvestment the principal payments on the securities purchased under the APP as they mature, for as long as necessary. (4) In the PSPP euro-denominated marketable debt instruments issued by regional and local governments located in the euro area are included in the list of assets that are eligible for regular purchases by the respective national central banks. (5) Continuation of conducting the main refinancing operations and three-month longer-term refinancing operations as fixed rate tender procedures with full allotment for as long as necessary, and at least until the end of the last reserve maintenance period of 2017.

²⁸ The initial list of international or supranational institutions located in the euro area and of agencies located in the euro area whose securities are eligible for the PSPP can be found on the ECB website:

governments and recognised agencies. This allocation is subject to revision by the Governing Council. Purchases in debt securities issued by eligible international organisations and multilateral development banks shall be conducted by NCBs only.

Figure B1: ECB's QE-Programme 2015/17: Allocation of monthly asset purchases by the Eurosystem



CBs = Covered bond purchases; ABSs = Asset-backed securities; CBs + ABSs = CBPP3 + ABSPP as of October 2014; the other components are PSPP
Source: Claeys et al. (2015), p. 3.

Due to the different timing of QE after the GFC and the Great Recession – the Fed was first, then came the Bank of England and the ECB and later the Bank of Japan – the balance sheets of the respective central banks were blown up differently (see Figure 10 and Table 2).

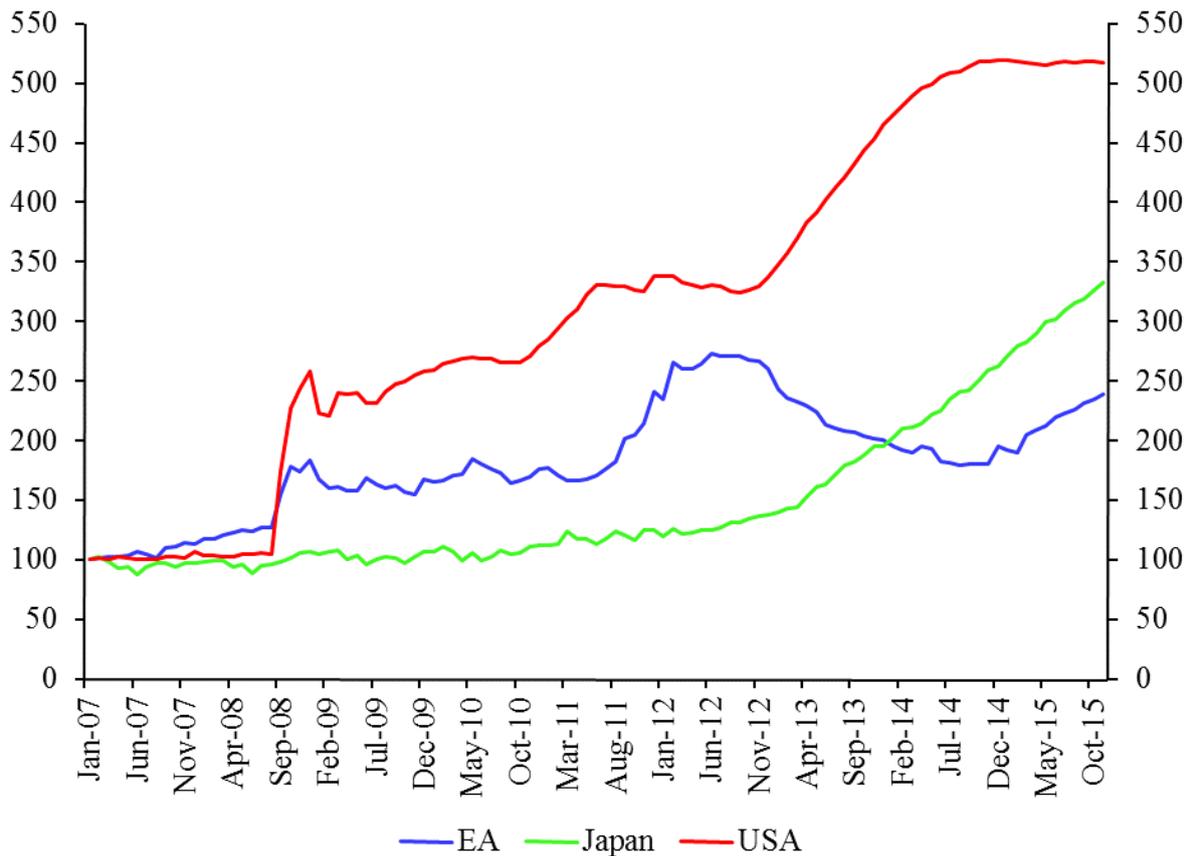
Analyses of previous central bank balance sheet shocks in the Euro area found a stronger impact in countries that are generally less affected by the financial crisis²⁹.

After the stimulating package of “Abenomics” in 2013 the Bank of Japan is heading the expansion of balance sheets.

<https://www.ecb.europa.eu/mopo/implement/omt/html/pspp.en.html>. The list has been revised on 3 September 2015: see: <https://www.ecb.europa.eu/mopo/implement/omt/html/pspp-qa.en.html>

²⁹ Boeckx et al. (2014) found the effects of an ECB balance-sheet shock on output to be relatively large in Germany, Finland, Estonia, Ireland, Slovenia, Slovakia and Luxembourg; much more subdued in France, Italy, Austria and Belgium, and negligible in Spain, the Netherlands, Portugal and Cyprus.

Figure 10: Central Bank's balance sheets (Total assets)
(1M2007=100); based on national currencies)



Source: MACROBOND

Table 2: Central banks' balance sheets and the monetary base: ECB in comparison

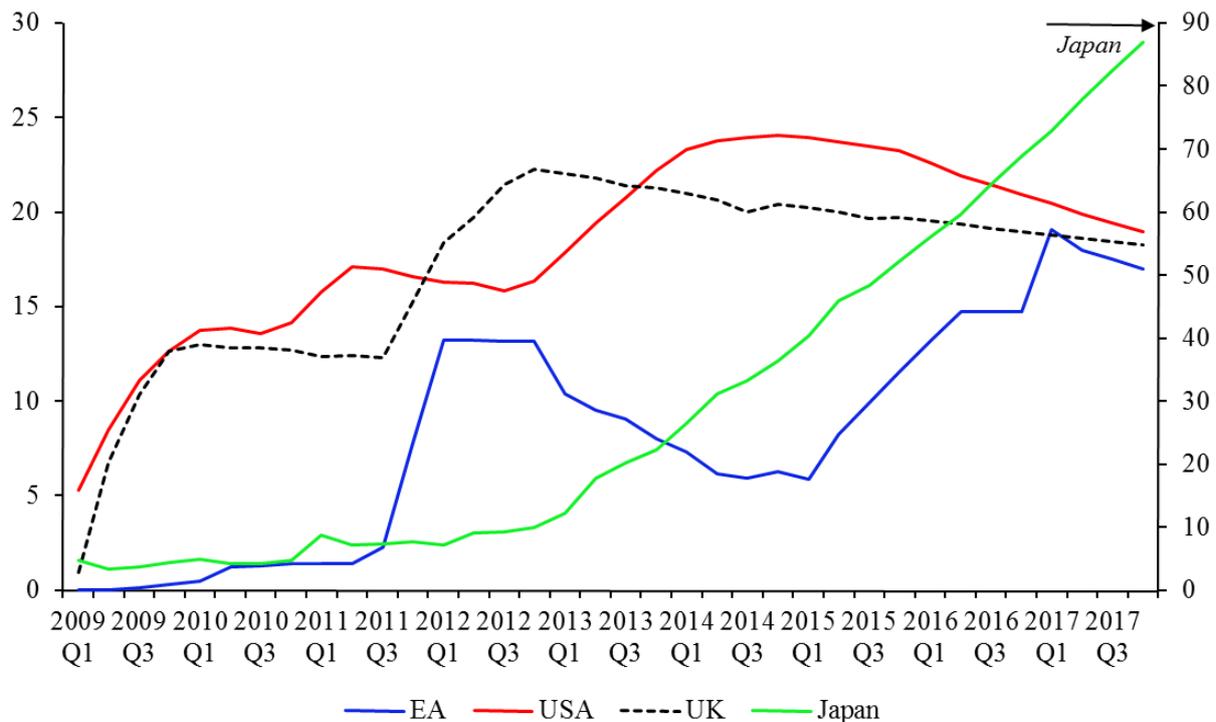
	Dates	Total Assets (% GDP)	Monetary Base (% GDP)	Outright Purchases (% GDP)	Outright Purchases (% total assets)
ECB (Eurosystem)	Latest	20.7	15.2	5.2	25.4
	Peak (June 2012)	26.2	18.0		
FED	Latest	24.5	22.7	24.3	99.1
	2007	5.8	5.7		
Bank of Japan	Latest	70.1	66.0	53.5	90.6
	2007	16.3	17.1		
Bank of England	Latest	23.4	21.7	20.9	89.5
	2007	5.4	4.4		

Source: Constancio (2015b).

QE by expanding the national banks balance sheets leads to an increase of monetary base (see Table 2) and hence, money supply M3. The dimension of QE still differs considerably between the major central banks.

The total amount the Eurosystem has purchased so far represents 5.3 percent of the GDP of the euro area, whereas what the Fed has done represents almost 25 percent of the U.S. GDP, what the Bank of Japan has done represents 64 percent of the Japanese GDP and what the U.K. has done 21 percent of the UK's GDP. Therefore, according to Constancio (21015c) the Eurosystem is very far from what the major central banks have done using the instrument of QE.

Figure 11: Dimensions of Quantitative easing – Eurozone late and lower
(QE in % of GDP)



Japan, right scale.

Source: Oxford Economics

As was already demonstrated in Figure 2 (QE reaction to the crises) the ECB was delayed compared to the Fed in applying unconventional monetary policy measures after 2009. The dimension of QE also varies and again demonstrates the delayed implantation by the ECB (see Figure 11).

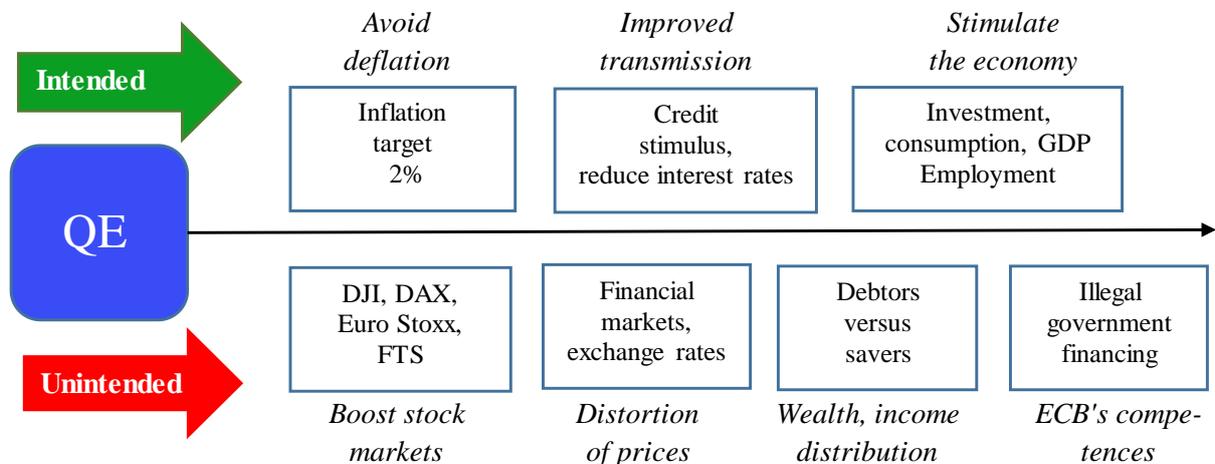
4.2 Intended and unintended impact of QE

ECB's QE intends primarily to avoid deflation and regaining control over the inflation target of below, but close to 2%. QE – if it properly works – should reach this goal. Additionally, it should stimulate the economy by reducing long-term interest rates and expand credits by

commercial banks³⁰. Lower interest rates also reduce the costs of debt serving for private and public debtors. Claeys et al. (2015, p. 11), estimate the public finance savings arising from sovereign bonds purchases from 0.01% to 0.02% of GDP.

However, QE can also lead to unintended effects (see Figure 12). QE, by dampening the credit costs could not only stimulate the real sector of the economy but could entail bubbles on the stock markets (“asset price” hike). Some commentators fear that a long-lasting QE policy would distort the financial – in particular the bond – markets³¹. A long period of low interest rates increases also the inequality between debtors and savers³². Zero interest rates lead on the one hand - via “financial repression” (see Reinhard and Sbrancia, 2011; Reinhard et al, 2011) – to a creeping loss of savers (they earn returns below the rate of inflation) and on the other hand it can help to liquidate government debts, but it might also lead to large renewed expansions in debt.

Figure 12: Intended and unintended effects of unconventional monetary policy (QE)



Source: Own design.

³⁰ Watt (2015) proposes a new form of conditional QE to stimulate growth in Europe. His scheme of conditional, overt monetary financing of public investment (COMFOPI) is a form of QE in which bonds newly issued by the European Investment Bank are purchased, on secondary markets, by the ECB, and the financial resources are made available to national governments to finance investment projects.

³¹ Recently more and more participants and analysts of the financial market criticise QE heavily (see NZZ, 2015a, 2015c; Jost and Seitz, 2015).

³² The German Council of Economic Experts (2012) qualifies the unconventional measures (quantitative easing) of the Federal Reserve and the Bank von England as „Financial Repression“. “The massive interventions by the Fed and the BoE in the bond market enabled their countries' steeply rising sovereign debt to be financed at historically low long-term interest rates – which contradicts the traditional crowding-out theory. This financial repression boils down to a covert channeling of funds from the holders of government bonds to the state.” (p. 19, Point 130). Beer and Gnan (2015) analyse how ultra-low interest rates might affect financial institutions. In the short-run it depends on the balance sheet structure. In the long-run the income of all types of financial institutions might suffer. A prolonged period of ultra-low interest rates might also compromise financial stability.

Then there is the fundamental legal question whether the ECB – which, in contrast to the Fed with its twin-goals of inflation and full employment has only inflation stability as its primary goal – could exceed its power and competence with its QE programme by direct public financing via profits of the PSPP (see Claeys et al., 2015, p. 11). Whether the QE programme – similarly to the never implemented OMT programme - will also be questioned legally because of monetary financing Member States, is open³³. However, it can be assumed that the Court of Justice of the European Union with its OMT ruling implicitly also accepts the QE programme as of 2015 as compatible with EU law (see Mayer, 2015).

Governments can gain from the zero-interest rate phase by issuing bonds even at negative yields (e.g. Germany). According to the BIS (2015b, p. 4-5), by the end of November 2015, the stock of euro area government bonds that carried negative yields had risen to more than €1.9 trillion, or approximately one third of the total market³⁴.

According to the ECB (see Cœuré, 2015) one key principle underlying the implementation of the PSPP is the minimisation of unintended consequences. The ECB will operationalise this principle by ensuring a high degree of transparency around their interventions and by closely monitoring their impact on liquidity and collateral availability.

4.3 Macroeconomic impact of QE in comparison

QE programmes should improve the transmission of monetary policy to the real sector.

4.3.1 Improvement of the transmission channel

The major concern of central banks is the improvement of the “*transmission channels*” of the QE policy. The QE policy in general, and ECB’s PSPP in particular for the Euro area is designed to strengthen the impact of the asset purchases already under way since the GFC. Conceptually, large-scale asset purchases by a central bank may have an effect through a number of channels (see Cœuré, 2015):

Lower yields: First, large-scale security purchases mechanically reduce the supply of securities available in the secondary market, which results in higher prices and lower yields

³³ A constitutional complaint against ECB’s QE has already been lodged at the Bundesverfassungsgerichtshof in Karlsruhe (see Mayer, 2015).

³⁴ In an econometric analysis Szczerbowicz (2015) evaluates the impact of the ECB’s unconventional policies on bank and government borrowing costs. The results show that (i) exceptional liquidity measures (three-year loans to banks and setting the ECB deposit rate to zero) significantly reduced persistent money market tensions and that (ii) asset purchases were the most effective in lowering refinancing costs of banks and governments in the presence of high sovereign risk. Moreover, the ECB asset purchases fed through into other asset prices: bank covered bond purchases diminished sovereign spreads, while sovereign bond purchases reduced covered bond spreads.

through the creation of scarcity. Importantly, this effect is by no means limited to the individual bonds that are purchased. Instead, the existence of “preferred-habitat investors” – agents with a preference for securities with a specific maturity – gives rise to “local” spillovers that also compresses the yield of bonds with a similar maturity (for a theoretical model, see Vayanos and Vila, 2009; for an empirical analysis for the USA, see Carpenter et al., 2013; for the Euro area, see Szczerbowicz, 2015). Since the announcement of the PSPP there was a decline in government and corporate debt yields, and a rise in equity prices, in France and in Spain (see Cœuré, 2015).

Risk reduction: In addition, asset purchases also reduce the overall duration risk borne by the market as securities are exchanged into central bank reserves. This lowers the interest rate risk borne by investors and accordingly affects the entire term structure, despite having a more pronounced effect on long-term bonds (see Adrian and Shin, 2010; Adrian et al., 2012; Greenwood and Vayanos, 2014). Notice that these two effects just mentioned have different implications for the effectiveness of asset purchases – local versus global impacts – and therefore need to be taken into consideration when implementing the PSPP.

Credit creation and growth: Besides the pure monetary impact (on bond yields) the QE programmes target also via liquidity enhancement of banks on credit creation and therefore on more investment and economic growth.

Inflation: The ultimate goal of ECB’s QE programme is to regain control over the inflation target of below, but close to 2% annual inflation.

4.3.2 Model evaluations of QE

There is already a considerable literature evaluating the QE policy of central banks, primarily in the case of the USA³⁵, but also in the UK and Japan. Most studies use Dynamic Stochastic General Equilibrium (DSGE) models, others apply econometric time series techniques.

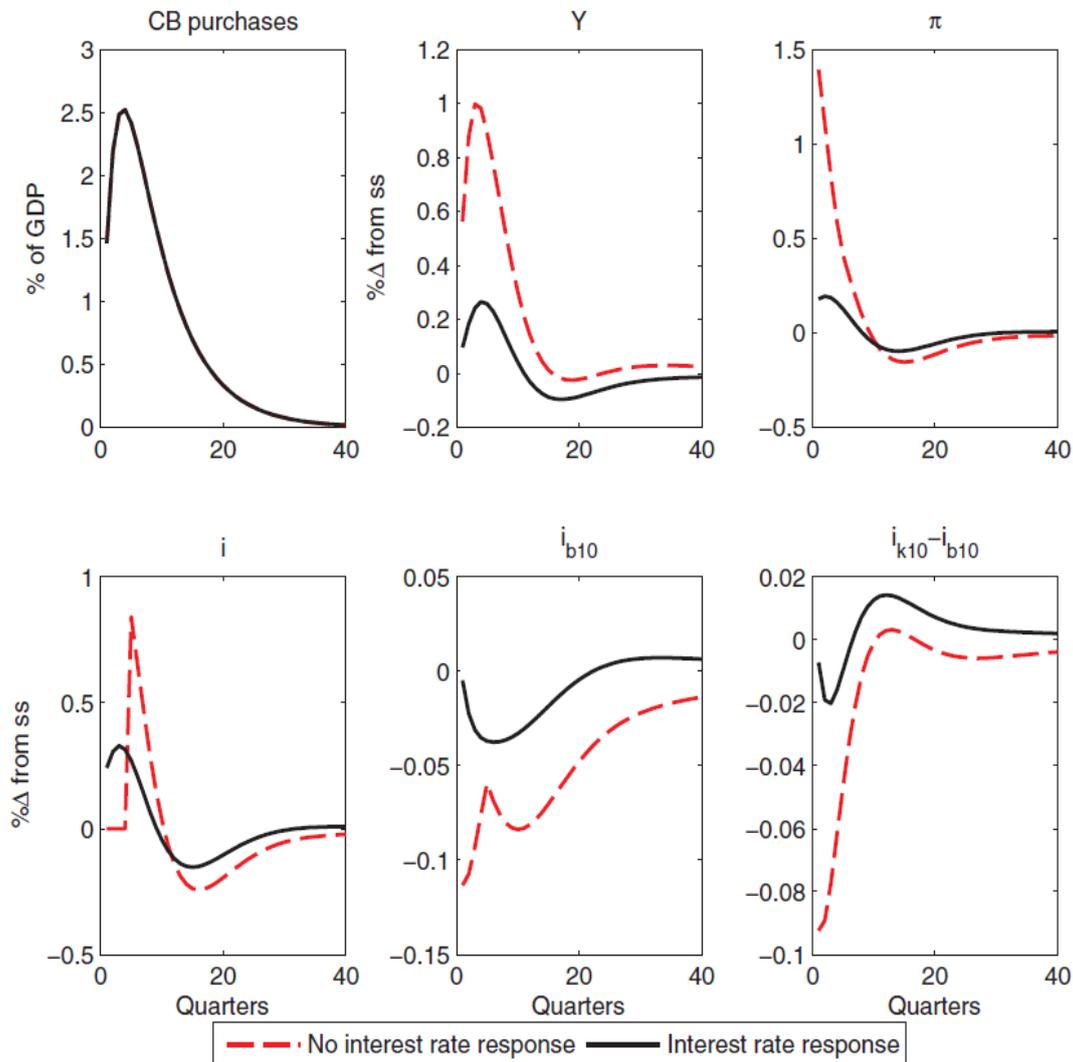
USA:

A prototype DSGE model to analyse QE policy by the US Fed is those of Gertler and Karadi (2013), based on earlier work by Gertler and Karadi (2011) and Gertler and Kiyotaki (2011).

³⁵ A short history of US’s unconventional monetary policy since the Great Recession in 2009 can be found in Williamson (2015a, 2015b). Since late 2008, the Fed’s target interest rate, the federal funds rate, has been close to zero. This long period of a zero interest rate policy, or ZIRP, is unprecedented since the Treasury-Federal Reserve Accord of 1951 modernized the approach to central banking in the United States. In its “Policy Normalization Principles and Plans” (Board of Governors, 2014), the Federal Open Market Committee (FOMC) proposed a program that should ultimately return the Fed’s balance sheet (which is currently more than four times as large as in 2007) to a state similar to that of December 2007. Williamson (2015b) therefore is urgently asking for a monetary policy normalization in the United States. A first step in this direction was set in December 2015.

Shortly after the meltdown of the shadow banking system that followed the Lehman failure in September 2008, the Federal Reserve initiated what is now known as QE1, followed by QE2 and QE3. The new policy measures have been large-scale asset purchases (LSAPs), known more generally as quantitative easing (QE)³⁶.

Figure 13: US Fed's QE policy: Impact in a DSGE model
(QE shock amounting to 2.5% of GDP)



CB purchases = QE2 (LSAP); Y = real GDP; π = inflation; i = short-term interest rate; i_{b10} = 10 years' government bond yields; ss = steady state.

Source: Gertler and Karadi (2013), p. 42

In their DSGE model, Gertler and Karadi (2013) interpret LSAPs as reflecting central bank intermediation. If private intermediaries are constrained in their ability to borrow, LSAPs can matter. The net benefits from LSAPs can be positive even if the central bank is less efficient than the private sector in intermediating the assets. These net benefits are likely to be

³⁶ A lengthy empirical literature has emerged attempting to identify the effects of the LSAP programs on market interest rates and economic activity (see: Gertler and Karadi, 2013, p. 7)

increasing in a financial crisis, since in this instance limits to private arbitrage are likely to be unusually tight.

Under different scenarios the authors come to the conclusion expected from QE policy: GDP, inflation and asset prices goes up as expected, the yields on long-term bonds go down³⁷.

Gertler and Karadi (2013) find a QE multiplier of around 0.4, i.e. government bond purchase of 2.5% of GDP leads to a short-term real GDP increase of 1.0% (in the ZLB scenario; see Figure 13). Gertler and Karadi (2013) simulate several scenarios. One is the comparison of a QE policy under different interest rate scenarios (see Figure 13). The authors address the issue of how the zero lower bound affects the impact of the LSAP. The baseline scenario (ZLB) where short rates are expected to be fixed (no interest rate response – ZLB) for a year with one where they adjust immediately (interest rate response).

As Figure 13 shows, the immediate adjustment of short rates offsets more than 80 percent of the effect of the LSAP on output. Real GDP rises only by 0.25% instead of 1% in the ZLB (baseline) scenario. This reduces the QE multiplier from 0.4 to 0.1. The rise in short rates generated by the Taylor rule is roughly 30 basis points for the first year, which mostly offsets the stimulus from the LSAP. Thus the authors conclude that it makes sense to use LSAPs only in situations where short rates are expected to remain fixed for a considerable period of time.

As a rare exception, Song (2014) – with a DSGE model with financial frictions and labour market search – analyses the impact of the US LASP programme on the labour market.

Among the policy objectives, unemployment rate is a crucial target to the US Fed. The bond purchasing (QE) policy has stronger effects on labour market and the security purchase policy creates more volatility to the unemployment rate. Both policies have effective short-run effect yet ineffective even negative long-run effect. Also, timing effects of asset purchase policy reactions are different.

UK:

There are many empirical studies on the macroeconomic impact of British QE done by LSAP. Joyce and Spaltro (2014) show that during the first round of British QE the increase in the

³⁷ These results are in line with time-series estimates of Gambacorta et al. (2011). Christensen and Rudebusch (2012) find a negative effect of the Federal Reserve's first LSAP program and the Bank of England's QE program of between 50 and 100 basis points on 10-year government bond yields. However, they find that declines in U.S. Treasury yields mainly reflected lower policy expectations, while declines in U.K. yields appeared to reflect reduced term premiums. Thus, the relative importance of the signaling and portfolio balance channels of quantitative easing may depend on market institutional structures and central bank communications policies.

growth of the credit action was relatively small, though QE was statistically significant for bank lending dynamics.

Weale and Wieladek (2015) examine the impact of large scale asset purchase announcements of government bonds on real GDP and the CPI in the United Kingdom and the United States with a Bayesian VAR, estimated on monthly data from 2009M3 to 2014M5. They identify an asset purchase announcement shock with four different identification schemes, always leaving the reactions of real GDP and CPI unrestricted, to test whether these variables react to asset purchases. Additionally, the transmission channels of this policy are explored. The results suggest that an asset purchase announcement of 1% of GDP leads to a statistically significant rise of 0.58% (0.25%) and 0.62% (0.32%) rise in real GDP and CPI for the US (UK). In the US, this policy is transmitted through the portfolio balance channel and a reduction in household uncertainty. In the UK, the policy seems to be mainly transmitted through the impact on investors' risk appetite and household uncertainty. Their results are more in favour of QE than previous ones based on the similar methodology (see Baumeister and Benati, 2013).

Butt et al. (2014) by studying the bank lending channel (BLC), found that the QE of the Bank of England did not boost bank lending. But it is consistent with other studies which show that QE boosted aggregate demand and inflation. UK policymakers did not rely on QE to boost bank lending and the evidence lends support to the use of other policies, rather than QE, to attempt to improve the supply of credit. Schuder (2014) stipulates that generally effects of expansionary monetary policy during economic crises are ambiguous.

Many DSGE models simulate the macroeconomic impact of QE programmes of the Bank of England (for an overview, see Caglar et al., 2011).

Practically all DSGE models apply small open closed economy models. An exception is Pietrzak (2015). He evaluates QE programmes of the Bank of England with a small open economy DSGE (SOE) model and compares the results with a closed economy model. He shows the consequences of omitting international dimension like trade and financial channels when modelling the effects of an unconventional monetary policy tool. He extends the model by Gertler and Karadi (2013) by open economy features. The QE programme of the Bank of England was somewhat different to those of the Fed. In contrast to the QE1 of the Fed, which was composed of the private securities, the Bank of England's MPC (Monetary Policy Committee) approved an asset purchases program called Asset Purchase Facility (APF) that was almost entirely composed of UK government bonds (gilts). During ten months starting

from March 2009 BoE bought £200bn of assets, which was equal to 14% of GDP and to the one third of domestic bonds held by the private sector.

Pietrzak (2015) demonstrates that QE policy in a closed economy model delivers much higher effects on real GDP, inflation and bond yields than in the case of a SOE model when spillovers are taken into account³⁸. The QE multiplier in a closed model is 0.6, in a SOE model 0.3. A QE impulse of 14% of GDP leads to an increase in real GDP in the first case of 9%, in the second case of only 4%³⁹.

Euro area:

The hitherto QE literature was primarily concentrated on countries with a longer tradition in this kind of unconventional monetary policy, in the USA and in the UK. As the ECB is lagging behind this tradition the respective economic literature is not very much developed. Dedola et al. (2013), based on work by Gertler and Kadri (2011, 2013) develop a two-country DSGE model in order to study the spill overs to others countries of QE programmes executed in one country (Euro area). The authors study the international dimension of unconventional policies in open economies featuring financial frictions. Of special interest are the implications for international policy coordination, of factors that account for a higher degree of financial and macroeconomic interdependence, such as financial integration.

In the same way as the subprime and banking crisis in the USA spurred the global financial crisis, unconventional monetary policy in one country is not only restricted to the country in which QE is executed. It will have an impact on other countries. The two-country model by Dedola et al. (2013) demonstrates this theoretically via simulations of different scenarios. Due to the international transmission of the monetary policy in one country to others this implies that, under some circumstances, international coordination of unconventional policies may be especially important. On the other hand, gains from cooperation should not be expected to be much larger for unconventional policies than for more standard policies. This result however

³⁸ For an econometric analysis of spill overs from monetary policies (interest rate and QE) in Europe and the USA to Mexico, see Morais et al. (2015).

³⁹ Falagiarda (2013), estimates the macroeconomic effects of QE with a DSGE approach for the US and the UK. Overall, the findings suggest that large asset purchases of government assets had substantial stimulating effects both in terms of lower long-term yields and higher output and inflation in both countries. These effects seem to be generally larger for the UK than for the US. This is not surprising, given that the size of asset purchases characterizing the phases of QE under consideration has been larger, in relative terms, in the UK rather than in the US. Falagiarda's findings indicates that large asset purchases of QE2 in the US had a peak effect on long-term rates in annualized terms of around -63 basis points, on the level of real GDP of 0.92%, and on inflation of 0.37 percentage points. In the UK, the preferred model specification suggests that the first phase of the APF programme had a peak effect on long-term rates of -69 basis points, on the level of real GDP of 1.25%, and on inflation of 0.49 percentage points.

reflects in part the lack of macroeconomic amplification of financial shocks in this model of financial frictions.

Limitations of DSGE models:

Most DSGE models evaluating QE policies are one-country models, mostly closed economy models. As Dedola et al. (2013) have shown, international spillovers have to be taken into account. Furthermore, there are differences in the impact of QE in closed and SOE models as Pietrzak (2015) has demonstrated. In the case of the Euro area with a heterogeneous set of member states, it would be necessary to evaluate the impact of ECB's QE not only for the average of the Euro area but for each Member State separately. The DSGE model technique, however, reaches very fast its limits with the three-country case (see Breuss and Fornero, 2009). Whatever DSGE model type one takes, it seems as if the macroeconomic impact of QE is overestimated.

4.3.3 Panel estimation of the economic impact of monetary policy in the crisis

The central banks of four countries are experiencing QE (in a broad sense) since the crisis of 2009, namely, Japan, the USA, UK and the Eurozone. In the following we estimated with a panel econometric approach the impact of QE in the four countries over the period 1Q2009 to 4Q2015. The database is the Global Economics Database of Oxford Economics.

According to the intended and unintended impact postulated in Figure 12 we test which effects had the standard measure (interest rate cuts) and non-standard measures (QE programmes) on the major macroeconomic variables (GDP, long-term interest rates, credit expansion, inflation and on the stock market prices). The estimation results of Table 3 are the following:

- Standard policy: Interest rate policy of the four central banks do not yield clear-cut results. This may be due to the fact, that relative early after the GFC central bank's target interest rates were reduced to a zero-level bound (ZLB). Therefore, over the whole period, the influence of interest rate policy can hardly be measured. In the case of influencing real GDP, the interest rate, credit demand and stock market prices, the estimated coefficients reflect the correct theoretically expected sign. In some cases, the sign is not correct (in one version of the credit equation; in both inflation equations) and in the credit equation the coefficient is not significantly different from zero.
- Non-standard policy: QE had in all cases the correct sign and a significant influence. A 10% increase of QE has increased real GDP on average of the four countries by 0.7% (i.e. the QE multiplier is 0.07), long-term interest rates (bond yields) came down by 0.3%,

credits expanded by 0.7%-0.9%, inflation increased by 0.3%-0.4%, and stock market prices were stimulated by 5.5%-8%.

Table 3: Monetary policy in the crisis - impact on GDP, interest rates, credits, inflation and stock market prices (1Q2009-4Q2015)

	Constant	R _{nb}	QE	LPR	D(U)	GDP	R ²
GDP ₁	0.37	-1.63**	0.07**				0.14
GDP ₂	-0.52**	-0.73**	0.07**	1.01**			0.78
Interest rate	2.02**	1.89**	-0.03**				0.81
Credit ₁	-1.68**	1.56	0.07**				0.13
Credit ₂	-1.89**	-0.14	0.09**			0.29**	0.28
Inflation ₁	0.30	1.42**	0.04**				0.38
Inflation ₂	0.26	1.71**	0.03**		-0.54		0.37
SMP ₁	2.87	-15.28**	0.80**				0.23
SMP ₂	1.46	-9.14**	0.55**			3.77**	0.46

Bold = sign not in conformity with theory;

Dependent variables: GDP = real GDP (% changes); Interest rate = long-term interest rates (10-years government bond yields), Credit = loans to non-financial corporations (% change); Inflation = HICP inflation rate (%); SMP = stock market price index (% changes);

Explaining variables: QE = quantitative easing in % of GDP; R_{nb} = central bank's target interest rate (%); LPR = Labour productivity (% change); U = unemployment rate (%); D(U) = absolute change of the unemployment rate.

Panel estimation with fixed country effects: 4 countries (Eurozone, Japan, UK, USA); period: 1Q2009-4Q2015; in the equation Credit₂, real GDP enters with a lag of 2 quarters.

** Statistically significant at 95% and 99% levels.

GDP₂ = Verdoorn's law; Inflation₂ = Phillips curve.

Data source: Oxford Economics: Global Economics Database; own estimates with EViews 8.

4.4 An evaluation of ECB's QE in 2015/17

Representatives of the ECB (see Constancio, 2015c) see ECB's QE programme effective and working already in many ways: Lending rates of banks have gone down, access to credit has improved. According to ECB statistics⁴⁰, the annual growth rate of credit to the private sector increased to 1.2% in November, from 1.0% in October. However, the success concerning the primary goal of the QE programme to keep the HICP inflation rate below but close to 2% is still absent. HICP inflation at the end of 2015 is still far away from the target of 2%. Headline inflation increased from -0.1% in March 2015 to only 0.2% in December 2015, the core inflation from 0.6% to 0.8%.

⁴⁰ ECB, Press Release "On monetary developments in the euro area: November 2015", 30 December 2015

The European Commission (2015a, 2015b) in their 2015 forecasts sees the QE programme of the ECB as one of three factors (besides the low oil price and the depreciation of the euro) underpinning the moderate economic recovery of the Euro area. Overall, the European Commission (2015a, p. 15) expects that QE will have a positive impact on inflation and economic activity over the forecast horizon. Due to the substantial size of ECB's QE programme the Commission assumes that the effects on real GDP growth and HICP inflation will be sizeable this year and next. Nevertheless, its own forecasts for HICP inflation for the Euro are (2015, 0.1%, 2016, 1%, 2017, 1.7%) do not reach the 2%-target in the medium run. Furthermore, the Commission quotes empirical studies which confirm a QE-induced reduction in long-term interest rates, but the magnitude of the effects differs widely across studies⁴¹. The reason for the ambiguity of the outcome of QE studies is that the impact of both the announcement and implementation of QE depends on a number of transmission channels. The main channels are the portfolio balance channel, the signalling channel, and the confidence (or uncertainty) channel (see Weale and Wieladek, 2015).

4.4.1 The impact simulated with a Global Economic Model

As an alternative approach to the usually applied DSGE models we use the Global Economic Model of Oxford Economics to analyse the impact of ECB's QE programme over the years 2015 and 2017⁴². This is a fully integrated global economic model where the individual country models (of 47 countries) are fully lined through global assumptions about trade, exchange rates, competitiveness, capital markets, interest rates, commodity prices and internationally traded goods and services. The rest of the world economy is covered in six trading blocs so that global GDP and trade are fully modelled.

In particular, we are interested in the impact of ECB's QE programme on the Euro area and its Member States as well as on spill overs to third countries. A specific feature of the Oxford model is that it not only models standard ECB monetary policy (the reaction on interest rate changes as of the Main Refinancing Operation rate) but also deals with non-standard instruments, like QE for the ECB and major industrial countries. QE feeds directly into the long-term interest rate and the credit conditions of private banks and hence, leading to impulses for investment and consumption and lastly to GDP.

⁴¹ For a comparison of empirical studies on QE in the US, see Williams (2014).

⁴² See: <http://www.oxfordeconomics.com/forecasts-and-models/countries/scenario-analysis-and-modeling/global-economic-model/overview>

4.4.1 Model assumptions

We simulate the concrete QE programme of the ECB, announced in January 2015 and implemented in March 2015 plus the extension announced on 3 December 2015. The size of PSPP amounts to monthly purchases of government bonds of EUR 60 bn. The programme runs until March 2017 and totals then EUR 1500 bn. As the Oxford model is a quarterly model we implement this programme as follows: Starting with 2Q2015 we input into the model in each quarter EUR 187.5 bn until 1Q2017 which over eight quarters cumulates to the respective amount of EUR 1500 bn. The relative size of the QE programme is 1.8% of GDP.

4.4.2 Model results

Generally, our impact results are modest compared to other – in particular to DSGE - exercises for the USA. The novelty of our approach is that we are able to quantify the effects not only for the aggregate of the Euro area but also for the individual Member States. Furthermore, we are able to study the spill overs to third countries.

1) QE impact on real GDP within the Eurozone and spill overs to third countries

ZLB or flexible interest rates: First we address the issue of how the zero lower bound affects the impact of ECB's QE. We compare a scenario where the short rates are expected to be fixed over the simulation horizon with one where the rates adjust according to the reactions of a Taylor rule. As in Gertler and Karadi (2013) the outcome of QE policy is more favourable in times of fixed short rates (at the peak after 8 quarters of 0.22% more real GDP⁴³) than in case of flexible interest rates (only +0.19%; see Figure 14)⁴⁴. This leads to the conclusion that to use QE policy makes sense only in situations where short rates are expected to remain fixed for a considerable period of time. The following simulations are undertaken under the assumption of flexible interest rates.

Different impact for Eurozone Member States: In the core of the Euro area the impact is in a similar range as in the Eurozone as a whole. In the periphery the QE impact on real GDP is above average, namely 0.24% at the peak for Greece and somewhat less in Spain (See Figure 14).

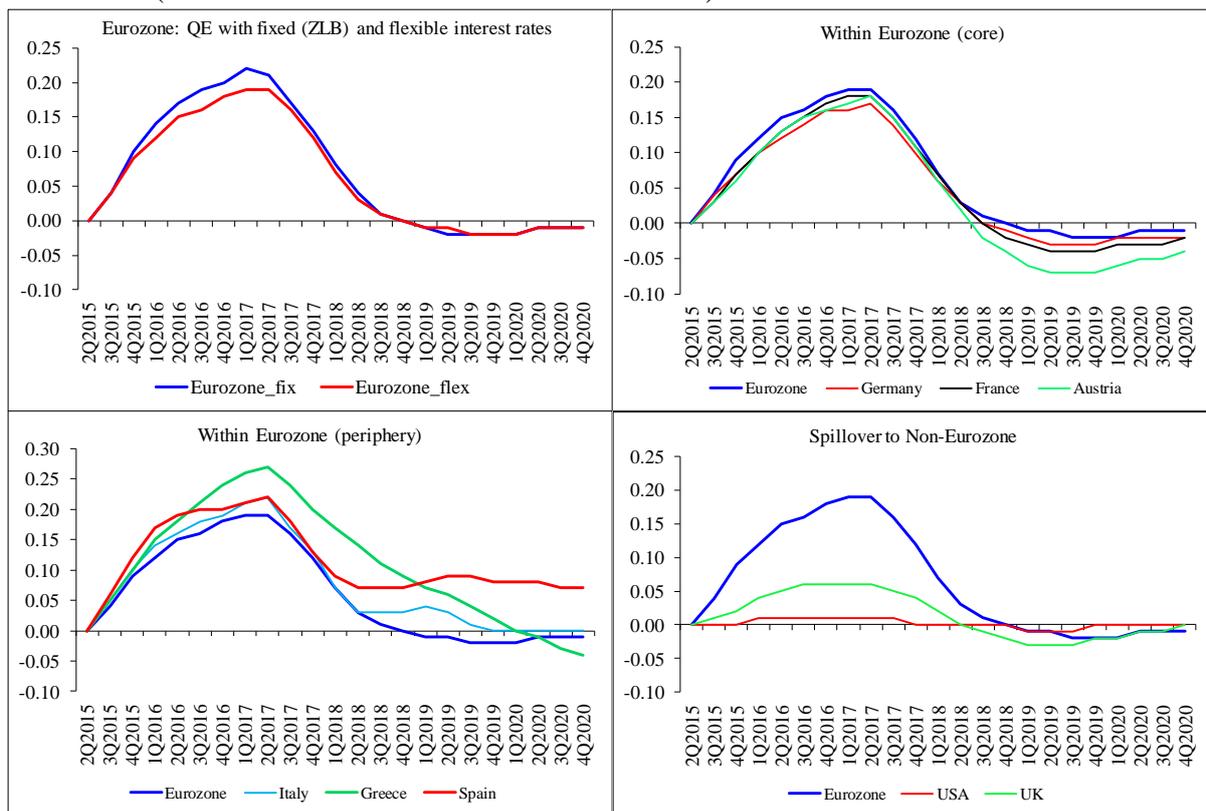
Spill overs to third countries: ECB's QE programme has also positive GDP effects via spill overs in the UK, less so in the USA (see Figure 14).

⁴³ The reaction of the real economy to QE policy is more lagged in our simulations than in DSGE exercises for the USA (see Gertler and Karadi, 2013)

⁴⁴ The difference in the GDP impact of ECB's QE policy between both scenarios (ZLB and flexible interest rates) is much smaller in our simulations than in the simulation experiments with a DSGE model by Gertler and Karadi (2013; see our Figure 13).

QE multiplier: The reaction of real GDP on QE policies (the “QE multiplier”) is much lower in our simulations (0.12) than in studies for the USA (in the range of 0.40 in Gertler and Karadi, 2013; in the case of flexible interest rates the QE multiplier is 0.1) to 0.58 in Weale and Wieladek (2015)) or for the UK (0.25% in Weale and Wieladek (2015)). It is difficult to evaluate which size is the correct one. It seems clear, however, that QE policy works best in the USA, and also properly in the UK. The long-lasting stagnation (“secular stagnation”) and deflation indicate that QE does not work properly in Japan. For the Euro area the real test is open.

Figure 14: ECB’s QE impact on real GDP: within the Eurozone and spill overs
(Cumulative deviations from baseline in %)



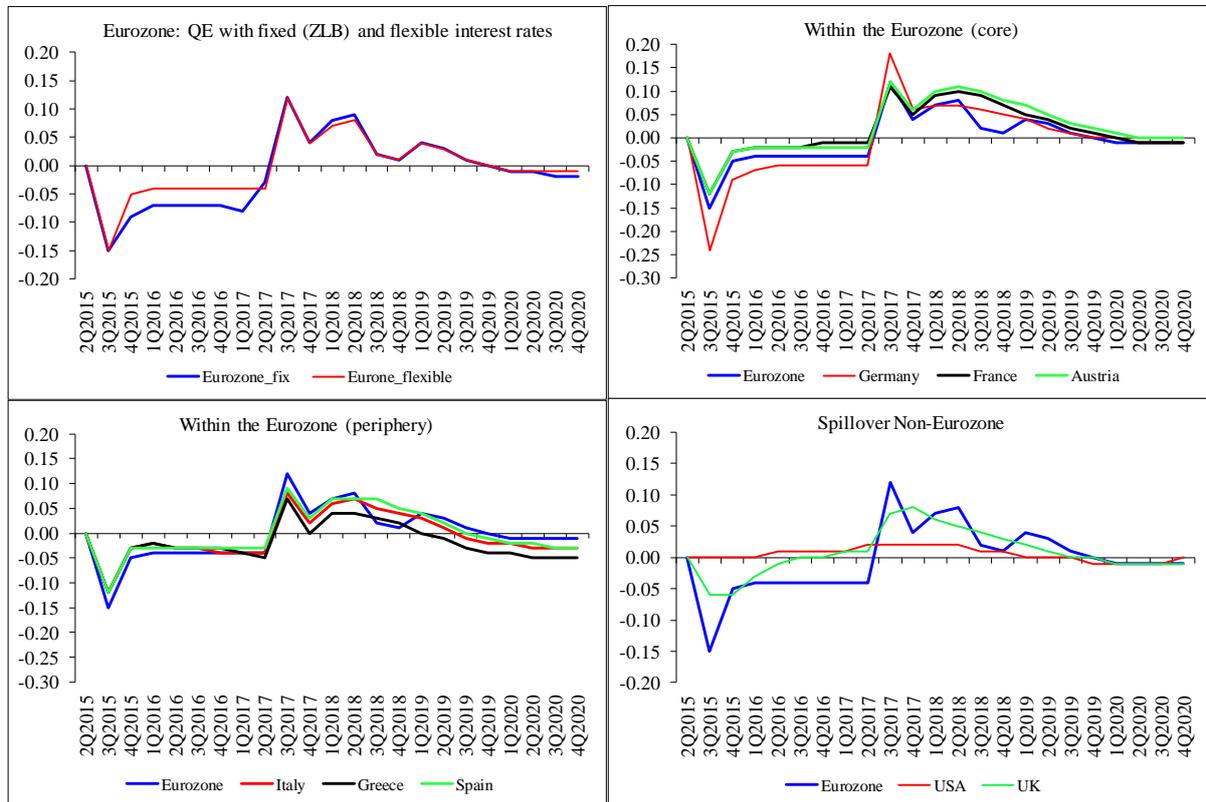
The detailed results refer to the flexible interest rate scenario.
Source: Simulations with the Oxford Economic World model.

2) QE impact on long-term interest rates

One of the intended effects of QE is the drop in the long-term interest rates (10-years government bond yields) in order to ease public finance. As in most DSGE studies for the case of QE in the US and UK, also our simulations lead to a drop in long-term interest rates due to ECB’s QE programme of 0.15 percentage points in the Eurozone (see Figure 15). In contrast to the lagged effects on real GDP, QE leads to an almost immediate drop in long-term

interest rates. Again we see different impacts in the member states of the Eurozone and also damped spillovers to third countries like the US and the UK⁴⁵.

Figure 15: ECB's QE impact on long-term interest rates: within the Eurozone and spill overs (Cumulative deviations from baseline in %)



Long-term interest rates = 10-years government bond yields
Source: Simulations with the Oxford Economic World model.

3) QE impact on other macroeconomic variables

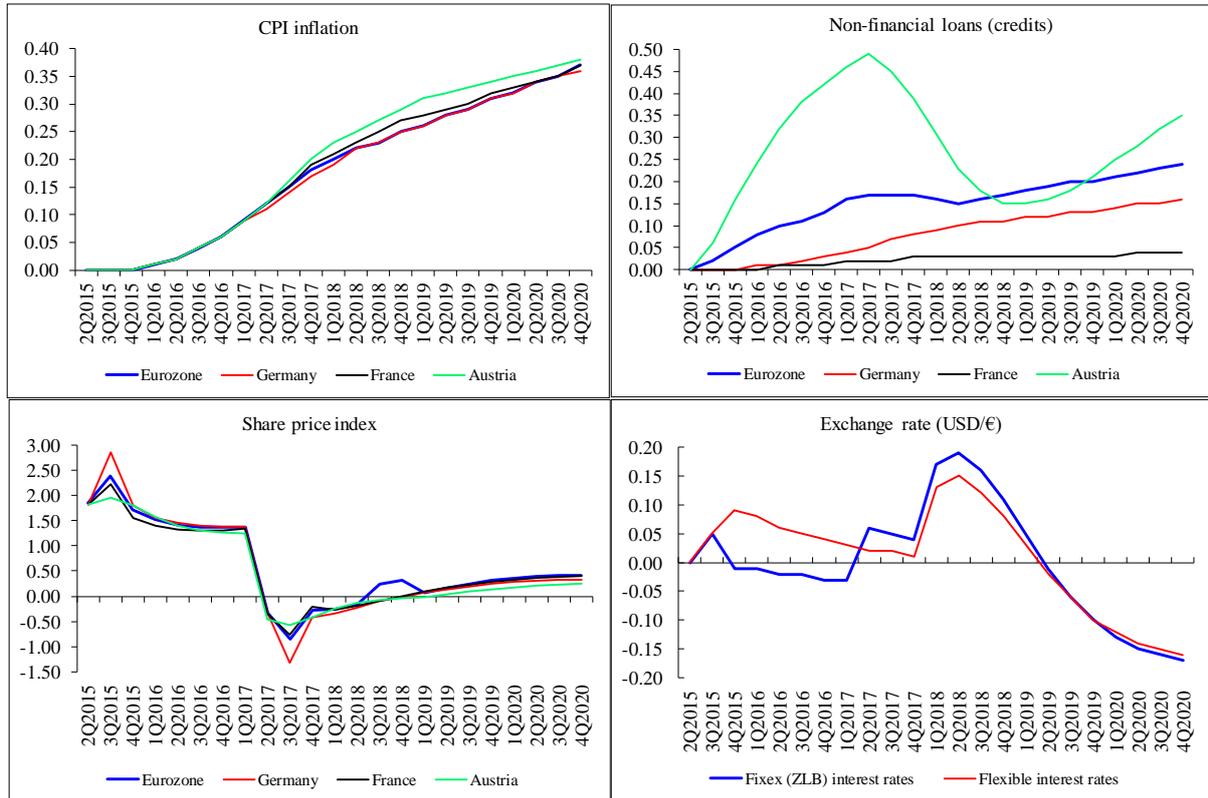
Inflation: One of the primary goal at which QE policy of the ECB is targeting is inflation.

According to our simulations the effect of ECB's QE (also implanted only until March 2017) has a long-lasting effect on inflation. The level of HICP inflation will cumulatively increase to 0.4 percentage points until 2020. Until the end of the programme, however, inflation will be stimulated only by 0.10 percentage points (see Figure 16). The QE inflation multiplier at the

⁴⁵ Morais et al. (2015) analyse econometrically the spill overs of (conventional and unconventional) monetary policies in the Eurozone, UK and US in the case of Mexico (via the international credit channel of European and U.S. banks in Mexico). They find that a softening of foreign monetary policy increases the supply of credit of foreign banks to Mexican firms. Each regional policy shock affects supply via their respective banks (for example, U.K. monetary policy affects credit supply in Mexico via U.K. banks), in turn implying strong real effects, with substantially larger elasticities from monetary rates than QE. Moreover, low foreign monetary policy rates and expansive QE increase disproportionately more the supply of credit to borrowers with higher ex ante loan rates (reach-for-yield) and with substantially higher ex post loan defaults, thus suggesting an international risk-taking channel of monetary policy. All in all, the results suggest that foreign QE increases risk-taking in emerging markets more than it improves the real outcomes of firms.

peak would be 0.21 in the Euro area, 0.6 in the USA (in Gertler and Karadi, 2013⁴⁶ and Weale and Wieladek, 2015) and 0.32 in the UK (see Weale and Wieladek, 2015).

Figure 16: ECB's QE impact on inflation, credits, share prices and exchange rate (Cumulative deviations from baseline in %)



Increase (decrease) of USD/€ exchange rate is appreciation (depreciation) of the € vis à vis USD.
Source: Simulations with the Oxford Economic World model.

Credits: Another important effects expected from QE is the credit channel, hence the effect on credit (non-financial loans). The effect is as expected positive, however, very weak – with the exception of Austria (see Figure 16). In the periphery the effect (not shown here) is much more pronounced, in particular for Greece, Italy and Spain. This underlines the suspicion that the QE programme primarily is targeted to the periphery countries.

Share prices: As an unintended (collateral) damage or effect of QE policy is the creation of bubbles at the stock markets which already led to the GFC 2008 (see Breuss, 2010).

According to our simulations share prices react quickly to the announcement and implementation of ECB's QE, much faster than the adjustment in the real sector of the economy (see Figure 16). After ending of the QE programmes, however, the effects vanish very quickly on the stock markets.

⁴⁶ In the scenario with flexible interest rates, the QE inflation multiplier in Gertler and Karadi (2013) would only be 0.1.

Euro devaluation: One side effect of ECB's QE is – due to the reduction of the interest rate differential of the Eurozone vis à vis the USA – a devaluation of the Euro vis à vis the USD. Although this side effect would be a stimulus to the presently weakly performing economy of the Eurozone (and would help to increase inflation) the simulated effect is very modest and more pronounced in the ZLB scenario.

5. Conclusions

After the GFC 2008, followed by the “Great Recession” in 2009 and – in Europe – by the Euro crisis starting in 2010, the ECB – in following the examples in the USA, in Japan and in the UK – unveiled a variety of new policy measures never used before. The Main Refinancing Operation rate of the ECB reached – lagging behind the Fed – effectively its zero lower bound. This implied that, despite the severity of the recession and the Euro crisis, the standard monetary policy option of reducing the interest rate was no longer available. Therefore, the ECB turned to new non-standard measures as the only avenue for stimulating the economy. Although different kinds of large-scale asset purchase programmes were already implemented after the crises, only one component of the extended asset purchase programme, announced in January 2015, the public sector purchase programme (PSPP), launched in March 2015 is called quantitative easing (QE).

This paper examines the macroeconomic impact of QE programmes, firstly by comparing its effect in other countries, and lastly by simulation with a Global Economic Oxford Model the concrete size of the impact of ECB's QE programme 2015/17. It turns out that the effects are weaker than in DSGE model studies for other countries (USA and UK). Furthermore, the lag of the impact of QE policy is larger in our simulations (in particular in the case of inflation) than in those of DSGE model studies. The novelty of our simulations is that they are able to evaluate and quantify the possible impact not only for the aggregate of the Euro area but also for its Member States and also the impact in third countries via spill overs.

Interestingly, the QE seems to fulfil much quicker and stronger the unintended goals (stock market bubble; exchange rate changes, distortion of prices on the financial markets) than the intended ones (increase inflation, improve monetary transmission, stimulate the real economy). It is particularly unpleasant, that until now, the ECB with its QE programme was not able to reach its primary goal, namely price stability, defined as an annual HICP inflation rate in the medium run of below but close to 2%.

Overall, QE makes sense in a period of interest rates at the zero lower bound as we experience right now. However, one cannot expect miracles from monetary policy alone - neither by

standard nor by non-standard measures - in stimulating economic growth to a sustainable path. Neither is an ultra-expansionary monetary policy able to turn deflationary tendencies into inflationary ones, nor is it the sole remedy to speed up the presently only moderately recovering European economy. Fiscal policy and structural reforms should accompany it, preferably in a cooperative way.

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