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The systemic excess of liquidity in the banking system and monetary exit strategies of ECB and Fed

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Čestné prohlášení

Prohlašuji, že diplomovou práci na téma *"The systemic excess of liquidity in the banking system and monetary exit strategies of ECB and Fed"* jsem vypracovala samostatně a veškerou použitou literaturu a další prameny jsem řádně označila a uvedla v přiloženém seznamu.

V Praze dne 7. září 2014 ……..

podpis

Poděkování

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Abstrakt

Cílem této diplomové práce je analýza nekonvenční měnové politiky, která byla aplikována Federálním rezervním systémem a Evropskou centrální bankou jako reakce na současnou finanční krizi, a možnost implementace strategie exitu pro každou z centrálních bank. První část práce popisuje teoretická východiska nekonvenční měnové politiky, konkrétně kvantitativního uvolňování (QE). Druhá část se zaměřuje na dva různé případy aplikace QE, a to Federální rezervní systém a Evropská centrální banka, a zdůrazňuje konkrétní programy a jejich vliv na ekonomiku. Poslední část se zabývá možným návratem k tradičním měnově-politickým nástrojům pro každou z centrálních bank v kontextu současného ekonomického výhledu a konkrétních opatření, které byly realizovány. Na závěr jsou shrnuté hlavní výsledky této diplomové práce.

Klíčová slova: finanční krize, kvantitativní uvolňování, Evropská centrální banka, Federální rezervní systém, strategie exitu

JEL Klasifikace: E52, E58

Abstract

The aim of this master thesis is to analyze the unconventional monetary policy measures that were applied by the Federal Reserve System and the European Central Bank as a response to the current financial crisis, and the possibility of an exit strategy for each of the central banks. The first part of the thesis describes the theoretical background to the non-traditional monetary policy, specifically the quantitative easing. The second part focuses on two different cases of the QE application – the Federal Reserve and the European Central Bank, highlighting the specific programs and their effects on the economy. The last part examines the possible return to the traditional monetary policy tools for each of the central banks, in the context of the current economic outlook and the specific measures that were implemented. The results of the paper are summarized in the conclusion of the master thesis.

Keywords: financial crisis, quantitative easing, the European Central Bank, the Federal Reserve System, exit strategy

JEL Classification: E52, E58

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"Extremis malis extrema remedia"

(Latin proverb)

Introduction

The years 2007-2008 were marked by the outbreak of the financial crisis, which turned into the largest and the most severe global economic recession since the Great Depression of the 1930s. The crisis and its aftermath dramatically affected the major financial centers and irreversibly reshaped the world of finance and investment banking. Faced with the inability to use the traditional monetary policy tools, the central banks turned to the unconventional monetary policy measures, in order to help the financial institutions, stabilize the markets and stimulate the economic growth. Particularly, the most high-profile form of non-traditional monetary policy is the *Quantitative Easing.*

The quantitative easing is an unconventional monetary policy which unusually magnifies the balance sheet of a central bank through open-market long-term government securities or other securities purchases. The aim of quantitative easing is to lower long-term interest rates in order to spur the economic growth, and in addition, in the case of long-term corporate bond purchases, the quantitative easing helps reducing the overall risk profile of the banks, by allowing them to shift the assets with higher credit risk from their portfolios with the secure ones.

Besides the quantitative easing, over the last 6 years, the central banks followed different non-standard monetary policy responses to the global financial crisis. The programs that were implemented were significantly different depending on the current situation and the structure of the economy. Overall, the actions of the central banks have helped in supporting the financial markets, and prevented the uncontrolled collapse of the global economy. However, the unconventional monetary policy measures are broadly criticized for the destabilizing effects in the monetary and fiscal markets, particularly, the inability to use the traditional monetary tools, in the context of the zero interest rates and the systemic excess of liquidity created in the system, in the context of the expanded central banks' balance sheets; and the significant increase of the public debts and the budget deficits, which also threatens the economic balance of the countries. In this context, the main goal of the central banks today is to design the gradual return to the stable functioning of the economies and the elimination of the negative effects of the

persisting imbalances. The set of measures and tools that aim to serve this purpose are called the exit strategy.

This thesis sets the objective to assess the Quantitative Easing programs and other liquidity providing measures that were implemented by the Federal Reserve System and the European Central Bank after the outbreak of the global financial crisis, and subsequently analyzes the possibility of an exit strategy for each of the central banks in the context of the specific monetary policy measures that were applied.

The paper is divided in four chapters. The first chapter provides the theoretical background to the unconventional monetary policy. It starts by describing the eruption and the evolution of the current financial crisis and continues with the conceptual basis of the quantitative easing policy. Afterwards, it explains the possible channels of operation of the quantitative easing. Finally, the chapter provides historical evidence on the implementation of the QE in Japan, emphasizing the main lessons of the Japanese experience.

The second chapter describes the implementation of the unconventional monetary policy in the U.S. economy. It starts from describing the traditional monetary policy that the Federal Reserve was implementing prior to the global financial crisis and the economic environment that it was facing in the summer of 2007. Further, it continues with the analysis of the Federal Reserve's entrance strategy, particularly, the liquidity facilities that were created from 2007 till 2008. In the following paragraphs the chapter describes the specific quantitative easing programs that were implemented by the central bank and their effects on the economy.

The third chapter describes the implementation of the unconventional monetary policy in the E.U. As well as the second chapter, it begins by describing the European Central Bank's traditional monetary policy and the economic outlook of the summer of 2007. It divides the euro area crisis in five main parts and analyzes the ECB's implemented measures and their effects on the economy.

The last chapter examines the central banks' possible return to the traditional monetary policy tools, in the context of the current economic outlook. The first paragraph contains the conceptual basis of an exit strategy. Further, the chapter provides the literature review and the historical evidence on the exit strategy, in the context of the BOJ's quantitative easing policy. The last part analyzes the implications for the current exit strategies of the Federal Reserve System and the European Central Bank. Lastly, the conclusion summarizes the main results of the paper.

1 The Quantitative Easing

1.1 The global financial crisis of 2007-2008

The global financial crisis of 2007-2008 is considered the largest and the most severe financial event since the Great Depression of the 1930s which not only affected the world's greatest financial institutions and the major financial centers but irreversibly reshaped the world of finance and investment banking. Its effects are still being felt in the global financial and commodity markets and in the real economy making it one of the most complex and wide-ranging financial meltdowns.

The outbreak of the current financial crisis, or how it is also called – The Great Recession, was in the summer of 2007 and it intensified in September 2008. However, its roots can be traced long before that and can be found in the combination of macroeconomic processes and micro-level institutional factors. But despite the complex causes that puzzled the economists and policymakers across the globe, the trigger and proximate cause for this crisis was the housing bubble in the USA. From the beginning of the year 2000 till late 2006 on the real estate market was created a huge bubble, when the real estate prices grew by more than 170%, especially in the southern regions. This bubble was a result of the loose credit policy of the banks, very optimistic expectations and the underestimation of the risk management by the credit institutions. The expansion of the housing market led to the increase of risky mortgages and their securitization with new structured financial products (CDOs and MBSs)[1] which were further sold off to obtain new funds for lending. However, after 2004 when the Federal Reserve started increasing the interest rates the number of delinquency rate on home loans began to rise, housing prices started to fall, homeowners started to default and this as a result, led to the failure of a number of US mortgage lenders.

The bursting of the housing bubble on the US market wasn't the only shock that caused the outbreak of the global financial crisis. It was strongly connected with other fundamental causes which amplified its duration and amplitude. One of the most important factors were the global

[1] CDO - Collateralized Debt Obligation - a structured financial product that pools together cash flow-generating assets and repackages this asset pool into discrete tranches that can be sold to investors. The tranches vary substantially in their risk profile. The senior tranches are relatively safer because they have first priority on the collateral in the event of default, have a higher credit rating and offer lower coupon rates than the junior tranches, which offer higher coupon rates to compensate for their higher default risk.
MBS - Mortgage-Backed Security - a type of asset-backed security that is secured by a mortgage or collection of mortgages. These securities must also be grouped in one of the top two ratings as determined by an accredited credit rating agency, and usually pay periodic payments that are similar to coupon payments. (Source: Investopedia)

macroeconomic imbalance, the mispricing of the credit risk, the astronomical growth of the "securitization" activities connected to structured credit products and derivatives which were difficult to understand and measure, the weaknesses in the financial system infrastructure, the shortcomings in risk management and the official oversight in the public sector.[2] The interaction of all these causes had a large negative impact on the financial markets and subsequently on the real economy.

So in the summer of 2007 on the global financial markets there could be seen the first signs of the crisis. The financial crisis that initially started from the busting of the housing bubble on the US real estate market spread not only on the mortgage lenders but also on other financial institutions and it rapidly transformed from a credit crisis in the banking system into a liquidity crisis. Among the largest financial institutions that announced the greatest losses were Citigroup, Merrill Lynch, Morgan Stanley, and Bear Stearns which was later bought by J.P. Morgan. However, the intensification of the global financial crisis is connected with the collapse of the Lehman Brothers in September 2008, when a wave of anxiety spread on the global financial markets. Even if the crisis came as a surprise for many policymakers, investment bankers and regulators it had a very large negative impact on the economic activity in the whole world.

"Wednesday is the type of day people will remember for a very long time. Events that models only predicted would happen once in 10000 years happened once in every day for three days." – Matthew Rothman, global head of quantitative equity strategies, Lehman Brothers, August, 2007.

As a result, in 2009 the major developed economies found themselves facing a deep recession. The central banks were in a very difficult situation, when they had to help the financial institutions, find a way to stabilize the financial markets and stimulate the economic growth. However, the use of the traditional monetary tools was limited.

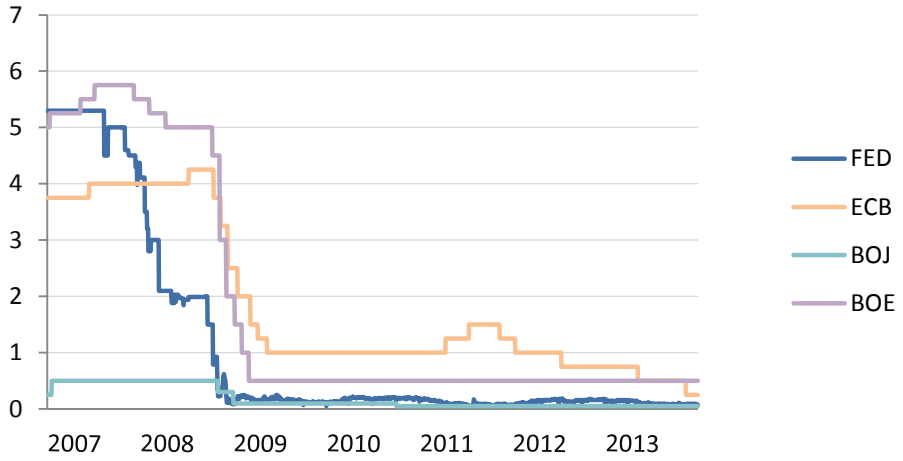
The traditional monetary policy is based on the short-term nominal interest rates that can affect the economy through a variety of transmission mechanisms. The main idea is that the changes of the short-term interest rates can affect the prices of other assets and so influence the willingness of banks to lend, firms to invest and individuals to consume. In other words, by selling or purchasing short-term debt securities the central bank can increase or lower the

[2] CORRIGAN, G.E.: *Causes and lessons learned from the financial crisis*, The Trilateral Commission, April 25, 2009

short-term interest rates and as a result also influence the exchange rates or the stock prices which subsequently have a direct impact on investment, consumption or export. For example, lower interest rates encourage borrowing for consumption or investment. However, when the interest rates are at zero this monetary policy becomes ineffective. Money and bonds become close substitutes and the public chooses to hold the money "under the mattress" rather than investing it. Further money injections from the central bank become useless to stimulate the economic activity. This situation is called a liquidity trap.[3] Moreover, under a liquidity trap, the central bank cannot further reduce the interest rates because in a situation of negative expectations and expected decline in the price level, together with the economic recession, makes the expected real interest rates high and therefore, the consumption and investments decline. This was the reality which the major central banks were facing by 2009. Figure 1 illustrates the development of the main policy rates from 2007 till 2013.

Figure 1

FED, ECB, BOJ and BOE Main Policy Rates



NOTE: The main policy rates for the Fed, ECB, BOJ, and BOE are, respectively, the federal funds rate, the main refinancing operations fixed/minimum bid rate, the uncollateralized overnight call rate and the official Bank rate. Data in percent per annum.
SOURCE: Fed, ECB, BOJ, and BOE.

In these conditions the central banks turned to less conventional monetary policy methods to provide liquidity, support their financial system and stimulate the economic growth. The most high-profile form of non-traditional monetary policy is the *Quantitative Easing (QE).*

[3] FAWLEY, B.W.; NEELY, C.J.: *Four stories of Quantitative Easing* , Federal Reserve bank of St. Louis Review, pp 51-81, 2013

1.2 The conceptual basis of the Quantitative Easing

The final years of 2000s brought remarkable changes no only to the financial markets but also to the world economy when the usual monetary transmission mechanism was not functioning and governments and central banks across the world had to introduce new measures in order to stabilize the economic conditions and support the aggregate demand. Literature uses different terms to define the new policy mechanisms – "non-standard", "unconventional", "exceptional", "non-traditional". But the main difference between this policy and the traditional monetary policy are the tools that are applied. They usually include a significant increase of the monetary base through purchase of long-term assets or sometimes even direct lending.

As described above, the conventional monetary policy instrument is the short-term interest rate. But in the condition of a liquidity trap the interest rates hit the zero lower bound and the conventional monetary transmission mechanism becomes limited. In this case the central bank can turn to non-traditional monetary policy tools in order to flatten the yield curve in government and corporate bond markets.[4] As Fawley B. and Neely Ch. described in their article[5] the effect of the monetary policy on the long-term interest rates can be understood by decomposing the n-year real yield on a bond:

$$Y_{t,t+n} = \bar{Y}_{t,t+n} + TP_{t,n} - e_t\pi_n, \quad (1)$$

where $Y_{t,t+n}$ is the expected real yield at time t on a n-year bond, $\bar{Y}_{t,t+n}$ is the average expected overnight rate over the next n years at time t, $TP_{t,n}$ is the term and the risk premium on a n-year bond at time t, and $e_t\pi_n$ is the expected average rate of inflation over the next n years at time t.

From (1) can be deducted that the long-term interest rates can be reduced through 3 channels: the decrease of the expected overnight rates ($\bar{Y}_{t,t+n}$), the decrease of the term premium ($TP_{t,n}$) and the increase of the expected inflation ($e_t\pi_n$). There are several non-traditional methods that the central bank can apply in this case. First, the central bank can commit to keep the overnight interest rates at the zero lower bound for a longer period of time.

[4] Flat yield curve – the situation when short-term and long-term bonds of the same credit quality offer equivalent yields.

[5] FAWLEY, B.W.; NEELY, C.J.: *Four stories of Quantitative Easing* , Federal Reserve bank of St. Louis Review, pp 51-81, 2013

Based on the rational expectations theory[6] this would affect the long-term interest rates by decreasing the average expected overnight rates ($\bar{Y}_{t,t+n}$). Secondly, the central bank can announce outright asset purchase programs of long-term government securities. This action would affect the term premiums on government bonds ($TP_{t,n}$) by decreasing them, and consequently, would affect the long-term interest rates. Lastly, the central bank can offer direct bank lending with a relatively long time to maturity. This can potentially affect the expected average rate of inflation ($e_t\pi_n$) by raising it, and in a result, decrease the long-term interest rates. While the first method can be considered an open mouth operation, the last two methods quantitatively change the central bank's balance sheet. However, the banks may not want to borrow the liquidity and the last tool may not have much impact. That is why, while the outright asset purchase programs of long-term government securities can be considered quantitative easing, the direct bank lending is not universally accepted as one of its forms.

Quantitative easing is an unconventional monetary policy which unusually magnifies the balance sheet of a central bank through open-market long-term government securities or other securities purchases. Through its actions the central bank creates a systemic excess of liquidity in the banking system as the banks do not want such an expansion in the liquidity and thus, deposit it back with the central bank and do not chose to lend it. In case they decided to do so, the liquidity would just shift to another bank but not outside the reserve accounts at the central bank, which happens under QE. The aim of quantitative easing is to lower long-term interest rates in order to spur the economic growth, and in addition, in the case of long-term corporate bond purchases, the quantitative easing helps reducing the overall risk profile of the banks, by allowing them to shift the assets with higher credit risk from their portfolios with the secure ones. The concept of QE is based on several assumptions. Firstly, the increase of bank reserves in condition of low interest rates would allow the banks to make more loans, which would consequently increase investments and consumer spending. Secondly, the increase of money supply would keep the value of the domestic currency low that would make the domestic exports relatively cheaper. In addition, the asset purchase increases their price and lowers the interest rate, which in theory would motivate the banks to lend them. However, even if theoretically QE would have a direct effect on the economy, it is connected with some unclarities. Firstly, a fast increase in the money supply can result in higher inflation rates. Furthermore,

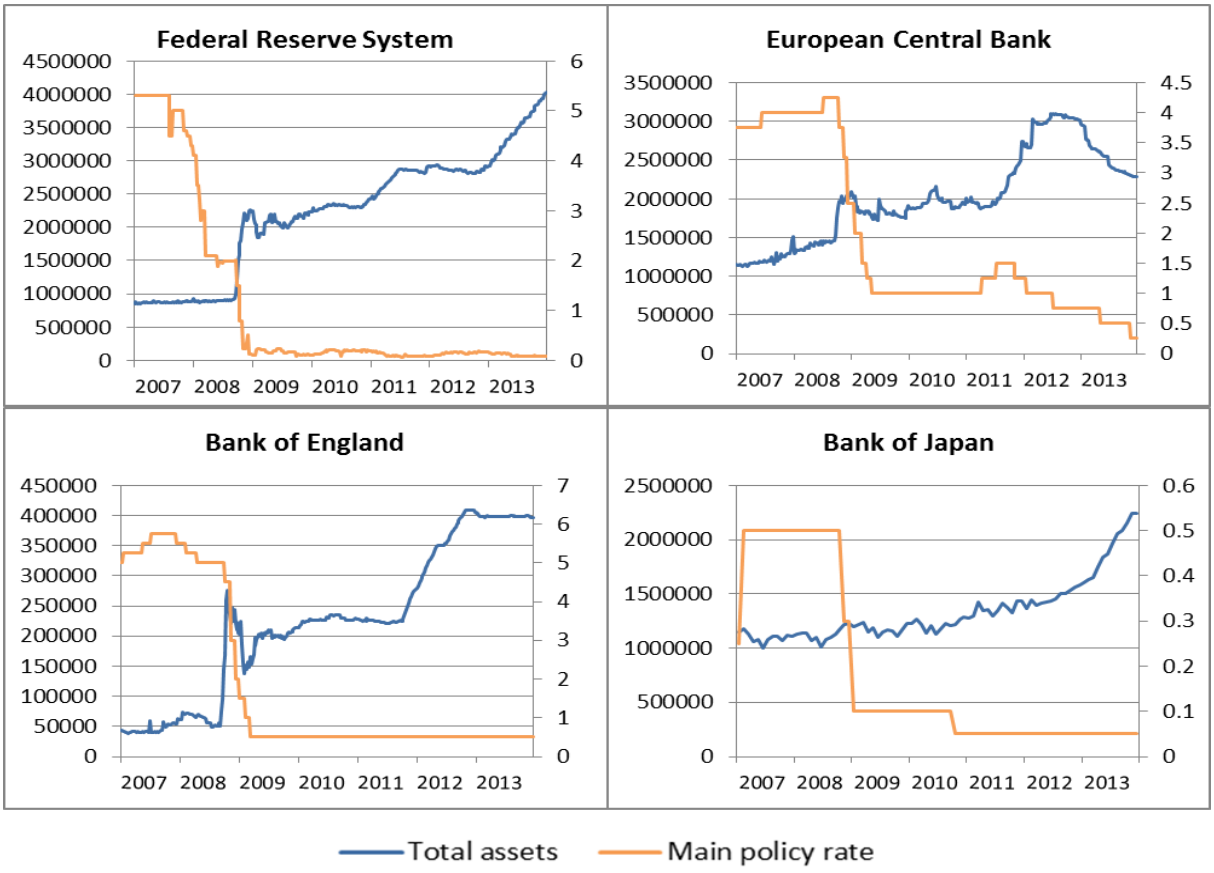
[6] Rational expectations theory - an economic theory that the individuals in the economy make their choices based on their rational outlook, available information and past experiences. It suggests that the future state of economy is equivalent to the current expectations of the people.

there is no certainty that the banks would decide lending the money to individuals and industries rather than keeping it. In addition, if the currency is devalued too much there can be a crash in its value.

The QE programs that were implemented by the central banks were significantly different depending on the current situation and the structure of the economy. So for example, the ECB and BOJ lent money to banks to inject reserves in their banking systems, when Fed and BOE injected reserves by buying bonds. Yet despite the unconventional monetary method that was used there could be observed the significant expansion of their balance sheets. Figure 2 shows the development of the central banks' balance sheets compared to the development of their main policy rates from the outbreak of the crisis till the end of 2013.

Figure 2

FED, ECB, BOJ and BOE Balance Sheets



NOTE: The main policy rates for the Fed, ECB, BOJ, and BOE are, respectively, the federal funds rate, the main refinancing operations fixed/minimum bid rate, the uncollateralized overnight call rate and the official Bank rate.

SOURCE: Fed, ECB, BOJ, and BOE.

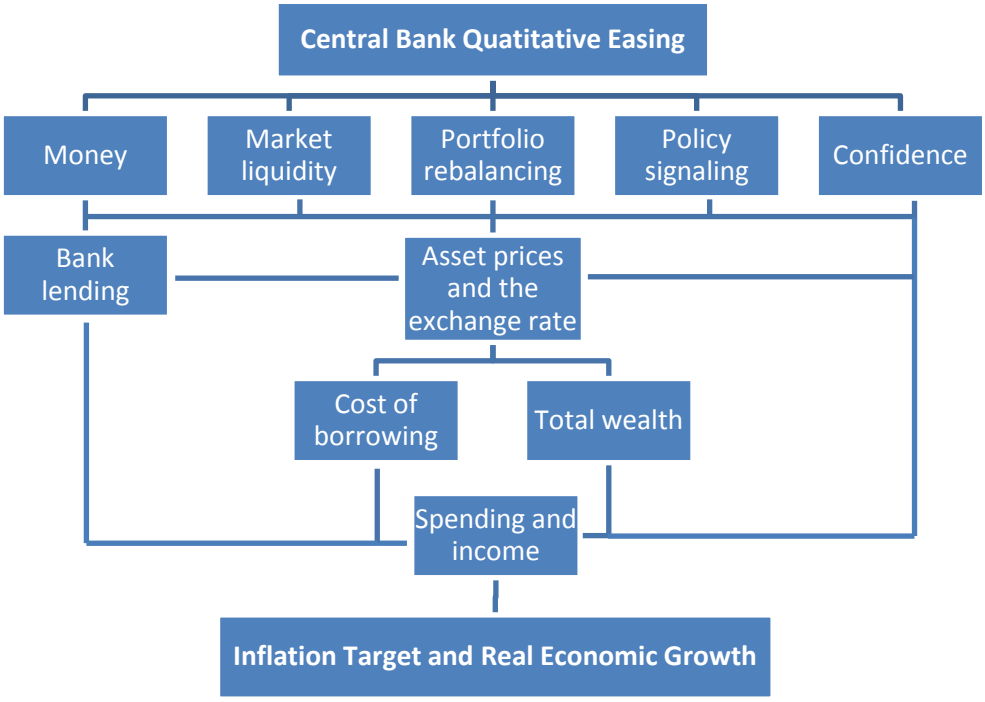
1.3 The transmission channels of the Quantitative Easing

Recent studies on nontraditional monetary policy have identified several possible channels of operation through which QE can potentially influence the interest rates and so stimulate the economy by influencing the willingness of companies to invest and employ, individuals to spend and banks to lend. These channels can be used in the situation when traditional channels, such as the interest rate, exchange rate and equity price channels, as well as the credit channel, are weak or ineffective. Although it is clear that the objective of the QE is to influence the level of inflation and the economic growth, it is necessary to understand it's transmission channels in order to assess whether a QE policy was successful or not.

The literature cites five key transmission channels through which QE may potentially affect medium and long-term interest rates. Figure 3 summarizes these channels and provides a brief representation.

Figure 3

Transmission channels of the Quantitative Easing



SOURCE: Adopted from Joyce et al. (2011)[7]

[7] JOYCE, M.; TONG, M.; WOODS, R.: *The United Kingdom's quantitative easing policy: design, operation and impact,* Research and analysis The United Kingdom's QE policy, Quarterly Bulletin 2011 QE, pp.201, 2011

1.3.1 The signaling channel

The first channel through which the quantitative easing affects the interest rates is the signaling channel. The Central Banks announce large-scale asset purchase programs. Through a signaling channel these announcements may communicate to the market participants about the central bank's views on current or future economic conditions, and may as well inform about the changes in the monetary policy reaction function or policy objectives. In other words, QE provides a "signal" to the private sector that the central bank will keep the short-term interest rates, as well as, with the help of QE, the long-term interest rates, low even in the future when the zero bound will not be a limitation anymore.

This channel and its effects were broadly discussed in the literature, for example G. Eggertsson and M. Woodford[8] in their paper confirm that non-traditional monetary policy can affect the long-term bond yields by lowering them only if this policy uses skilful management of expectations and serves as a credible commitment by the central bank regarding the low interest rates even after the economy recovers; this can be even lower than what a Taylor rule[9] may call for. J. Clouse and others [10] discuss that such a credible commitment can be achieved by purchasing in QE a large quantity of long duration assets. In essence, it means that the central bank would be penalizing itself if the interest rates reached an upper limit thereby providing commitment to keeping rates below these limits. However, it is important to notice that the signaling transmission channel should have a bigger effect on the medium-term interest rates than on long-term as the "promise" to keep the short-term real interest rates low in future will supposedly last until the economy recovers and the central bank can sell the assets.

1.3.2 The portfolio rebalancing channel

The second channel which is considered a central transmission channel is the portfolio rebalancing channel. This channel is based on the ideas of a number of well-known monetary economists like James Tobin, Milton Friedman, Franco Modigliani, Karl Brunner and Allar Meltzer. The key assumption is that the financial assets are not perceived as perfect substitutes in the investors' portfolios. Therefore, when a central bank purchases assets and the money in

[8] EGGERTSSON, G.B.; WOODFORD, M.: *Optimal monetary policy in a liquid trap,* NBER Working Paper, No. 9968, 2003

[9] Taylor's rule is a formula developed by Stanford economist J. Taylor which was designed to provide "recommendations" for how a central bank should set the short-term interest rates as economic conditions change to achieve both its short-term goal for stabilizing the economy and its long-term goal for inflation. Specifically, the rule states that the "real" short-term interest rate should be determined according to 3 factors: (1) where the actual inflation is relative to the targeted level, (2) how for economic activity is above or below its "full employment" level, and (3) what the level of the short-term interest rate is that would be consistent with full employment.

[10] CLOUSE, J. and others: *Monetary policy when the nominal short-term interest rate is zero*, FEDS Working Paper, No. 2000-51, 2000

the investors' holdings increase, unless for the investors, money is a perfect substitute for the financial assets, the investors will try to rebalance their portfolios by buying other assets that would be better substitutes. As a result, the assets purchases should raise their prices and lower their yields. This should have an effect on the economy, stimulating its growth by stimulating spending. In this context, Tobin suggested that purchases of longer-term assets by Fed during the Great Depression could have helped the US economy recover even if the short-term rates were close to zero.[11] Milton Friedman also supported large-scale long-term assets purchases by the Bank of Japan as a method to overcome the deflationary trap[12]. Generally said, the portfolio rebalancing channel shows, how the investors rebalancing their portfolios as a result of the central bank's QE asset purchases, directly affects the asset prices.

The former chairman of the Federal Reserve, Ben Bernanke in 2010 said that the most favorable channel through which Fed's purchases affect longer-term interest rates and financial conditions more generally is the portfolio balance channel.[13]

1.3.3 The term premia channel

The third key transmission channel through which quantitative easing affects the financial markets and their participants is the term premia channel. Through liquidity operations and purchases of long-term securities (such as MBS or CDO) the central bank increases the market liquidity by increasing the balance sheet reserves of the banks. The reserves are more liquid assets than the long-term securities and as a consequence the liquidity price premium[14] decreases and therefore the asset prices increase and the interest rates fall. This is very important because during a financial crisis, when the markets are instable and illiquid the liquidity premia can be relatively high. Moreover, the term premium also includes the premium for holding the long-term instrument, covering the risk that in time the interest rates can increase making the price of the security lower. During the crisis, when there is uncertainty regarding the future development of the markets and of the interest rates, this premium also rises. By purchasing the long-term securities the central bank pushes their prices up and the yields with the term premium down.

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[11] TOBIN, J.: *Money and economic growth,* Econometrica, Volume 33, 1965

[12] FRIEDMAN, M.: *The role of monetary policy,* The economics of unemployment. International Library of Critical Writings in Economics, vol. 122, Mass.: Elgar, pp. 423-39, 2001

[13] Speech by Ben Bernanke at Jackson Hole, 2010

[14] Liquidity premia – a premium yield/rate of return that investors expect as compensation when a given security is difficult to convert in cash. If an asset is illiquid, the liquidity premia is high, which results in the decrease of the prices and the increase of the interest rates.

It is also important to notice that this transmission channel is dependent on the liquidity operations and purchases of long-term securities and therefore it is believed to persist only while the central bank is conducting these operations.

1.3.4 The confidence channel

Another quantitative easing transmission channel is the confidence channel. The large-scale asset purchase programs are a credible commitment of a central bank for further actions and a brighter economic outlook. This shores up confidence on the financial markets, increases investment activity, encourages consumer confidence and spending. As a result, the financial markets become more stable, the investor risk aversion decreases and the trust in a stable economic growth increases. Joyce et al.[15] also state that the confidence effects may influence the asset prices by increasing them and lowering the risk premia.

1.3.5 The bank lending channel

Quantitative easing also operates through a bank lending channel. The large-scale asset purchase programs increase the reserves on the banks' balance sheets and also create new deposits if the assets are purchased from non-bank investors. This may improve the bank lending conditions, lowering their cost and making them more accessible to businesses and households. The new loans, as a result, would stimulate the economic growth.

However, there is no certainty that this channel will work. Considering the risk aversion and the anxiety on the markets, the banks can chose keeping the reserves and not loosening the lending conditions. Therefore, this channel is very limited.

It can be easily concluded that the quantitative easing can influence the economy through various transmission channels which are rather different from the traditional monetary channels. But all these channels are part of a whole process that aims to spur the economic growth. Understanding how these channels work is very important for designing a QE policy, its operational considerations and programs. Although, it is important to notice, that the central banks relied on the portfolio rebalancing channel as the key transmission channel of the quantitative easing.

[15] JOYCE, M.; TONG, M.; WOODS, R.: *The United Kingdom's quantitative easing policy: design, operation and impact,* Research and analysis The United Kingdom's QE policy, Quarterly Bulletin 2011 QE, pp.201, 2011.

1.4 Historical evidence on Quantitative Easing

Quantitative easing is an unconventional monetary policy that doesn't have much historical evidence that would provide guidance to the central banks regarding its effects on the economic performance. But one of the most eminent examples of its application was in Japan.

The economy of Japan was experiencing stagnation at the end of 1980's followed by the burst of the asset price bubble at the beginning of the 1990's, along with declining of the economic activity and consumer price deflation. This environment led Japan to lowering its policy rate to zero by the late 1990's but this didn't help the economy. The burst of the global IT bubble just deepened the recession and this pushed the Bank of Japan (BOJ) to turn to a new monetary policy – the quantitative easing policy (QEP). At that point QEP was an unprecedented experience, an innovation in central banking. But it is important to understand the macroeconomic effects of the quantitative easing policy that was implemented in Japan, examine its successes and lacks and the lessons learned as it became the policy that the major central banks followed in implementing after the outbreak of the financial crisis of 2007-2008.

The BOJ's QEP lasted 5 years from March 2001 till March 2006 and was based on three main pillars. The first pillar was changing the main target of the monetary policy from the uncollateralized overnight call rate to outstanding current account balance (CAB) held by the commercial banks and other financial institutions at the BOJ. For achieving this target BOJ used outright monthly purchases of Japanese government bonds (JGB). During the QEP the target of CAB's was raised 9 times from ¥ 5 trillion to ¥ 35 trillion by 2004. The second pillar derives from the first one and consists in a significant raise in purchase of government bonds, especially long-term JGB's from ¥ 0, 4 to 1, 2 trillion. The purpose was to lower the long-term interest rates and thus stimulate the long-term investment. The third pillar was based on expectations effects of the markets in the BOJ's commitment to follow the QEP policy and respectively to keep the interest rates at the zero lower bound until the CPI stopped declining.[16] It can be easily observed how BOJ relied on the QE transmission channels in each of this pillars: from the announcement of the implementation of the QEP through the signaling channel, achieving the target CAB and using the liquidity and bank lending channels in order to spur the economic growth, raising the outright purchases of long-term JGB's and through portfolio rebalancing channel stimulating the long-term investment and finally raising the trust of the financial markets in the BOJ's

[16] BROWMAN, D.; CAI, F.; DAVIES, S.; KAMIN, S.: *Quantitative easing and bank lending evidence from Japan,* Board of Governors of the Federal Reserve System, International Finance Discussion Papers, No. 1018, 2011

commitment of following the QEP through the confidence channel. To summarize, the measures adopted by BOJ aimed to help the banking sector, ease the conditions on the financial markets and most importantly stop the deflation.

The real effects of the unconventional monetary policy used in Japan were broadly discussed in the literature. Most of the analyses agree on the fact that the major goals that were set initially by the BOJ were failed: the deflation was not eliminated and the economic growth was not sufficient. Schenkelberg et al.[17] assessing the real effects of QEP found that the QE-shock didn't significantly affect prices in a long-term period of time. Van Luu[18] and Ueda[19] also argued that the stimulus was not enough to bring the economy out of the inflation trap. However, there undoubtedly are positive effects that prove the effectiveness of QEP.

Firstly, quantitative easing can be correlated with the lowering of long-term interest rates. The most effective in this sense proved to be the confidence channel. Oda and Ueda[20] have shown in their paper that the commitment policy of BOJ raised the confidence on the financial markets and helped to lower the long-term interest rates. In another study Bernanke, Reinhart and Sack[21] argue that the lowering of long-term interest rates was achieved through BOJ's purchases of JGB's. Secondly, QEP stimulated the banking sector, especially by helping the "weaker" banks. Kimura et al.[22] confirm that the raise of the reserves and liquidity in the banking system could have had a stabilizing effect on the financial markets by avoiding further collapse. Moreover, QEP can be associated with the decline of term spreads with fewer anomalies. This argument was discussed by Takeda and Yajima in their paper. [23]

Although QEP had undoubtable positive effects on the Japanese economy, there clearly are several lessons to be learned for the other central banks as Japan was a forerunner in implementing this unconventional monetary policy. Most economists criticize Japan for the slow

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[17] SHCENCKELBERG, H. et al.: *Real effects of quantitative easing at zero lower bound: Structural VAR-based evidence from Japan,* University of Munich, 2011

[18] VAN LUU: *Quantitative easing: should investors worry about inflation or deflation?*, Russell Research, 2009

[19] UEDA, K.: *Bank of Japan's experience with non-traditional monetary policy,* The University of Tokyo, 2010

[20] ODA, N.; UEDA, K.: *The effects of the Bank of Japan's zero interest rate commitment and Quantitative monetary easing on the yield curve: A macro finance approach*, The Japanese Economic review, Vol. 58, No. 4, 2007

[21] BERNANKE, B.; REINHART, V.R.; SACK, B.P.: *Monetary policy alternatives at the zero bound: an empirical assessment,* Brooking papers on economic activity, 2004

[22] KIMURA, T.; KOBAYASHI, H.; MURANAGA, J.; UGAI, H.: *the effect of the increase in the monetary base on Japan's economy at zero interest rates: An empirical analysis*, Bank for International Settlements Conference Series, No. 19, 2003

[23] TAKEDA, Y.; YAJIMA, Y.: *Searching for the Effects of Unconventional Monetary Policy: The Case of the Bank of Japan*, Japanese Journal of Monetary and Financial Economics, Vol. 2, No. 1, 2014

response to its financial problems. In fact, it took Japan almost eight years to turn to QEP. Nonetheless, this was an important lesson for the central banks in the light of the current financial crisis – the central banks reacted faster, when the problems that they were facing were less severe. Another lack of the Japanese experience that Blinder[24] discusses in his paper is the fact that BOJ concentrated its QEP on decreasing the term premiums, when in his opinion, is much more effective concentrating on risk premiums, which Federal Reserve did. Lastly, another issue that is examined is whether BOJ's fast exit strategy did not have a negative effect on the economic recovery.

To summarize, even if there is not much historical evidence on quantitative easing, the Japanese experience offers guidance on the macroeconomic effects of this policy. The central banks around the world can deduct many important lessons regarding its effectiveness and the implemented methods as the financial challenges that Japan was facing in the 1990's are very similar to the financial stress of the economies today. However, there are significant differences between the policies and the methods used by Bank of Japan and those used by the other central banks, given by the differences of the financial structure of the economies, objectives and concrete financial problems.

[24] BLINDER, A.S.: *Quantitative Easing: Entrance and Exit Strategies*, CEPS Working Paper, No. 204, 2010

2 The Fed's Quantitative Easing

This chapter of the paper will describe the implementation of the quantitative easing policy in the U.S. economy. In order to better understand the environment and the circumstances that the Federal Reserve System was facing in the summer of 2007, it will start by explaining how the Fed conducted its monetary policy prior to the crisis and it will continue with analyzing its entrance strategy and how this affected its balance sheet and the market liquidity.

2.1 The FED's monetary policy and balance sheet before the crisis

Prior to the global crisis of 2007-2008 the Federal Reserve conducted its monetary policy, in order to achieve its objectives, by targeting the level of the federal fund rate – the interbank interest rate at which banks and other depository institutions trade balances held at the Fed with each other overnight, on an uncollateralized level. Section 2A. of the Federal Reserve Act specifies the following monetary policy objectives:

"The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."[25]

From this statement can be deducted what is often called the "dual mandate" of the Federal Reserve – full employment and price stability, with moderate long-term interest rates. To achieve this complex task the Fed traditionally used three instruments: open-market operations, the reserve requirement and direct lending. The primary method through which the Federal Reserve allocated liquidity to the banking system was the daily open-market operations which involved outright transactions and repo or reverse repo operations. By buying or selling U.S. Treasury and agency securities the Fed could affect the reserve base by expending or contracting it, thus influencing the available liquidity and its price. The second tool of the Federal Reserve System is the reserve requirement. Changing it would also influence the liquidity on the market. However, this tool was used very rarely.[26] Lastly, another way that the Fed could affect the supply is the direct lending to the commercial banks and other depositary institutions through the discount window. However, this lending facility was also not very used as the banks could

[25] The Federal Reserve Act, available online at <http://www.federalreserve.gov/aboutthefed/fract.htm>
[26] From October 2008 the Fed began to pay interest rate on excess reserves.

cover their supply needs through the open-market operations and used the discount window facility only for the short-term liquidity shortcoming.[27]

In order to highlight the changes that were brought to the monetary policy after the financial crisis it is important to analyze the structure of the central bank's balance sheet before its breakout. Table 1 represents the Federal Reserve Balance Sheet as reported on 12th of July 2007.

Table 1

Federal Reserve Balance Sheet (12.7.2007)

Assets		Liabilities	
Securities		Federal Reserve Notes	779,89
Held outright	790,61	Commercial Banks Reserve Balances	10,72
Repurchased agreements	20,5		
Loans to depositary institutions	0,21	Liabilities related to Foreign Official and U.S. Treasury Deposits	43,7
Gold stock	11,04		
		Other liabilities	5,7
Other assets	50,84		
		Total liabilities	**840,01**
Total assets	**873,2**	**Capital**	**33,19**

NOTE: Release date 12th of July 2007, data in billions of dollars
SOURCE: Federal Reserve statistical release H.4.1, Table 2, available online on <http://www.federalreserve.gov/releases/h41/>

As it can be seen from the table the total amount of assets on the central bank's balance sheet by the middle of July 2007 was 873 200 millions of dollars. The structure of these assets was unsophisticated and was composed of securities, loans and related operations associated with monetary policy, and other less-liquid assets. The securities held outright, the loans to

[27] Even if direct lending and open-market operations could be described as two tools with similar consequences, it is important to state some essential differences: firstly, in the open-market operations can participate 19 primer dealers, while the discount window facility is available to every commercial bank or depositary institution; secondly, in the open-market operations it is accepted a very narrow range of securities, while the discount window facility accepts a very large range of assets.

depositary institutions and the repurchase agreements were forming 811 320 million of dollars, which represents *92,91%* of the total assets. Almost all of these assets *97,45%* were securities held outright that were entirely constituted by U.S. Treasury bills *35,04%,* and notes and bonds *64,96%.* The repurchased agreements or the repos were 20 500 million which is just *2,35%* of the total assets. Nonetheless, as mentioned above, the repos are a very important instrument in the open-market operations for adjusting the deviation from the target federal fund rate. The loans to the depository institutions represented an extremely small amount from the total assets – *0,03%*. From all the loans and securities *50,46%* were maturing in less than 1year, *29,7%* were maturing from 1 to 5 years, *9,43%* were maturing from 5 to 10 years and *10,41%* had the maturity over 10 years. The other less-liquid assets like gold, items in process of collection, bank premises were forming *7,09%* of the total assets.

On the right side of the balance sheet the Federal Reserve Notes[28] represent the largest part of the liabilities – 779 890 million of dollars. This would mean $2 508 per U.S. resident, as the U.S. population for the mid-2007 was estimated at 302,2 million habitants.[29] However, from *50* to *66%* of this amount was held outside the U.S.A.[30] The reserves held by the commercial banks represented *1,28%* of the total liabilities and the liabilities related to foreign official and U.S. Treasury deposits – *5,2%.* If further analyzing the structure of the liabilities, there could be noticed that the Federal Reserve Notes and the bank reserve balances represented almost the same amount as the securities held outright. This means that the long-term demand for liquidity was covered by long-term securities purchases.

To sum up, before the flare-up of the recent financial crisis the Federal Reserve System was conducting its traditional monetary policy having 2 main objectives – maximum employment and stable inflation, with moderate long-term interest rates. For achieving these goals, the Fed was setting the target for the federal fund rate which could be influenced with 3 instruments: the main – open-market operations and two additional – the reserve requirements and the discount facility. In July 2007 the target rate was *5,25%*. The total size of the assets in Fed's balance sheet was of $873,2 billion, the largest amount of which constituted securities, loans and other operations associated with monetary policy (*92,91%*), where *97,45%* were U.S. Treasury bills, notes and bonds.

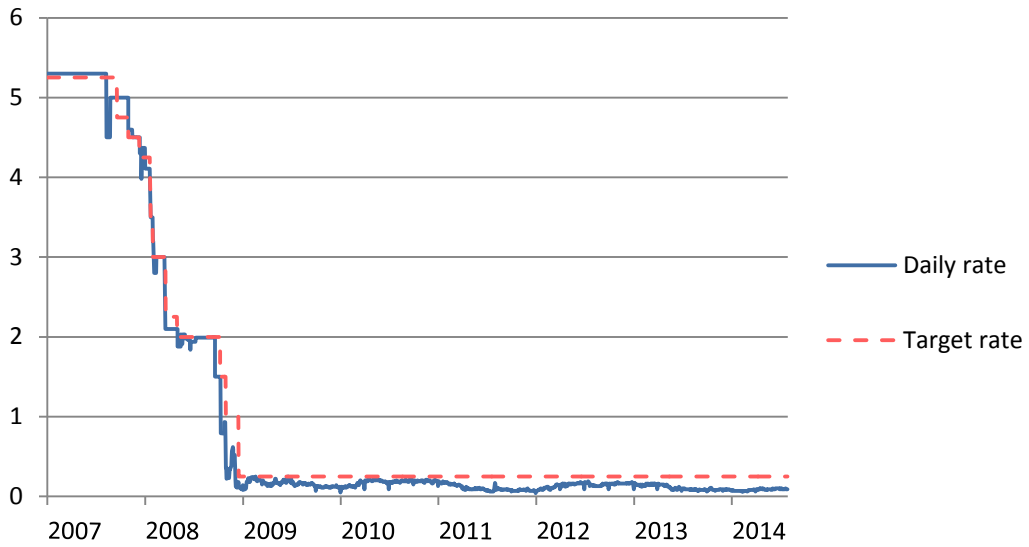
[28] Federal Reserve Notes – the paper currency, the dollar bills in circulation.
[29] Population Reference Bureau <www.prb.org>
[30] U.S. Treasury <www.treasury.gov>

2.2 The Fed's entrance strategy

The Fed's entrance strategy began after the summer of 2007 when in response to the first symptoms of the crisis which appeared on the financial markets FOMC[31] started aggressively cutting the policy rate. The first cut of the federal fund rate was on the 18th of September 2007 and it continued till the 16th of December 2008. During this period of time the target rate was cut 10 times being reduced to a range between *0,00-0,25%* where it currently stays. Figure 4 illustrates the development of the effective daily and target federal fund rates from the beginning of 2007 till July 2014. It can be seen on the figure how radically was the Fed cutting the policy rate. Just in the period of 30.04 till 07.10.2008 the policy rate was kept at *2%* and afterwards lowered further till it reached the zero lower bound.

Figure 4

Effective daily versus Target Fed Fund Rates



NOTE: Data from 1.1.2007-31.7.2014 in percent per annum

SOURCE: Federal Reserve Bank of New York

This strategy has no historical predecessor being extremely rapid and active. The Fed aimed to reduce the negative effects of the financial stress on the economy. However, with the intensification of the crisis in 2008 and the tightening of the financial conditions the monetary

[31] FOMC – Federal Open Market Committee – the branch of the Federal Reserve Board that determines the direction of monetary policy.

easing proved to be ineffective and didn't have the expected result. This brought concern to the monetary authorities about the efficiency of the traditional monetary tools.

In these circumstances, in order to stimulate the economy, the Fed turned to additional measures to help the economy and cover the increasing demand for liquidity. Firstly, on 17th of August 2007 the Federal Reserve lowered the spread between the discount rate and the federal fund rate target from 100 to 50 basis points and extended the term of discount lending up to 30 days. But this didn't encourage the borrowing at the discount window as much as the Fed expected.

2.2.1 Term Auction Facility

The second important step was taken in mid-December 2007 when the Fed created the Term Auction Facility (TAF). As described in the press release from December 12, 2007, TAF was a monetary policy program that allowed the Federal Reserve System to auction fixed amounts of collateral-based short-term loans to depository institutions that were judged by their local Reserve Banks to be in generally sound financial condition. The rate was determined by the auction process and was the minimum bid rate established at an overnight indexed-swap (OIS) rate corresponding to the maturity of the loans.[32] The first TAF auction was held on December 17, 2007 for the fixed amount of 20 billion of dollars with 93 bidders and the OIS rate of *4,17%*.

The primary goal of TAF was to serve as an alternative mechanism to introduce liquidity in the financial markets as a response to the increasing demand for liquidity from the market participants. Ben Bernanke, in this sense, in 2009 mentioned:

"In August 2007 banks were reluctant to rely on discount window credit to address their funding needs. The banks' concern was their recourse to the discount window, if it became known, might lead market participants to infer weakness – the so-called stigma problem."[33]

The stigma problem or the stigma attached to the discount window is the situation when banks that are facing liquidity shortages are not willing to use the discount window facility and the central bank fails as a "lender of last resort". This happened in the second half of 2007 in the U.S. when despite the fact that the Fed tried to ease the lending conditions, the banks didn't turn to this facility. The TAF aimed to solve this lack of borrowing and the liquidity shortages. Besides

[32] Press Release of the Board of Governors of the Federal Reserve System; Release date: 12.12.2007; available online on < http://www.federalreserve.gov/monetarypolicy/20071212a.htm >

[33] Speech by Ben Bernanke at the Federal Reserve Bank of Richmond, 2009 Credit Markets Symposium, Charlotte, North Carolina, 3.4.2009

the discount window stigma solution, there are other advantages associated with the Term Auction Facility. Firstly, the fact that the TAF allowed the Fed to control the amount of liquidity injected in the system and the timing of the injection, in this way anticipating the demand for liquidity and stabilizing it, making it less volatile. Secondly, it allowed allocating funds directly to a larger amount of institutions. Moreover, it didn't affect the Fed's balance sheet quantitatively, as the increase in lending was equally rebalanced with the decrease of outright securities. In addition, the Fed didn't reveal the identities of the banks that received funds, which made TAF more attractive to them. However, in 2010 the Fed disclosed detailed information about its participants.[34]

The TAF auctions were held every two weeks from December 7, 2007 till August 8, 2010 in a total of 60 auctions. As mentioned above, the total reserves supplied initially constituted $20 billion but later it rose gradually till $150 billion in October 2008 and remained in this amount till June 2009. After which it decreased reaching $3,4 billion on August 8, 2010. During the auctions there were allocated a total of 4 214 loans with the range between $1,4 million and $15 billion, the largest being allocated to Bank of America, Barclays, Citibank, J.P. Morgan Chase, Wells Fargo and Wachovia. The term of lending was from 13 to 85 days and the OIS rate varied between *0,2-4,67%*. As collateral for the loan there we used different types of assets like: residential mortgages, ABSs, commercial loans, real estate, corporate securities. It is interesting to mention that almost *60%* of the loans were lent to foreign banks, which were active in the American market and that is why, it was important to include them in the program.[35]

Overall, there are different opinions upon the efficiency of the TAF, but it can be certainly said that it had a positive effect on the breakdown of liquidity on the financial markets and it served its primary purpose.

2.2.2 Term Securities Lending Facility

The third important step that the Fed took was on March 11, 2008 when it announced the creation of the Term Securities Lending Facility (TSLF). At the beginning of 2008 on the financial markets could be observed a raising demand of U.S. Treasuries which was supported by a decline of their interest rate. Aiming to provide more liquidity to the markets the Fed created the TSLF. In fact, it was a transformation of the existing facility. The new program was a weekly lending

[34] The information was disclosed as required by the Dodd-Frank Act on 1.12.2010.
[35] BENMELECH, E: *An Empirical Analysis of the Fed's Term Auction Facility*, Cato Institute, Cato Papers on Public Policy, Vol.2, 2012

facility allowing primary dealers to borrow Treasury Securities held by the System Open Market Account on a 28-day term against eligible collateral.

The TSLF had a lot of advantages. Firstly, it prolonged the loan term and broadened the range of collateral accepted like: AAA asset-backed securities including student loans, auto loans, mortgages. Secondly, the Fed intended to lend $200 billion to primary dealers. In addition, like the TAF, this facility changed just the composition of the Fed's balance sheet, not the size, affecting just the asset side. Finally, it aimed to affect the liquidity premiums by reducing them.[36] The TSLF facility was held between 27.03.2008 and 1.2.2010. During this period it affected the Treasury interest rate by raising it, thus being very effective in achieving its primary goal.

2.2.3 Central Bank Liquidity Swaps

Another important program that was established by the Fed was the Central bank liquidity swaps. Because of the pressure and liquidity problems on the global bank funding markets, caused by the shortage of U.S. dollars, the Federal Reserve announced on December 12, 2007 about the creation of the temporary swap arrangements with foreign central banks. The central bank liquidity swaps intended to ameliorate the liquidity conditions in the U.S. and foreign funding markets. There were created two liquidity swap lines – dollar liquidity lines and foreign-currency liquidity lines. The liquidity swap implies two transactions. In the first, the Fed and the foreign central bank exchange dollars and foreign currency in a specified amount, at a certain exchange rate, for an agreed period of time. At maturity, in the second transaction, the central banks exchange back the currencies for the same exchange rate as the one used in the first transaction, which means that there is no exchange risk involved, and one of the central banks pays interest to the other one. For example, in a dollar liquidity swap the foreign central bank pays interest for the Fed for borrowing U.S. dollars; in a foreign-currency liquidity swap the Fed pays interest for borrowing foreign currency. The maturities of the liquidity swaps are from overnight to three months.[37]

Initially the Fed created swap lines with the ECB ($20 billion) and the Swiss National Bank ($4 billion) and after authorized the swap lines with other 12 central banks.[38] These swap

[36] CECCHETTI, S.: *Crisis and the responses: The Federal Reserve in early stages of the financial crisis,* Journal of economic perspectives, Vol. 23, No. 1, pp 51-75, 2009

[37] The Federal Reserve System Credit and Liquidity Programs and the Balance Sheet, available online at <http://www.federalreserve.gov/monetarypolicy/bst.htm>

[38] The Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Canada, Danmarks Nationalbank, the Bank of England, the Bank of Japan, the Bank of Korea, the Banco de Mexico, the Reserve Bank of New Zealand, the Norges Bank, the Monetary Authority of Singapore and the Sveriges Riksbank.

agreements ended on February 1, 2010 but in May the Fed reopened them with the Bank of Canada, The Bank of England, The European Central Bank, the Bank of Japan and the Swiss National Bank. In October 2013 the Fed announced about the conversion of these arrangements from temporary to permanent. Mostly the dollar liquidity swaps were used by the ECB, the BOJ and the BOE. The foreign-liquidity swaps were, however, not used by the Fed from their establishment in 2009.

2.2.4 Bear Stearns and AIG support

The next step taken by the Fed is the direct support provided to Bear Stearns and AIG. In March 2008 the Bear Stearns, which at that time was the fifth largest investment bank in the U.S., was in huge financial problems. The failure of this institution would have had a catastrophic effect on the financial stability of the U.S.A. In these circumstances, on March 14, 2008 the Fed announced the loan to Bear Stearns through J.P. Morgan Chase. Bear Stearns was acquired by J.P. Morgan Chase and in this sense was created a limited liability company – Maiden Lane LLC that had to manage the assets acquired from Bear Stearns – a $30 billion portfolio of mortgage-backed securities. The Federal Reserve Bank of New York (N.Y. Fed) lent $29 billion to Maiden Lane LLC for a term of 10 years at the primary credit rate. J.P. Morgan Chase also provided $1 billion as a note. The primary beneficiary of the LLC was the N.Y. Fed and consequently all its assets and liabilities were indicated on the Fed's balance sheet. Since the Great Depression of 1930's this was the first time the Fed provided direct financial support to a broker.

The second institution that beneficiated from Fed's support during the recent financial crisis was the American International Group (AIG). On September 16, 2008 the Federal Reserve announced a two-year secured loan of $85 billion in exchange for a 79,9% equity interest in the company. There were created two new limited liability companies that had to manage the assets purchased from the company: Maiden Lane II LLC – residential mortgage-backed securities, Maiden Lane III LLC – multi-sector collateralized debt obligations (CDOs). As in the previous case, the loan was given by the N.Y. Fed and the assets and liabilities of the LLC's were consolidated on its balance sheet. In the Press releases from the Federal Reserve Bank of New York was announced that the loan to Maiden Lane II LLC has been fully repaid on March 1, 2012 and the loans to Maiden Lane LLC and Maiden Lane III LLC were announced as fully repaid on June 14, 2012.[39]

[39] Press Release of the Federal Reserve Bank of New York; Release date: 14.06.2012; available online on <http://www.newyorkfed.org/newsevents/news/markets/2012/an120614.html>

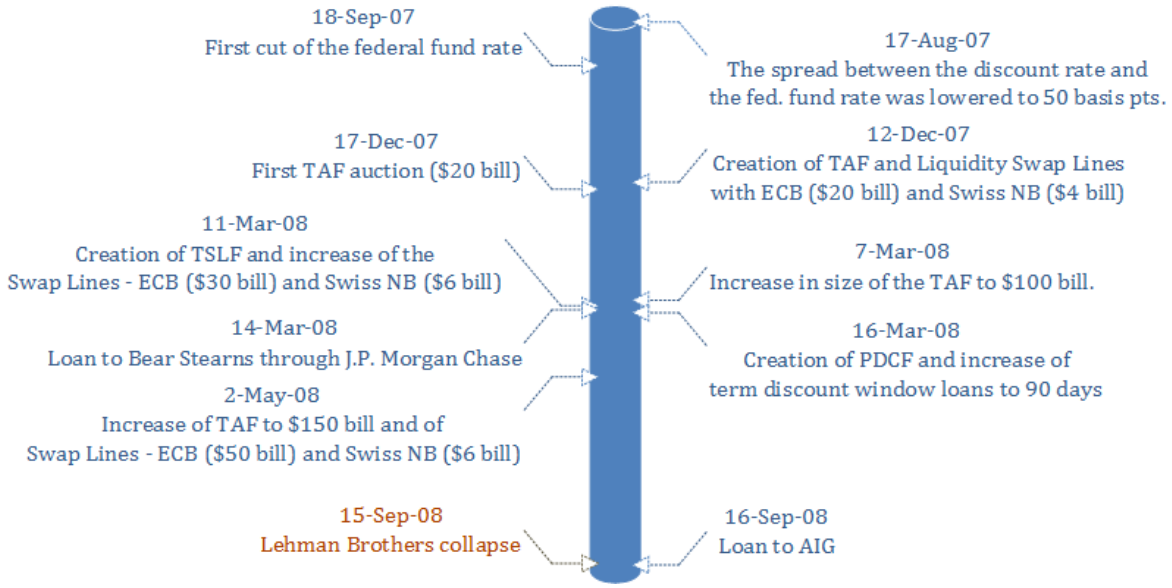
2.2.5 Primary Dealer Credit Facility

On March 16, 2008 complementary to all the above listed credit and liquidity programs the Fed established a new facility that aimed to provide overnight loans to primary dealers – the Primary Dealer Credit Facility (PDCF). The loans were secured by a wide-ranged set of collateral: investment-grade corporate securities, municipal securities, mortgage-backed securities and asset-backed securities for which a price is available.[40] This facility was accessible to primary dealers who couldn't participate at term discount lending or TAF. PDCF was providing additional funding for the primary dealers when they couldn't find it anywhere else. Data show that the largest users of this facility were the Citigroup, Morgan Stanley and Bear Stearns.[41] This facility was terminated on February 1, 2010.

Overall, the credit and liquidity programs that have been created by the Fed in that period of time had a positive effect on the markets. They succeeded in accomplishing their main goal – providing liquidity. Figure 5 succinctly lists all the outlined measures taken by the Fed from the outbreak of the crisis in 2007 till it's intensification in September 2008.

Figure 5

The Fed's entrance strategy timeline



SOURCE: The Federal Reserve System

[40] Press Release of the Federal Reserve Bank of New York; Release date: 16.03.2008; available online on <http://www.ny.frb.org/newsevents/news/markets/2008/rp080316.html>

[41] Federal Reserve System, <www.federalreserve.gov>

While analyzing the overall effect of these measures it is important also to understand how they influenced the Fed's balance sheet. Table 2 represents the Federal Reserve's Balance Sheet as reported on September 11, 2008. Comparing it to Table 1 it can be seen how the balance sheet evolved in over a year.

Table 2

Federal Reserve Balance Sheet (11.9.2008)

Assets		Liabilities	
Securities		Federal Reserve Notes	797,6
Held outright	479,78		
Uncommitted	363,88	Commercial Banks Reserve Balances	32,07
Committed to TSLF	115,9		
Repurchased agreements	126,75		
Loans to depositary institutions		Liabilities related to Foreign Official and U.S. Treasury Deposits	53,29
Primary credit	23,46		
Term auction credit	150,0		
Net portfolio holdings of Maiden Lane LLC	29,33		
Gold stock	11,04		
		Other liabilities	0,8
Other assets	103,8		
		Total liabilities	**883,76**
Total assets	**924,22**	**Capital**	**40,46**

NOTE: Release date 11th of September 2008, data in billions of dollars
SOURCE: Federal Reserve statistical release H.4.1, Table 2, available online on <http://www.federalreserve.gov/releases/h41/>

By mid-September 2008 the total amount of the Federal Reserve's assets consisted 924,22 billion of dollars, representing a *5,84%* growth from the year before. This growth isn't significant but the most important at this point is the change of composition of the assets. The structure became more sophisticated and new entries connected to the new monetary policy measures appeared on the balance sheet. In July 2007 the securities held outright, the loans to depository

institutions and the repurchase agreements represented *92,21%* of the total assets. By September 2008 their value changed to 779 990 million of dollars or *84,41%* of the total assets. The most important change occurred in the value of the securities held outright. Before the crisis their value was a little over $790 billion, representing *97,45%* of the assets listed above. However, by September 2008 their value decreased by *35,21%* or $ 310,83 billion and *24,16%* of them were committed to the Term Securities Lending Facility. On the opposite, the value of the repurchase agreements grew from $20,5 to $126,75 billion, meaning a *518,29%* growth. The loans that before the crisis were insignificant grew remarkably. As described in this paragraph the Federal Reserve used a variety of monetary tools to make loans to financial institutions, including the new created Term Auction Facility. In the maturity of the loans and securities there can't be found any noticeable changes. On the assets' side of the balance sheet can be also remarked the loan to Bear Stearns as the value of the portfolio holdings of Maiden Lane LLC.

On the right side of the balance sheet there can't be noticed any remarkable changes. The commercial banks reserves and the liabilities related to foreign official and U.S. Treasury deposits increased with $21,35 and $9,59 billion respectively. This growth is connected with the new liquidity and credit facilities.

Briefly, after the flare-up of the crisis in the summer of 2007 the traditional monetary policy failed in supporting the economy. In these circumstances, the Federal Reserve turned to measures that were less traditional by starting from aggressively cutting the main policy rate and lowering the spread between it and the discount rate, following with the creation of new liquidity and credit facilities, and even direct support to some financial institutions. The main goal was to provide liquidity to the financial markets, especially U.S. Treasuries. As a result, the size of the balance sheet was not affected but the structure of the assets changed enormously.

2.3 The QE1 Program

September 15, 2008 proved to be a dramatic day for the financial markets. The failure of the Lehman Brothers and the near-failure of AIG intensified the on-going financial crisis. These financial shocks overflew into the global economy. For the Federal Reserve System this was a sign that the measures that were taken were not enough to stop the crisis. So, in response to this evolution, the Fed decided to implement unconventional monetary policy.

In a speech at the London School of Economics in January 2009[42], the former chairman of the Federal Reserve, Ben Bernanke, described the non-traditional monetary policy used by the Fed as "credit easing" and differentiated it from the pure form of quantitative easing that in his opinion, focuses more on liabilities side of the balance sheet. The only similarity would be just the fact that both policies imply an expansion in the size of the balance sheet. The Federal Reserve's credit easing policy targeted the loans and the securities on the asset side, in this way focusing on the credit conditions. Ben Bernanke highlighted the difference between the quantitative easing policy applied by Japan between 2001 and 2006 and the credit easing policy that the Fed was applying, arguing that there were "differences in financial and economic conditions between the two episodes. In particular, credit spreads were much wider and credit markets more dysfunctional in the United States today than was the case during the Japanese experiment with quantitative easing. To stimulate aggregate demand in the current environment, the Federal Reserve must focus its policies on reducing those spreads and improving the functioning of private credit markets more generally."

Overall, from the beginning of the crisis and till nowadays the Fed implemented 3 rounds of QE programs. The first type of QE, also referred to as QE1, started in November 2008, almost 3 months after the Leman Brothers bankruptcy, lasted almost 17 months, until March 2010.

In November 2008 the Federal Reserve announced the initiation of the first large-scale asset purchase program (LSAP) that involved purchases in large quantities of agency and mortgage-backed securities. In the initial Press release on November 25, 2008[43] the Fed declared its intention to purchase up to $100 billion in direct obligations of housing-related government sponsored (GSEs) – Fannie Mae, Freddie Mac and the Federal Home Loan Banks and up to $500 billion in mortgage-backed securities backed by Fannie Mae, Freddie Mac and Ginnie

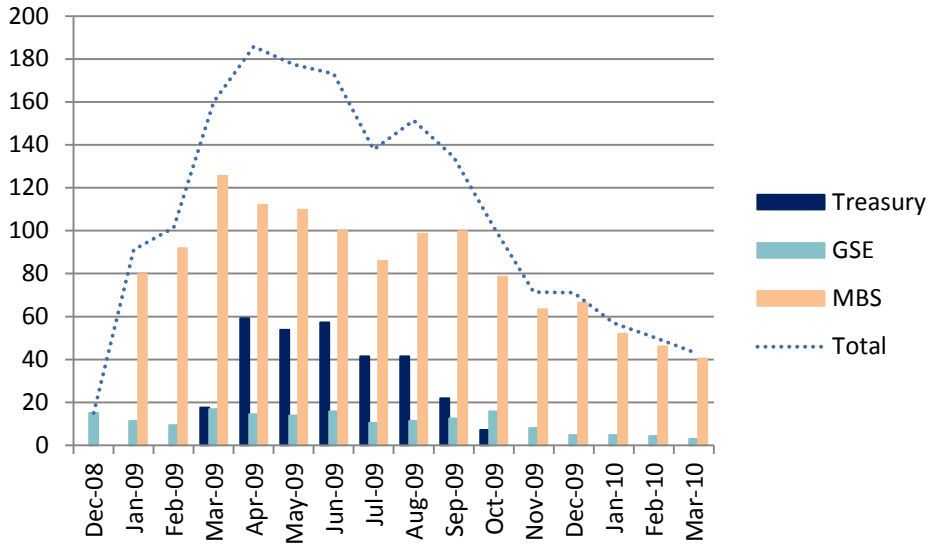
[42] Speech by Ben Bernanke at the Stamp lecture at the London School of Economics, London, England, January 13, 2009

[43] Press Release of the Board of Governors of the Federal Reserve System; Release date: 25.11.2008; available online on < http://www.federalreserve.gov/newsevents/press/monetary/20081125b.htm >

Mae. The intention of purchasing in such substantial quantities assets that the Fed never purchased before was backed by the main objective of this program – "support the housing markets and improve the conditions in financial markets generally".[44] This announcement was followed by another one on March 18, 2009[45] when in the light of continuing economic recession, the Fed decided to increase the LSAP and its balance sheet. The FOMC decided to acquire additional $100 billion of GSEs debt, $750 billion of MBS and moreover, $300 billion of long-term Treasury securities. This means that in the QE1 program the Fed purchased $200 billion of federal agency debt, $1,25 trillion of mortgage-backed securities and $300 billion of long-term Treasury securities, representing a total of $1,75 trillion assets. The following figure illustrates the development of the purchases of these assets from December 1, 2008 through March 31, 2010.

Figure 6

The Fed's asset purchases under QE1



NOTE: Data in billions of dollars
SOURCE: Federal Reserve Bank of New York, available online on <http://www.newyorkfed.org/markets/pomo_landing.html>.

[44] Press Release of the Board of Governors of the Federal Reserve System; Release date: 25.11.2008; available online on < http://www.federalreserve.gov/newsevents/press/monetary/20081125b.htm >
[45] Press Release of the Board of Governors of the Federal Reserve System; Release date: 18.03.2009; available online on < http://www.federalreserve.gov/newsevents/press/monetary/20090318a.htm >

As it can be seen from the graph, the evolution of the LSAP program was gradual. The total monthly purchases during the course of the program ranged between 15 and 185,7 billion of dollars, being significantly larger between March and July 2009. The further decline of the purchases was connected with the FOMC announcement on August 12, 2009[46] about the intention to slow down the purchases' pace. From all the Treasuries purchased, most of them were maturing between 2 and 10 years, just about *5%* were maturing from one to two years and *15%* were maturing in over 10 years. The distribution of maturity of the GSEs was mostly concentrated from 2 to 5 years – about *40$*, from 3 months to 2 years – about *30%*, and from 5 to 10 years - about *20%*. The MBS purchases were mostly constituted by *4.0-5.0%* coupon rate.[47] The program was terminated by March 31, 2010.

All in all, QE1 can be considered a success. It supported the economic activity through various channels, most remarkable being the signaling channel, the portfolio rebalancing channel and the term premia channel. The FOMC achieved its goal by influencing the long-term rates. In a research made by Gagnon et al.[48] it is analyzed how the interest rates reacted to the Fed's key announcements. The findings confirm that the LSAP reduced the longer term interest rates on agency MBS and debt, and also on Treasury securities, corporate bonds and interest rate swaps. These findings are also confirmed later by Krishnamurthy and Vissing-Jorgensen.[49] Figure 7 represents the development of the 10-year U.S. Treasury yield, the 10-year Swap Rates, the Baa Corporate Bond yield, and the GSE and 30-year agency MBS yields of the Freddie Mac. On the figure there are also highlighted the 8 key announcements made by the Fed on: 25.11.2008, 1.12.2008, 16.12.2008, 28.1.2008, 18.3.2009, 12.8.2009, 23.9.2009 and 4.11.2009. The graphs confirm that the LSAP reduced the yields of the listed assets, the biggest impact being observed during the first announcements in November and December 2008. During that month the most significant decrease can be noticed in the MBS – 124 basis points, followed by the 10-year Treasury – 110 basis points, the Swap rate – 105 basis points, the Baa corporate bond – 103 basis points and the GSE – 94 basis points.

[46] Press Release of the Board of Governors of the Federal Reserve System; Release date: 12.08.2009; available online on <http://www.federalreserve.gov/newsevents/press/monetary/20090812a.htm>

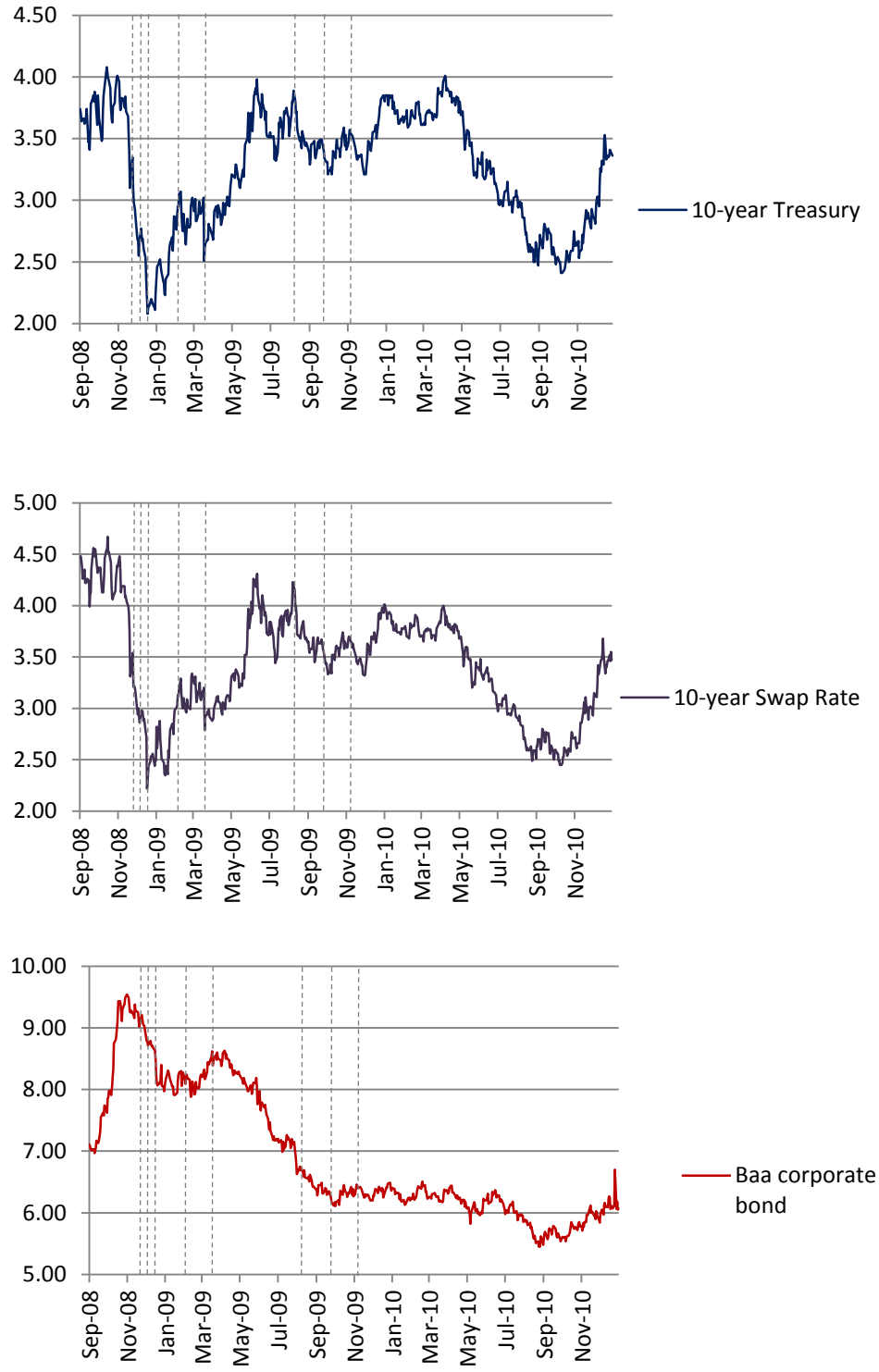
[47] Federal Reserve Bank of New York, available online on < http://www.newyorkfed.org/>

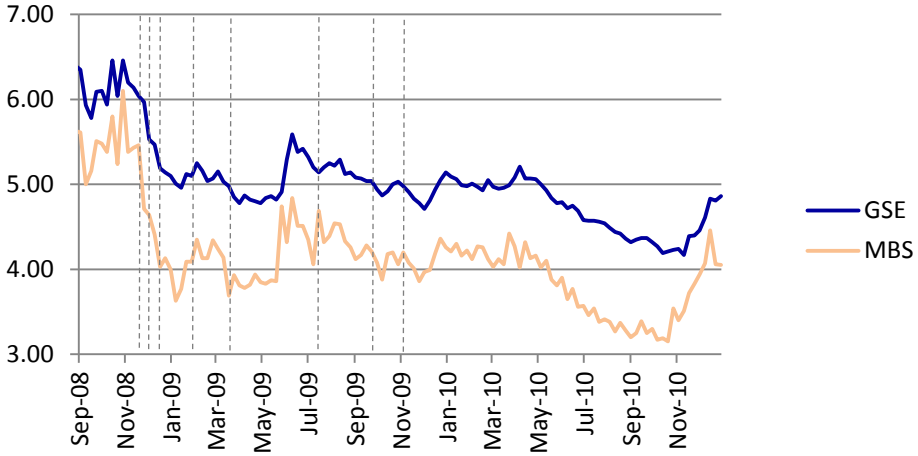
[48] GAGNON,J. et al.: *Large-scale asset purchases by Federal-Reserve: Did they work?,* Federal Reserve Bank of New York Staff Reports, No.441, 2010

[49] KIRSHNAMURTHY, A.; VISSING-JORGENEN,A.: *The effect of QE on interest rates*, Kellogg School of Management and NBER, 2011

Figure 7

The 10-yr Treasury, 10-yr Swap Rate, Baa Corporate Bond, GSE and MBS





NOTE: Data in percent per annum
SOURCE: The Federal Reserve Bank

The cumulative daily effects of the announcements are summarized in the table below. As it can be observed the largest cumulative decrease was for the Agency Debt and Agency MBS of respectively, -155 and -114 basis points. The cumulative effect for the 10-year Treasury on the announcement dates was of -92 basis points. Besides the Treasuries, MBS and GSEs the QE1 purchases affected also the 10-year swap and the corporate bond yields by -70 and -68 basis points. This proves that the large-scale longer-term assets purchases had wide range effects on the interest rates. However, some economists argue that these effects were not long-lasting. As it can be observed on the graphs, towards the end of 2010 the yields started increasing.

Table 3

Cumulative effects of the QE1 key announcements on the interest rates

10-yr U.S. Treasury	10-yr GSE	MBS	10-yr Swap	10-yr Term Premium
-92	-155	-114	-70	-102

NOTE: Data in basis points. The key announcements of the FOMC dated from: 25.11.2008, 1.12.20008, 16.12.2008, 28.1.2009, 18.3.2009, 12.8.2009, 23.9.2009, 4.11.2009.

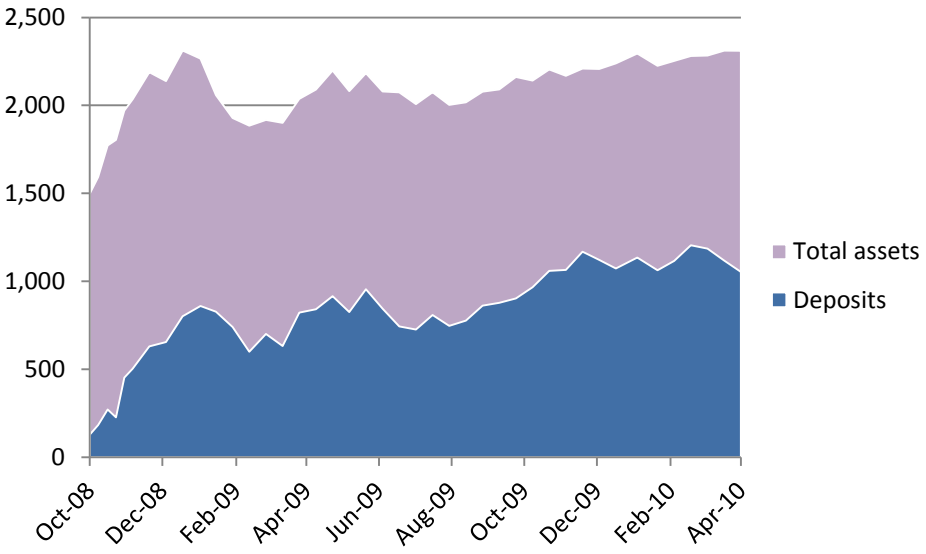
SOURCE: Adopted from Gagnon et al., 2010

Another benefit of the LSAP program is that it improved the market liquidity and removed the high-risk assets from investors' portfolios. This considerably ameliorated the conditions in the mortgage market – the mortgage rates decreased by *5%* during a year after the incitation of

the program. Another effect is that the Fed's actions created a systemic excess of liquidity. As described in the chapter before the banks don't choose to lend the acquired liquidity but deposit it back with the central bank. Figure 8 illustrates the development of the bank deposits during the LSAP compared to the development of Fed's total assets.

Figure 8

The banks' deposits during QE1



NOTE: Data in billions of dollars

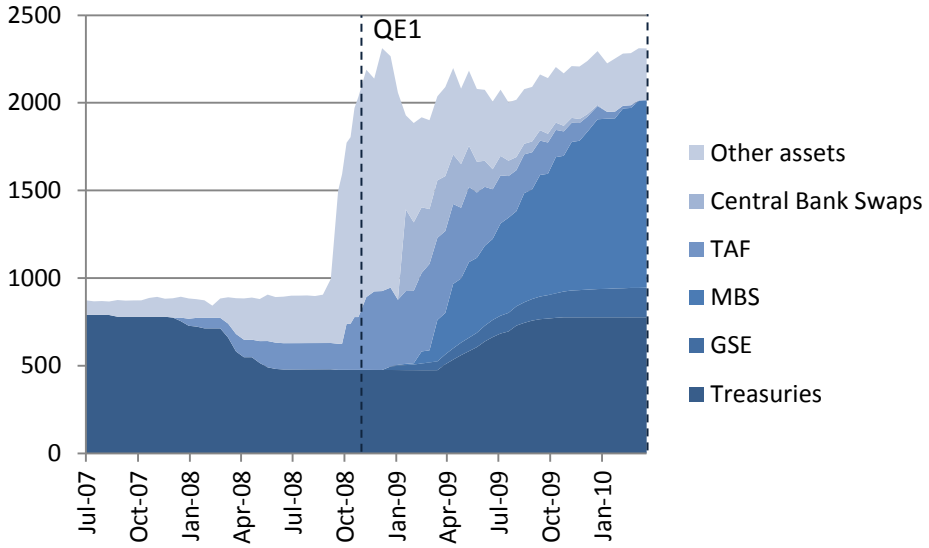
SOURCE: The Federal Reserve Statistical Release H.4.1, available online on http://www.federalreserve.gov/releases/h41/.

It can be seen on the figure how dramatically increased the deposits held by the depositary institutions on the Fed's balance sheet from $129 billion in October 2008 to $860 billion by the end of the year, reached $1 trillion in October 2009 and constituted $1,054 trillion by the end of the program. The boost of the reserves generally was of *717,05%.*The bank reserves increased almost proportionally with the increase of the balance sheet. In this way the Fed created an excess of liquidity in the system.

The increase of the balance sheet by the removing the high-risk assets from investors' portfolios, meant also an accumulation of assets on the Fed's balance sheet. The QE1 dramatically changed the composition of the Fed's assets. Figure 9 represents the change in composition of the Federal Reserve's assets from July 2007 till April 2010.

Figure 9

The composition of the Fed's assets (July 2007-April 2010)



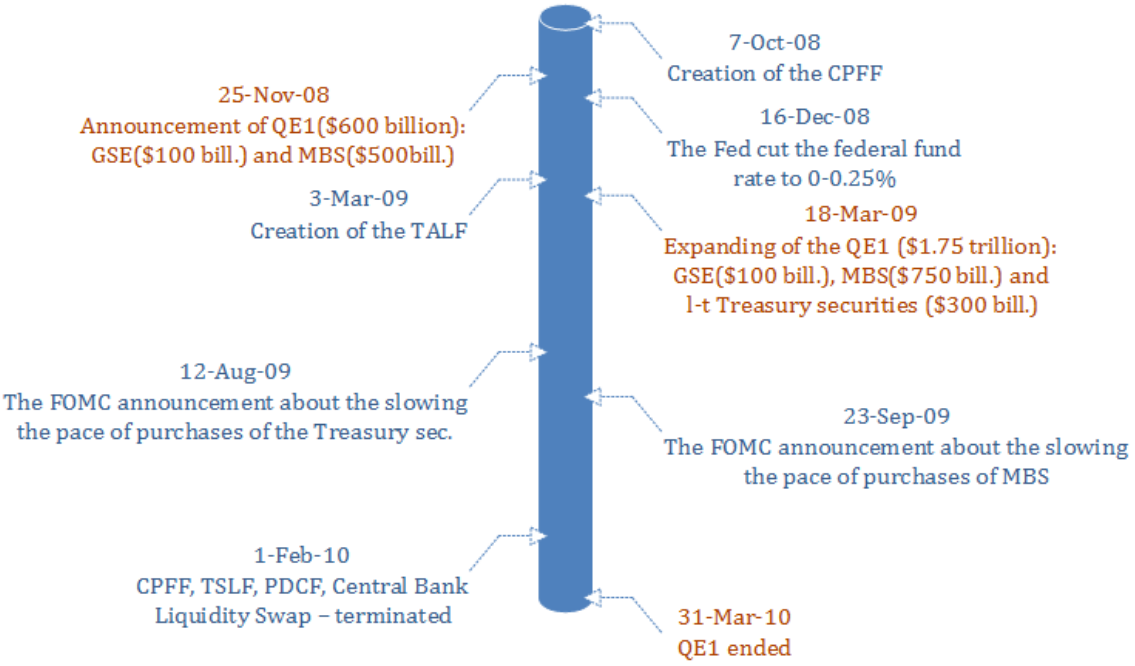
NOTE: Data in billions of dollars.

SOURCE: The Federal Reserve Statistical Release H.4.1.

The total Federal Reserve System's assets ballooned from $873,198 billion in July 2007 to $2 310,533 billion by April 2010, the most relevant growth being noticed between September and November 2008, when the assets increased sharply by *143,81%*. The boost of the balance sheet was due to the numerous liquidity and credit programs in which was Fed involved. Besides LSAP, during this period of time, the Fed also implemented two other facilities. The first, the Commercial Paper Funding Facility (CPFF) was announced in October 2008 and aimed to expand the liquidity of commercial paper market by providing funding to the issuers. This program was primarily destined to help the businesses by purchasing highly rated unsecured and asset-backed commercial paper and thus improving the liquidity conditions. The program was terminated by February 2010. The second, the Term Asset-Backed Securities Loan Facility (TALF) was announced in March 2009 and aimed to support the issuance of asset-backed securities (ABS) collateralized by various loans like student loans, auto loans, credit card loans. This facility was designed to support the consumer spending and the aggregate demand. Figure 10 succinctly lists all the key events from October 2008 till April 2010.

Figure 10

The QE1 timeline



SOURCE: The Federal Reserve System

Briefly, the QE1 was successful; its effects were wide ranging by lowering the longer-term interest rates and, more generally, supporting the economy. The Fed concentrated on the liquidity programs to help the banks and the financial institutions. During the LSAP the Fed purchased a total of $1,75 trillion of assets – U.S. Treasuries, agency debt, but focusing mainly on the MBS. As a result, this program was highly effective in lowering the long-term interest rates, the term premium and in ameliorating the conditions on the mortgage market. However, the QE1 had affected the Fed's balance sheet; it changed the composition on the asset side and on the liabilities' side increased the bank reserves.

2.4 The QE2 program

After the end of QE1 the financial markets seemed to be recovering but the pace of this healing considerably slowed in the second half of 2010, creating a disinflationary trend. This, the continuing weakness on the labor markets and the lessons learned from Japan – that even with nominal zero interest rates there can be a deflationary trend, pushed the Federal Reserve to take new measures.

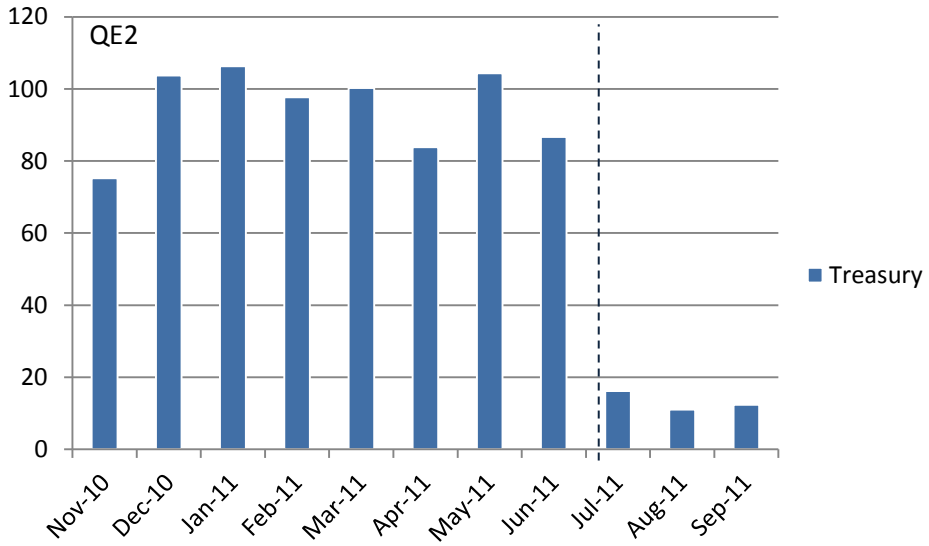
In August 2010 the Fed announced its intention to keep the constant size of its assets by reinvesting principal payments from previously purchased GSEs and MBS in Treasury securities. Shortly after that, in a speech in Jackson Hole, Ben Bernanke suggested that "additional purchases of longer-term securities would be effective further easing financial conditions" and in September the FOMC announced its predisposition to "provide additional accommodation if needed". So on November 3, 2010[50], 7 months after the QE1 ended, the second round of quantitative easing, also referred to as QE2, was put in place.

The QE2 lasted 7 months from November 2010 till June 2011. In its initial announcement the FOMC stated that it would acquire $600 billion of long-term Treasuries, at a pace of $75 billion per month, intending to terminate the program by the first half of 2011. The program was ended by June 20, 2011 but the FOMC decided to continue reinvesting the principal payments on agency debt and MBS in Treasuries. The reinvesting of the payments was terminated 3 months after on September 30, 2011. The main objective of this round of QE was to support the consumption and the investments, and increase the inflation expectations by lowering the yields on Treasuries and bonds. By implementing the QE2 program the Federal Reserve intended to stimulate the economy through the portfolio rebalancing channel: by purchasing the U.S. Treasuries, the Fed would increase the money in the investors' holdings and by this would force them to invest in other assets while rebalancing their portfolios. Moreover, like in QE1, the Fed hopped by increasing the liquidity on the commercial banks' balance sheet and creating an excess of reserves to stimulate the bank lending, this time in better financial conditions on the markets. The following figure illustrates how Fed's purchases of assets developed during QE2.

[50] Press Release of the Board of Governors of the Federal Reserve System; Release date: 3.11.2010; available online on <http://www.federalreserve.gov/newsevents/press/monetary/20101103a.htm>.

Figure 11

The Fed's asset purchases under QE2



NOTE: Data in billions of dollars
SOURCE: Federal Reserve Bank of New York, available online on <http://www.newyorkfed.org/markets/pomo_landing.html>.

As it can be seen from the graph, like in QE1, the evolution of LSAP2 was smooth. The total monthly purchases during the course of the program ranged between 75 and 106,3 billion of dollars monthly, not having any pronounced peeks. The maturity of these securities was ranging between 2 $^{1}/_{2}$ and 10 years. The total amount of Treasury securities purchased over the course of LSAP2 can be estimated to $736 billion, as additional purchases of Treasuries were made. It can be also observed how the purchases declined after June 2011 when the Fed terminated the QE2 but continued reinvesting the principal payment in Treasuries the following 3 months with an average of $13,19 billion monthly.

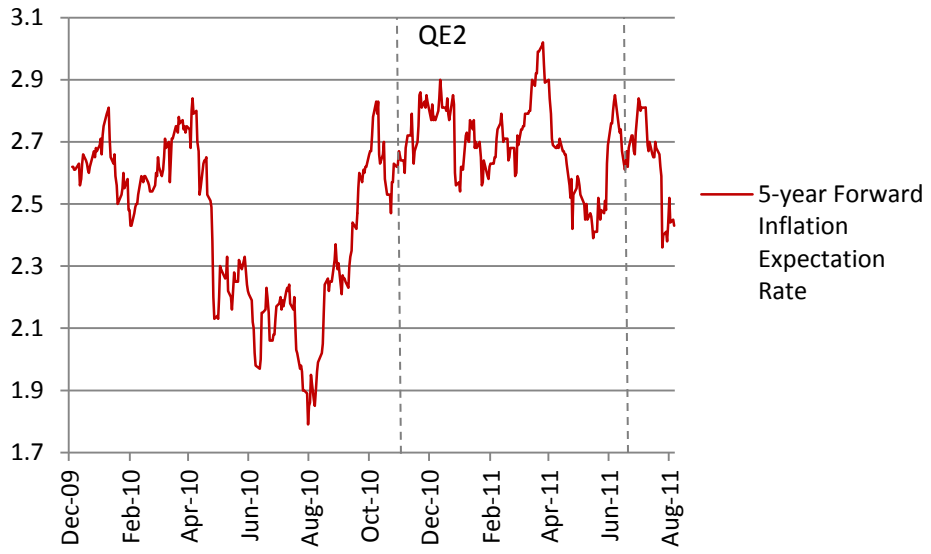
During the QE2 the total assets of the Federal Reserve System grew from $2 300,395 billion in November 2010 to $2 854,233 billion in September 2011 which represented a *24%* growth. An important change happened in the composition of the assets – in the securities held outright. At the beginning of the QE2 the Treasury securities represented $842,008 billion which was *36,55%* of the total assets. By the end of September 2011 their value increased to %1 664,655 billion that constituted *58,32%* of the total assets. On the liabilities' side grew the value of the

bank deposits from $982,722 billion in November 2010 to $1 608,996 in September 2011. Their increase was more rapid than the increase of the balance sheet and as a result, their value grew from *44%* to *56%* of the total assets.

The effects of the second round of quantitative easing were broadly discussed in the literature. Generally, the QE2 wasn't such a big success as the QE1 was, but it definitely had some strong points. It accomplished one of its main goals – the rising of the inflation expectations, saving the U.S. economy from Fed's fear of a deflationary trend. The asset prices also rose considerably. The following figure represents the development of the inflation expectations from December 2009 till August 2011.

Figure 12

5-Year Forward Inflation Expectation Rate



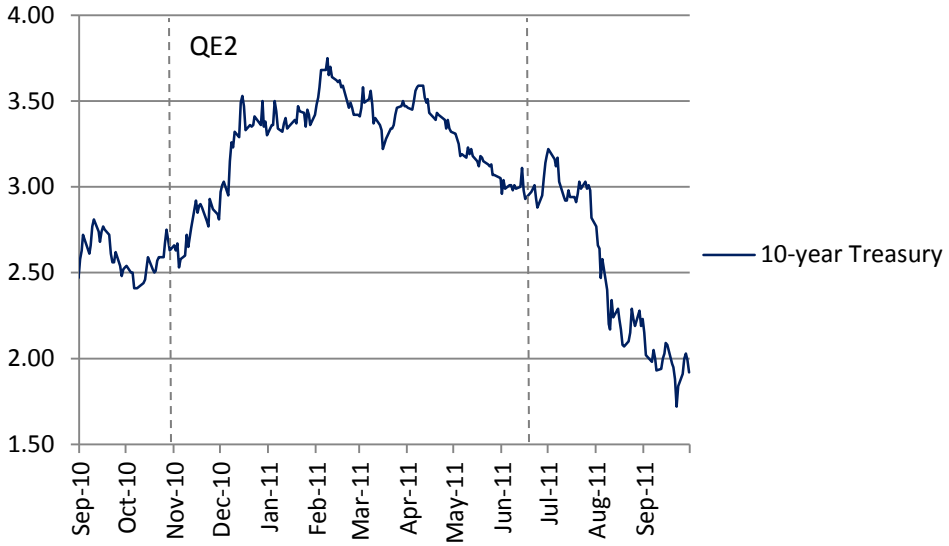
SOURCE: The Federal Reserve Bank of St. Louis

From April 2010 the inflation expectations considerably decreased from *2,84%* reaching the lowest level of *1,79%* in August 2010. The Fed feared that the deflationary trend would continue. However, in the second half of 2010 the inflation expectations increased considerably reaching *2,83%* by November. The most considerable increases can be noticed in August and September and can be associated with the Fed's "suggestions" about a new round of quantitative easing.

The second goal of the QE2 wasn't achieved with such a big success as the first one – the real interest rates declined but not as much as the Federal Reserve expected; QE1 has been much more effective in this sense, especially in reducing the interest rates in a wide range. In a study, Hamilton and Wu[51] estimated that the cumulative effects of QE2 reduced the 10-year Treasury yield by about 17 basis points. Figure 13 represents the development of the 10-year Treasury yield from September 2010 till September 2011.

Figure 13

10-Year U.S. Treasury yield (2010-2011)



NOTE: Data in percent per anum

SOURCE: The Federal Reserve Bank of St. Louis

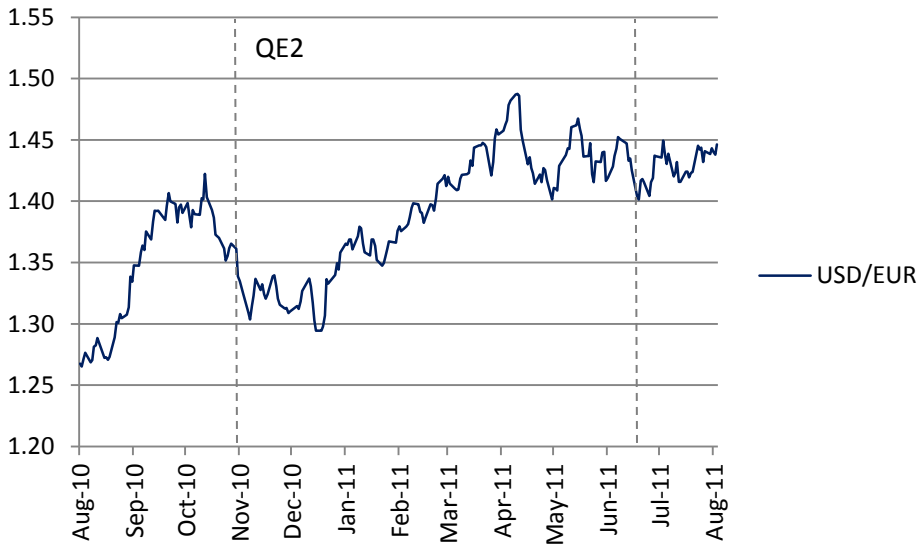
Indeed, the 10-year Treasury yield decreased from its level from the end of the summer 2010; however, there can be observed a mild increase around the dates when the key announcements of QE2 were made. A possible explanation of this, as in the case of the inflation expectations, can be that the markets were expecting the coming of the QE2 from the "suggestions" made before in August and September 2010. Therefore, the prices and the interest rates could have had adjusted and there couldn't be observed a pronounced effect through the signaling channel.

[51] HAMILTON, J.; WU, J.: *The effectiveness of alternative monetary policy tools in a zero lower bound environment,* NBER Working Paper, No. 19656, 2011.

Another positive effect of the QE2 that can be noted is the depreciation of the dollar, which consequently had a positive, stimulating effect on the economy. The figure below shows how the USD/EUR foreign exchange rate changed under QE2.

Figure 14

USD/EUR Foreign Exchange Rate



SOURCE: The Federal Reserve Bank of St. Louis

This was followed by the raise in the equity prices through the portfolio rebalancing channel. As the Federal Reserve expected at the beginning of the program, some investors turned to riskier assets, especially on the equity markets that increased their prices and the business credit. It is also important to mention that at the same time with the implementation of QE2, as well as of QE1, there was a rapid growth in the budget deficit, which made the purchase of securities by the Fed a debt monetization with a direct impact on the interest costs of the debt. Moreover, the earnings of these operations the Fed was transferring to the state budget.

Briefly, the QE2 was not such a large program as QE1, injecting $600 billion into the economy through the purchases of U.S. Treasury securities. It had beneficial effects on the economy by raising the inflation expectations, depreciating the value of the dollar and raising the equity prices. QE2 also affected the longer-term real interest rates but its effect was less pronounced as the effect of QE1.

2.5 The Maturity Extension Program

The beginning of the second half of 2011 brought back the uncertainty to the financial markets. The real economic activity was slower than expected, the weakness on the labor market was continuing, followed by high unemployment rate, and low consumer spending. As a reaction to this uncertain environment, the Federal Reserve decided to implement a new monetary program – The Maturity Extension Program (MEP), also known as Operation Twist.

On September 21, 2011[52] the FOMC announced the third round of large-scale asset purchase program (LSAP3) that aimed to "support a stronger economic recovery and ensure that inflation is stable". Under Operation Twist, the Fed was planning to acquire $400 billion of Treasury securities with maturity from 6 to 30 years and sell the same amount of Treasuries with maturity less than 3 years. The main goal of the MEP was to affect the long-term interest rates by decreasing them and short-term interest rates by increasing them, in such a way twisting the yield curve – from where comes the popular name of Operation Twist.[53] Initially the MEP was intended to be terminated in June 2010 but on June 20, 2012 it was extended till the end of the year with the aim to acquire and sell Treasuries in the value of $267 billion. By the end of 2012 when Operation Twist expired the FOMC announced the plan to continue to buy monthly long-term Treasury securities in the value of $45 billion but without selling the same amount of short term ones.

Besides LSAP3 on September 21, 2011 the FOMC also announced a change in reinvestment of principal payments from agency debt and agency MBS from Treasuries in agency MBS. The main goal of this change was to support the mortgage markets that were still weak.

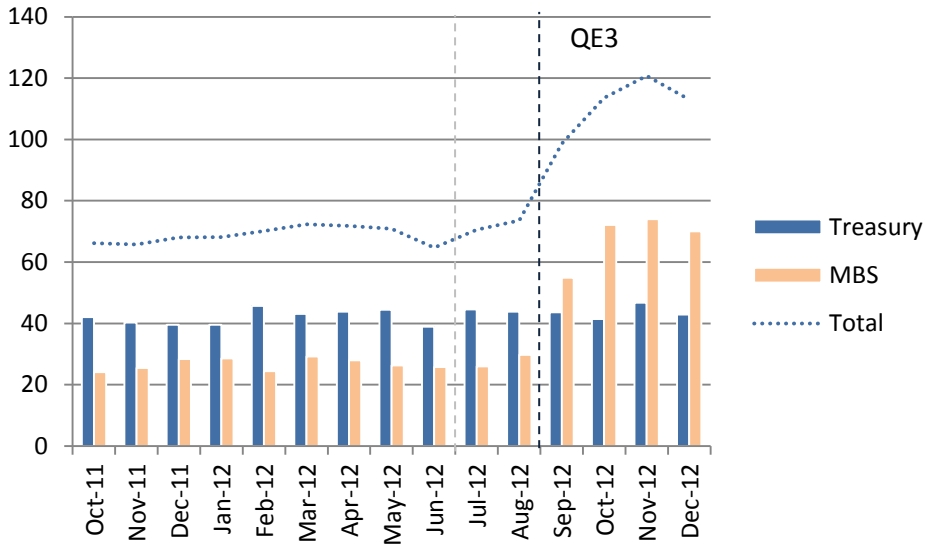
Figure 15 illustrates the development of the Fed's purchases under Operation Twist and the development of agency MBS purchases under the reinvestment of the principal payments from October 2011 till December 2012. The total Treasury securities purchased by June 2012 constituted $377,507 billion and $640,639 billion at the end of the program in December 2012. The monthly purchases ranged between $39,61 billion and $47,769 billion. The total purchases of agency MBS during October 2011 – August 2012 was of $269,05 billion. The increase in the MBS purchases from September 2012 that can be noticed on the graph is connected with the implementation of the QE3 program which will be described in the following paragraph.

[52] Press Release of the Board of Governors of the Federal Reserve System; Release date: 21.09.2011; available online on <http://www.federalreserve.gov/newsevents/press/monetary/20110921a.htm>

[53] This program is also called Operation Twist 2, as in 1961 the Federal Reserve implemented successfully the first Operation Twist and managed to decrease the long term interest rates.

Figure 15

The Fed's asset purchases under Operation Twist



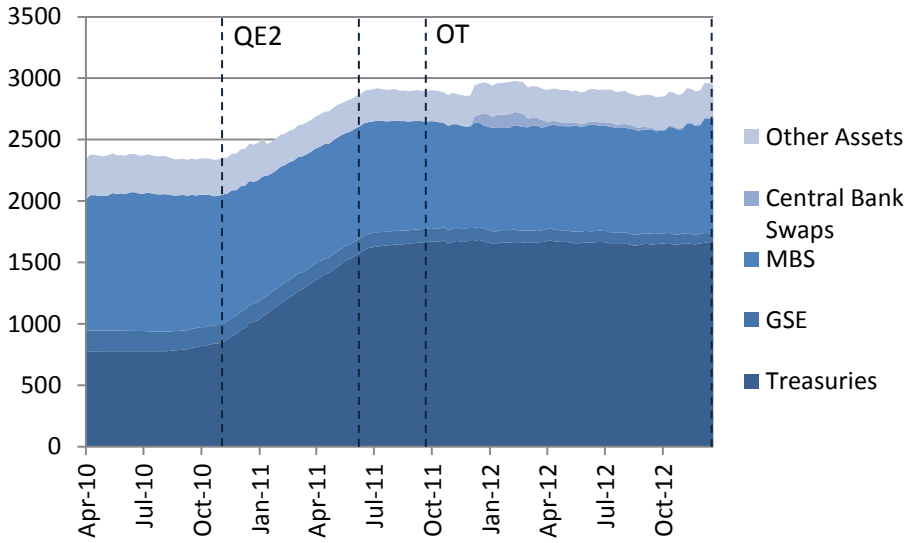
NOTE: Data in billions of dollars

SOURCE: Federal Reserve Bank of New York, available online on <http://www.newyorkfed.org/markets/pomo_landing.html>.

In comparison with QE1 and QE2, the MEP wasn't a quantitative easing monetary policy as it didn't quantitatively affect the Federal Reserve's balance sheet, it was balance sheet neutral. In contrast, the Operation Twist changed slightly the structure of the assets. Under the MEP the total assets of the Federal Reserve didn't alter much representing a total of $2 898,083 billion at the end of September 2011 and $2 901,436 billion by December 2012, fluctuating around the average of $2 905,859 billion. The value of the Treasuries also didn't change a lot, constituting about *56,8%* of the total assets. The change occurred in their composition, with an increase in their duration. The value of the agency MBS fluctuated around an average of $902,357 billion. By the end of 2012 their value started slightly increasing which is connected with the implementation of QE3. The following figure emphasizes the development of the asset side of the Federal Reserve's balance sheet from April 2010 till December 2012.

Figure 16

The composition of the Fed's assets (April 2010-December 2012)



NOTE: Data in billions of dollars
SOURCE: The Federal Reserve Statistical Release H.4.1.

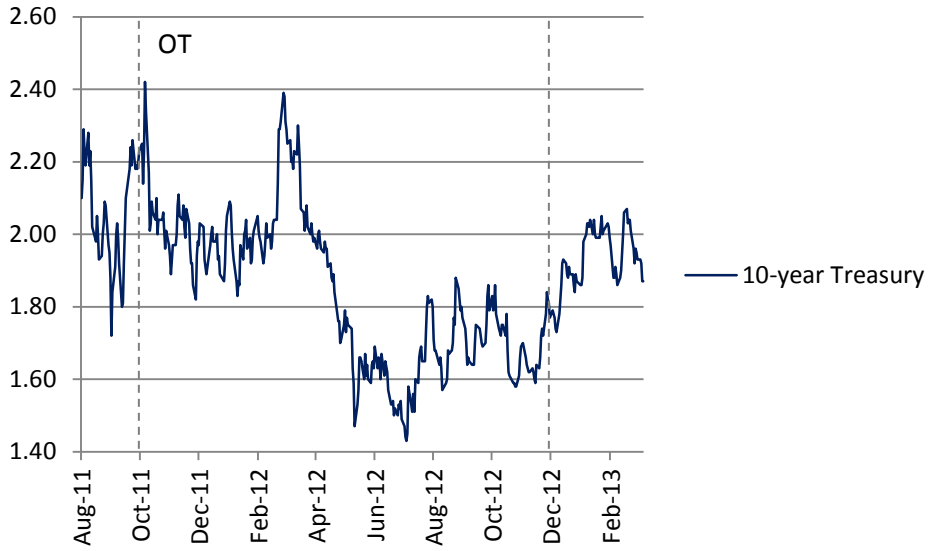
The Operation Twist had a positive effect on the economy. It achieved its primary goal in bringing down the long-term interest rates, even if the effect was relatively moderate. Overall, it decreased the long-term Treasury yields by 15 basis points – from *1,87%* in September 2011 to *1,72%* in December 2012. Which comparing to QE2 is a better result, considering that it didn't quantitatively affect the balance sheet. However, many critics argue that the effects on the long-term interest rates were not long-lasting and vanished within a month.[54]

Figure 17 emphasizes the development of the 10-year Treasury yield from August 2011 till March 2013.

[54] EHLERS, T.: *The effectiveness of the Federal Reserve's Maturity extension program – Operation twist 2: the portfolio rebalancing channel and public debt management,* BIS Paper, No. 65, 2012

Figure 17

10-Year U.S. Treasury yield (2011-2012)



NOTE: Data in percent
SOURCE: The Federal Reserve Bank of St. Louis

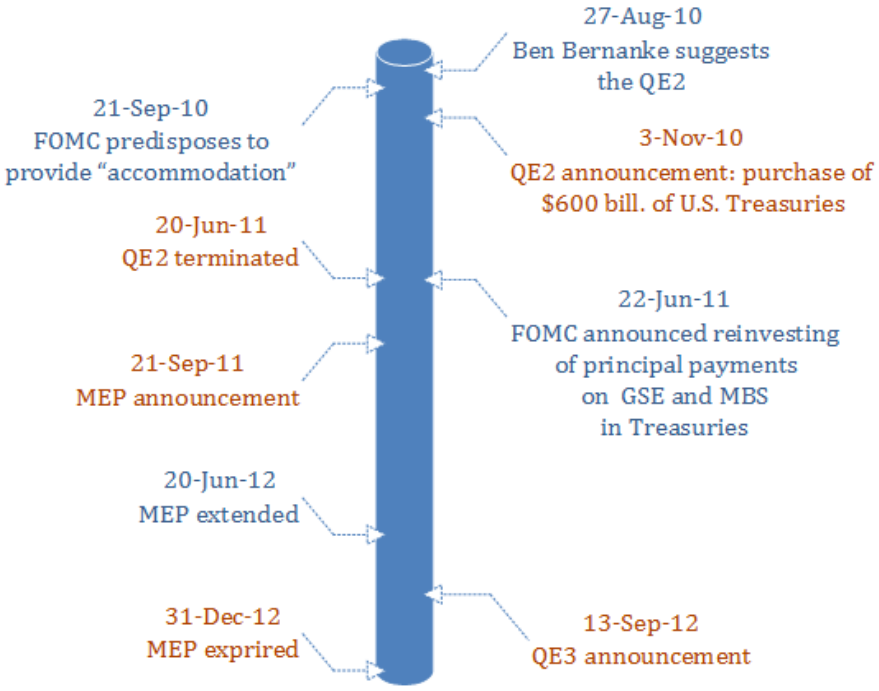
Indeed, under the Operation Twist there can be noticed a significant decrease of the yield but after the program was terminated the yield started increasing reaching the pre-program level (*1,87%*) by the end of March 2013, which proves the fact that the impact of the OT was not long-lasting. But on the other hand, the MEP also helped in reducing the maturity of outstanding debt, which is a stimulus for consumption, investments and the economic activity generally.

Briefly, the Maturity Extension Program can be compared to the QE2 by its volume and the targeted securities – the U.S. Treasuries. But in contrast to the QE2, the MEP targeted the long-term interest rates by implementing the twist of the yield curve. The program proved to be partially successful as it managed to lower the interest rates but the stimulus wasn't enough and additional measures needed to be implemented.

The following figure represents the timeline of the QE2 and the Maturity Extension Program highlighting the key events.

Figure 18

The QE2 and MEP timeline



SOURCE: The Federal Reserve System

2.6 The QE3 Program

In the light of slow employment growth with continuously high employment rates, unsatisfying economic activity, a downtrend in the investments and low inflation expectations by the end of the summer of 2012, the Federal Reserve aiming to achieve its dual mandate – full employment and price stability, launched a new large-scale asset purchase program, also known as the QE3.

First, on August 22, 2012[55], the FOMC suggested its intention to provide support to the economic recovery with a possible "additional monetary policy accommodation". This was followed by the official announcement of the QE3 program on September 13, 2012.[56] The FOMC declared its plan to purchase monthly amounts of $40 billion of MBS till the "outlook for the labor market does not improve substantially and price stability is achieved". The substantial difference between this quantitative easing program and the previous two is that the Federal Reserve didn't set the total planned amount of purchases or the planned end date; on the contrary, just the pace of these purchases was determined. This change in the program was supported by many economists. As described in the previous paragraph the QE3 was followed by the extension of the MEP program and a change in the reinvestment of the principal payments from the agency debt and agency MBS from Treasury securities in MBS. Overall, these programs covered a total amount of $85 billion monthly purchases. In December 2012 the QE3 was extended after the expiration of the Operation Twist – the Fed announced its intention to buy Treasury securities in the value of $45 billion.[57] In December 2013 the FOMC voted to reduce the monthly purchases by $10 billion in an even way for the Treasury securities and the agency MBS, and it continued to gradually reduce them in the following meetings. In the most recent Press release dated from July 30, 2014[58] the FOMC repeatedly reduced the pace of purchase of the agency MBS bringing it down to $10 billion per month and of the Treasury securities to $15 billion per month. Early in June 2014, Richard Fisher, the president of the Federal Reserve Bank of Dallas, stated that he expected the QE3 to end by October 2014, considering the reduction of the pace of the monthly purchases. However, the Fed doesn't intend to increase the federal fund rate until mid-2015.

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[55] Press Release of the Board of Governors of the Federal Reserve System; Release date: 22.08.2012; available online on <http://www.federalreserve.gov/newsevents/press/monetary/20120822a.htm>

[56] Press Release of the Board of Governors of the Federal Reserve System; Release date: 13.09.2012; available online on <http://www.federalreserve.gov/newsevents/press/monetary/20120913a.htm>

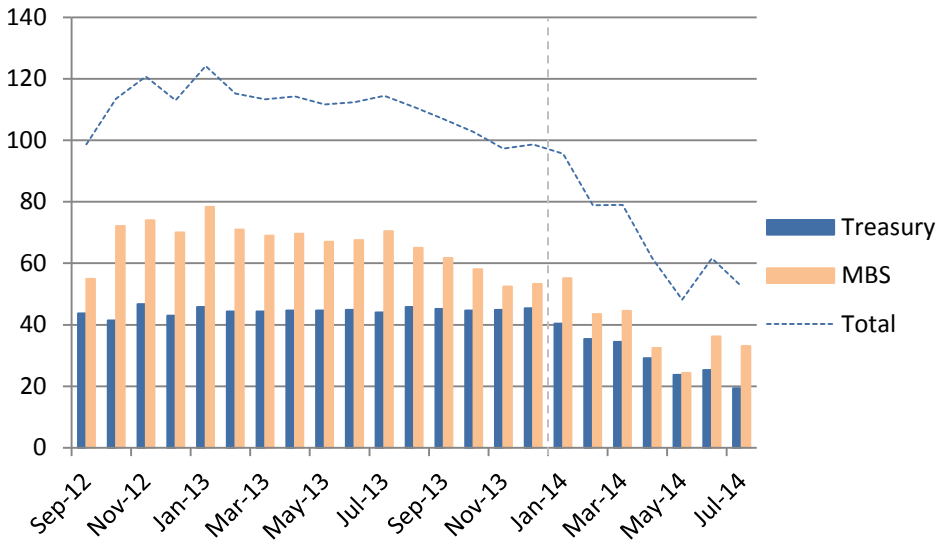
[57] Some economists believe that QE3 ended in December 2012 with the expiration of MEP and QE4 was launched.

[58] Press Release of the Board of Governors of the Federal Reserve System; Release date: 30.07.2014; available online on <http://www.federalreserve.gov/newsevents/press/monetary/20140730a.htm>

The figure below shows the pace development of the purchases of agency MBS and Treasury securities made by the Fed from the implementation of QE3 in September 2012 and till the end of July 2014.

Figure 19

The Fed's asset purchases under QE3



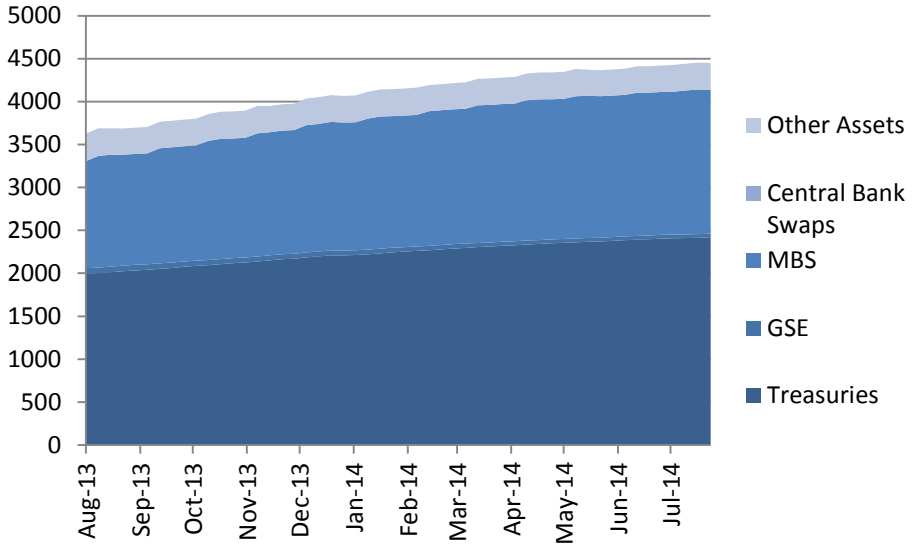
NOTE: Data in billions of dollars
SOURCE: Federal Reserve Bank of New York, available online on <http://www.newyorkfed.org/markets/pomo_landing.html>.

The Treasury securities continued their trend, the purchases being lightly under $45 billion monthly until the expiring of Operation Twist. On the graph can be seen how the quantity of the purchases declined at the beginning of 2014 in result of the decision that was taken by the FOMC in December 2013. In contrast the purchases of the agency MBS rose from the initiation of QE3. To be noted that this graph includes both, data for the purchases of MBS under QE3, and under reinvestment of principal payments. From September 2012 till December 2012 the total monthly amount of agency MBS purchased ranged between $52.42 and $78.4 billion. From January 2014, like in the Treasuries case, there can be observed the declined of the purchased amounts with a little raise in June and July 2014. From all the MBS purchased more than $^1/_2$ were Fannie Mae MBS, a little less than $^1/_3$ were Freddie Mac MBS and the remaining were Ginnie Mae MBS.

The QE3 had a significant effect on the size of the Federal Reserve's balance sheet. The following figure shows the developments of the size and the structure of the assets during QE3.

Figure 20

The Composition of the Fed's assets (August 2013-July 2014)



NOTE: Data in billions of dollars
SOURCE: The Federal Reserve Statistical Release H.4.1.

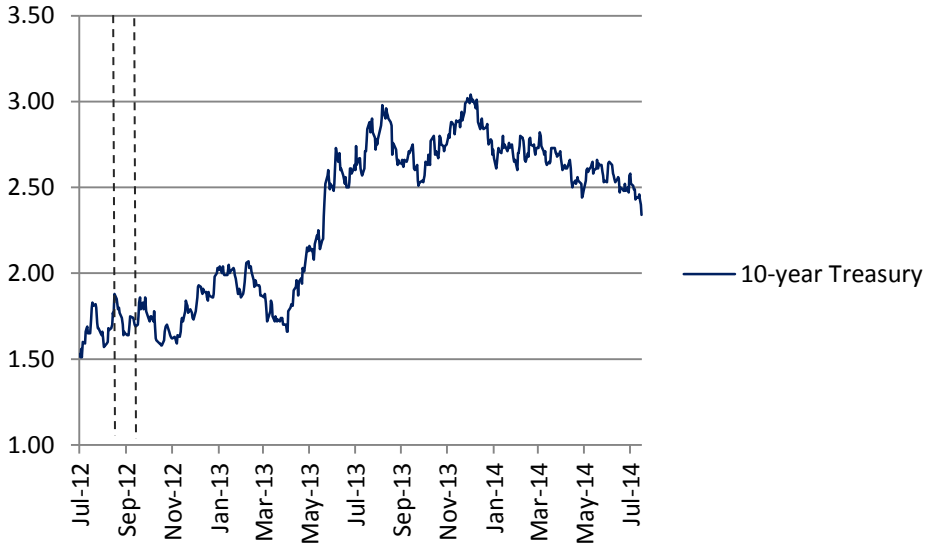
Under QE3 the total Federal Reserve System's assets ballooned from $3 704,477 billion in September 2013 to $4 450,085 billion at the end of July 2014 which is a *20,12%* increase in 11 months. The increase was gradual, with no prominent peeks and slowed down from the beginning of 2014. The total amount of Treasury securities increased by *19,03%* - from $2033,29 to $2 420,285 billion. Their share in the total assets didn't change considerably decreasing by *1%.* More significantly changed the amount of the agency MBS growing by almost *30%* from $1291,35 to $1 674,363 billion representing a change from *34,95%* to *37,62%* from the total assets. The central bank swaps had insignificant values ranging between $75 million and $0.511 billion.

On the liabilities' side the bank deposits grew by *22,5%* reaching $2 278,798 billion by the end of July 2014; and the Federal Reserve Notes grew by almost *7%*..

The overall effect of the QE3 program can be appreciated as a positive one. The chair of the Federal Reserve System, Janet Yellen argues that the QE3 stimulated the economy and helped the growth of the employment. The QE3 also helped in lowering the long-term interest rates but as QE2 not as much as it was expected. The possible explanation as in the case of QE2 is the fact that the prices and the interest rates due to the expectations adjusted before the official announcements were made. In a paper Baver and Neely[59] calculated the cumulative effect of two key events (on 22.08.2012 and 13.09.2012) on the 10-year Treasury yield. Their result indicated that the yield was lowered by 14.3 basis points. Figure 21 shows the evolution of the 10-year Treasury yield under the QE3.

Figure 21

10-Year U.S. Treasury yield (2011-2012)



NOTE: Data in percent per annum
SOURCE: The Federal Reserve Bank of St. Louis

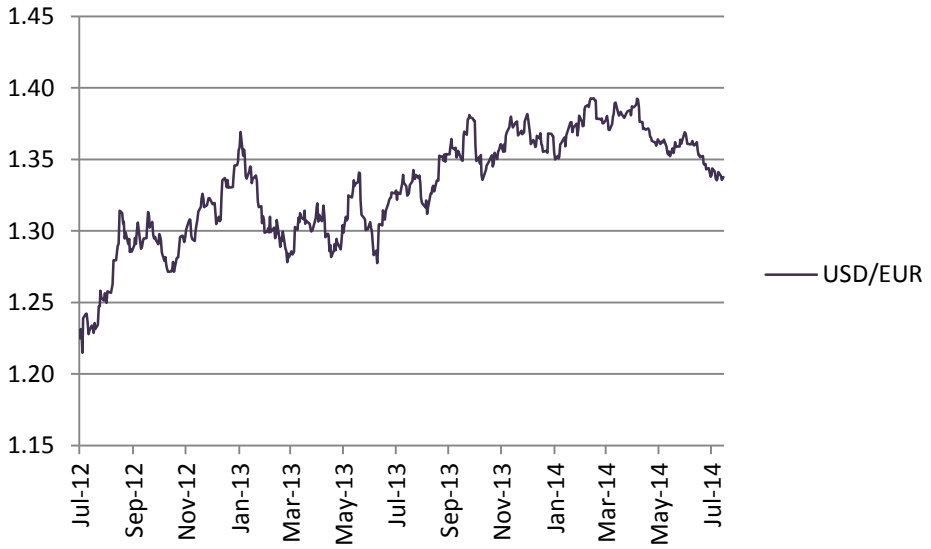
In the graph there are indicated the two key announcement dates – August 22 and September 13. There can be seen how the 10-year Treasury yield decreased after these two events. In May 2013 the yield, however, started increasing but there can be noticed a decreasing trend starting from the beginning of 2014.

[59] BAVER, M.; NEELY, C.: *International channels of the Fed's unconventional monetary policy,* Federal Reserve Bank of San Francisco, Working Paper Series, No. 2012-12, 2013.

Another benefit of the QE3 is that it affected the U.S. Dollar by depreciating it. The weakened currency is a stimulus for the exports and the economic growth. However, in the current uncertain environment of the global economy and the continuing crisis in Europe, the depreciation of the U.S. dollar may have had a smaller impact on the exports. The following graph shows the development of the USD/EUR foreign exchange rate over the past two years.

Figure 22

USD/EUR Foreign Exchange Rate



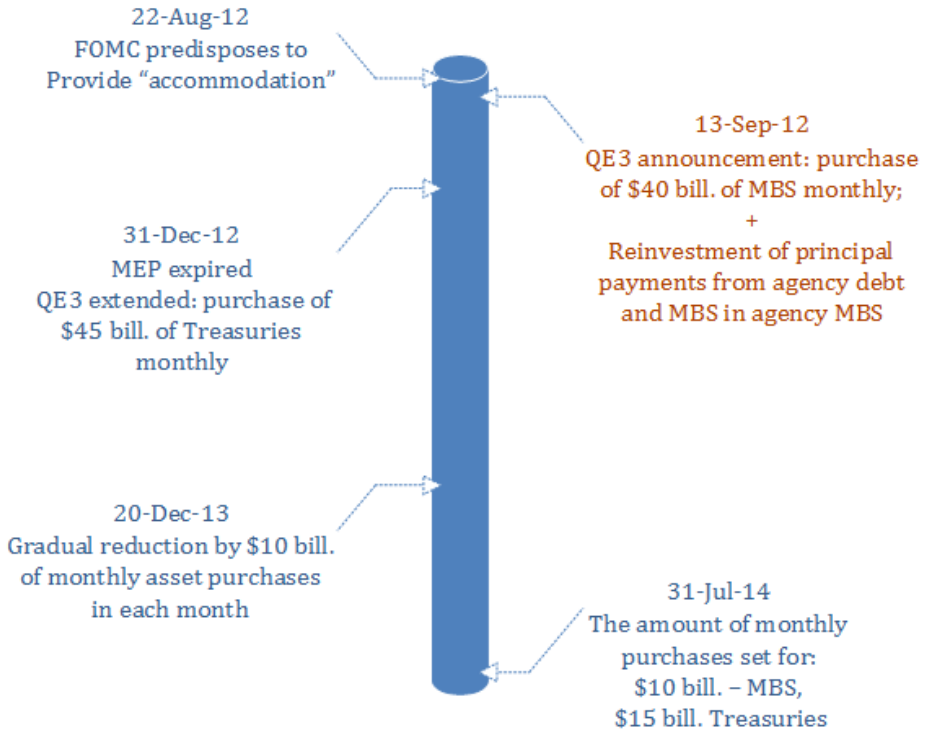
SOURCE: The Federal Reserve Bank of St. Louis

However, there are also many critics in the address of QE3. First, the opponents argue that there is still a risk of a high inflation that can appear even if now the expected inflation is lower than the target. Secondly, the critics highlight the fact that the large-scale purchases concentrated too much on the mortgage market and ignored the other markets. Moreover, many economists are concerned about the exit strategy because there is no previous experience in central banking in going back to traditional monetary policy.

The following figure summarizes the main highlights of the QE3 program.

Figure 23

The QE3 timeline



SOURCE: The Federal Reserve System

2.7 Conclusion

The Federal Reserve's unconventional monetary policy that was implemented for the last 7 years can be generally divided in two phases. The first one was a first aid phase when the Federal reserve reacted very promptly to the upcoming crisis, the decisions were taken very fast and there were implemented a number of liquidity and credit programs like: TAF, TSLF, PDCF, the support of several financial institutions, including Bear Stearns and AIG. However, all the decisions taken were not systematic; they could be described more as responses to certain problems that appeared in the markets. On the contrary, the second phase of the monetary policy was more organized; the Federal Reserve had a fixed goal that it was targeting with the help of well-thought programs: QE1, CPFF, TALF, QE2, MEP, and QE3.

The first round of quantitative easing was an outstanding success as at that time the markets were short of liquidity. The program had a lot of effects on the economy by lowering the long-term interest rates, the term premium and ameliorating the conditions on the mortgage market. The Federal Reserve found the best solution in a situation with no alternatives. However, the following two programs were not such a success anymore. The positive effects were moderate and were connected with negative outcomes. An important effect that can't be neglected is that the low interest rates are "penalizing" the incomes of the savers and retirees. With the increasing prices of the assets this takes the purchasing power out of economy. The attention of the critics was also drown to the size and structure of the Fed's balance sheet which quintupled since the outbreak of the crisis and reached $4,45 trillion. On the asset side appeared assets that Fed never held before like illiquid mortgage-backed securities that the Federal Reserve will most likely chose to hold till their maturity. On the liabilities side considerably grew the reserves of the depositary institutions. The Federal Reserve System through its operations created a systemic excess of liquidity on the market that at the initial point helped the markets and was a success but now it became a liability.

Chapter 4 will analyze the main issue of today's monetary policy of the Federal Reserve System – the exit strategy or the possibility to return to conventional monetary policy.

3 The ECB's Quantitative Easing

This chapter of the paper will describe the implementation of the quantitative easing policy in the E.U. In order to better understand the economic environment and the circumstances that prevailed before the outbreak of the crisis, it will start by explaining how the European Central Bank conducted its monetary policy prior to the crisis and it will continue with analyzing its entrance strategy and how this affected its balance sheet and the market liquidity.

3.1 The ECB's monetary policy and balance sheet before the crisis

Before the outbreak of the global financial crisis of 2007-2008 the European Central Bank conducted its monetary policy in order to achieve its primary objective mainly through refinancing operations by setting the key interest rates and managing the liquidity in the financial sector. Article 127(1) of the Treaty on the Functioning of the European Union defines the main monetary policy objective as follows:

"The primary objective of the European System of Central Banks […] shall be to maintain price stability"; continuing with the secondary objectives – supporting "the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union", which include balanced economic growth, full employment, social progress.

From this statement can be deducted the one clear mandate of the ECB – price stability. Even if the ECB has multiple objectives that it sets to accomplish, the Treaty indicates the hierarchy of these objectives leaving the "favorable economic environment" and the "full employment" as secondary goals. From here derives the first evident difference between the ECB and the Fed – which has a "dual mandate" in its monetary policy objectives. Its main goal, the ECB achieves by maintaining inflation rates below but close to *2%* over the medium term.[60] The monetary policy decisions of the Governing Council of the ECB derive from the economic and monetary analysis – the two pillars of the monetary policy strategy. The economic analysis assesses the price stability in short to medium-term by defining the possible dynamics, risks and shocks. The monetary analysis assesses the price stability in longer-terms, defining inflationary and monetary trends for extended horizons. The primary objective and the two pillars are the key features of the monetary policy implemented by the ECB.

[60] The Governing Council defines price stability as "year-on-year increase in the Harmonized Index on Consumer Prices (HICP) for the euro area below *2%*".

To achieve this task the ECB traditionally used three instruments: standing facilities, open-market operations and reserve requirements. The primary method through which the ECB allocated liquidity to the market participants was the open-market operations, most importantly – the main refinancing operations (MROs), which were repo and reverse repo auctions[61] made every week on a regular basis with maturity of one week. Comparing to the Fed, which targeted its monetary policy rate, the ECB set the minimum bid rate which is also the main monetary policy rate. In addition to the MROs, the ECB also conducted once a month longer-term refinancing operations (LTROs) with maturity of three weeks. These two types of operations were completed by fine-tuning operations that were reverse or outright transactions or foreign-exchange swaps which were conducted regularly on the last day of each reserve maintenance period; and structured operations that aimed to adjust longer-term structured positions. The second traditional tool of the European Central Bank was the standing facilities: the deposit facility that allowed making overnight deposits at the central bank and the marginal lending facility that allowed obtaining liquidity. Before the outbreak of the crisis, in June 2007 the main policy rate was *4%*, the marginal lending facility rate was at the level of *5%* and the deposit facility rate – *3%.* Lastly, another way the ECB could affect the liquidity supply was through the reserve requirements. Changing the level of so called "minimum reserves" could also influence the liquidity. The reserve requirement was set at the level of *2%*.[62] The change of the reserve requirements wasn't used by the ECB as a monetary policy instrument; however, otherwise, the tool was used.

In order to highlight the changes that were brought to the monetary policy after the financial crisis it is important to analyze the structure of the Eurosystem's (ES) balance sheet[63] before its breakout. Table 4 represents the Eurosystem's Balance Sheet as reported on 13th of July 2007.

As it can be seen from the table by the middle of July 2007 the total amount of assets on the ES balance sheet was 1 185,36 billion of euros. *37,28%* of these assets were loans and other operations connected with monetary policy. From these *66%* were main refinancing operations and the other about *34%* were longer-term refinance operations. The securities constituted only *7,85%* of the total assets due to the fact that Article 123 (1) of the Treaty prohibited the ECB to

[61] To be noted that a repo operation for the ECB is called a reverse repo operation by the Fed and respectively, the reverse repo is called a repo.
[62] The *2%* reserve requirement is set for overnight deposits, deposits with agreed maturity or period of notice up to 2 years, debt securities issued with maturity up to 2 years, money market paper.
[63] The Eurosystem comprises the European Central Bank and the national central banks of the Eurozone.

purchase government bonds in the primary issuer market. The general government debt was 37,15 billion of euro which represented *3,13%* of the assets.

Table 4

Eurosystem's Bank Balance Sheet (13.7.2007)

Assets		Liabilities	
Securities	93,12	Banknotes is circulation	638,84
Loans		Depository institutions reserves	
Main refinancing op.	292,0	Minimum reserves	193,04
Longer-term refinancing op.	150,0	Deposit facility	0,08
Gold stock	172,62		
		Other liabilities	285,09
Other assets	477,62		
		Total liabilities	**1117,05**
Total assets	**1185,36**	**Capital**	**68,31**

NOTE: Release date 13th of July 2007, data in billions of euros
SOURCE: European Central Bank statistical release, available online on <http://sdw.ecb.europa.eu/>

On the right side of the balance sheet the Banknotes represented the largest part of the liabilities – 638,84 billion of euros. The reserves held by depository institutions were 193,12 billion which is *16,29%* of the total assets. Mostly of them *99,95%* were minimum reserves and *0,05%* were reserves held in the deposit facility. The capital's size was of 68,31 billion of euros.

To sum up, before the flare-up of the crisis, the European Central Bank conducted its traditional monetary policy having one main objective – price stability. The main decisions taken by the Governing Council were based on the two main pillars of the monetary policy strategy – the economic and monetary analysis. For achieving its goal, the ECB was setting the main refinancing rate and using 3 main instruments: the main – the open market operations, and two additional – the standing facilities and the reserves requirements.

3.2 The ECB's entrance strategy

The second half of 2007 brought tensions and uncertainty to the global financial markets. In line with the other central banks, the European Central Bank started reacting to the changing conditions. Before describing the ECB's actions, it is important to highlight some key features of the European financial structure that differentiate it from the American financial structure. The main difference is that the European financial system is a bank-based one; the banks are the main financing source of the economy and have a fundamental role in the ECB's monetary policy transmission. The American financial system is market-based and the banks don't play such an important role in financing the economy. Another key difference in the financial structure that also played a principle role in the choice of non-traditional monetary policy that was implemented by the ECB and that differentiated it from the Fed. Based on the economic and monetary analysis the ECB takes the decisions which are after implemented by the ECB and the national central banks, involving a large number of counterparties. In the U.S. on the other hand, the decisions taken by the FOMC are implemented by the N.Y. Fed and the number of participants in the transactions is rather small comparing to the euro area. That is why, from the outbreak of the crisis the ECB focused more on aiding the banks and supporting the effective functioning of the transmission channels in its monetary policy.

The crisis in the euro area can be classified in five main parts:

1) The turmoil of 2007-2008;
2) The intensification of the global crisis in 2008;
3) The euro area sovereign debt crisis in 2010;
4) The re-intensification of the debt crisis and the bank-sector strain in mid-2011;[64]
5) The ECB's forward guidance in the context of low inflation in mid-2013.

3.2.1 Fine-tuning operations

The ECB's entrance strategy began prior, in August 2007, when in response to the first turbulences that appeared in the financial markets the ECB provided full accommodation to the liquidity needs of the banks, which were facing difficulties in obtaining short-term liquidity. On August 9, 2007 the ECB announced its intention to provide EUR 95 billion through a fine-tuning operation (FTO) on an overnight basis with a fixed rate and full allotment. This operation marked a new phase of monetary policy and mainly liquidity management named frontloading.

[64] THIMANN-COUR, P.; WINKLER, B.: *The ECB's non-standard monetary policy measures: the role of institutional factors and financial structure,* Oxford Review of the Economic Policy, No. 28, 2013.

The frontloading policy aims to provide additional liquidity in order to frontload the reserve accumulation within the reserve maintenance period. The primary goal of this policy and of the more frequent fine tuning operations was to bring the overnight interest rate (EONIA) close to the minimum bid rate.[65]

3.2.2 Supplementary longer-term refinancing operations

Moreover, the ECB increased the amount of liquidity provided through longer-term refinancing operations. On August 22, 2007 supplementary longer-term refinancing operations were announced for an amount of EUR 40 billion with a three month maturity. Further operations of this type were held in September (EUR 75 billion), November (EUR 60 billion), and December (EUR 60 billion) of that year and continued during the next year. In March 2008 the ECB announced about conducting additional six-month longer-term refinancing operations by this shifting the maturity of LTROs. This decision was taken as a reaction to the instability in the markets brought by the rescue of Bear Stearns. By increasing the amount of LTROs the ECB didn't change the total amount of outstanding liquidity but just decreased the weight of the MROs in this way changing the structure of the refinancing operations. Particularly, during 5 months, the LTROs increased from *34%* to *43,5%* of the total refinancing operations; and by mid-September 2008 they already constituted *63%*, representing an amount of EUR 299,99 billion vs. EUR 176,5 billion of MROs. Through this change the ECB aimed to support the banking system and the credit activity.

3.2.3 Central Bank Liquidity Swaps

In addition, at the end of 2007 the European Central Bank started cooperating with the Federal Reserve System, as a response to the pressure in the foreign exchange markets caused by U.S. dollars shortage. As described in paragraph 3.2 the temporary Central Bank Liquidity Swaps Program was announced on December 12, 2007. Initially, there were planned 2 operations of up to $10 billion each of one-month maturity, which were further renewed in January and expended in March up to $15 billion. However, after the events from March 2007 the ECB reinforced the cooperation with Fed announcing in May about the extension of the swap agreements up to $25 billion and planning them for every two weeks. A further expansion happened in August the same year by adding operations of three-month maturity up to $10 billion and expending the swap allowance up to $50 billion. These actions improved the

[65] CASSOLA, N.; DURRE, A.; HOLTHAUSEN, C.: *Implementing monetary policy in crisis times – the case of ECB*, The European Central Bank Conference, November 18-19, 2010.

conditions in the Eurodollar market, the interbank market of U.S. dollars outside the USA, and most importantly, covered the shortage of U.S. dollars.

Another step taken by the ECB in the summer of 2008 was in response to the raising inflation expectations which were endangering the main objective of the central bank – price stability. In these circumstances, on July 3, 2008 the ECB announced the raising of the minimum bid rate with 25 basis points up to *4,25%.*

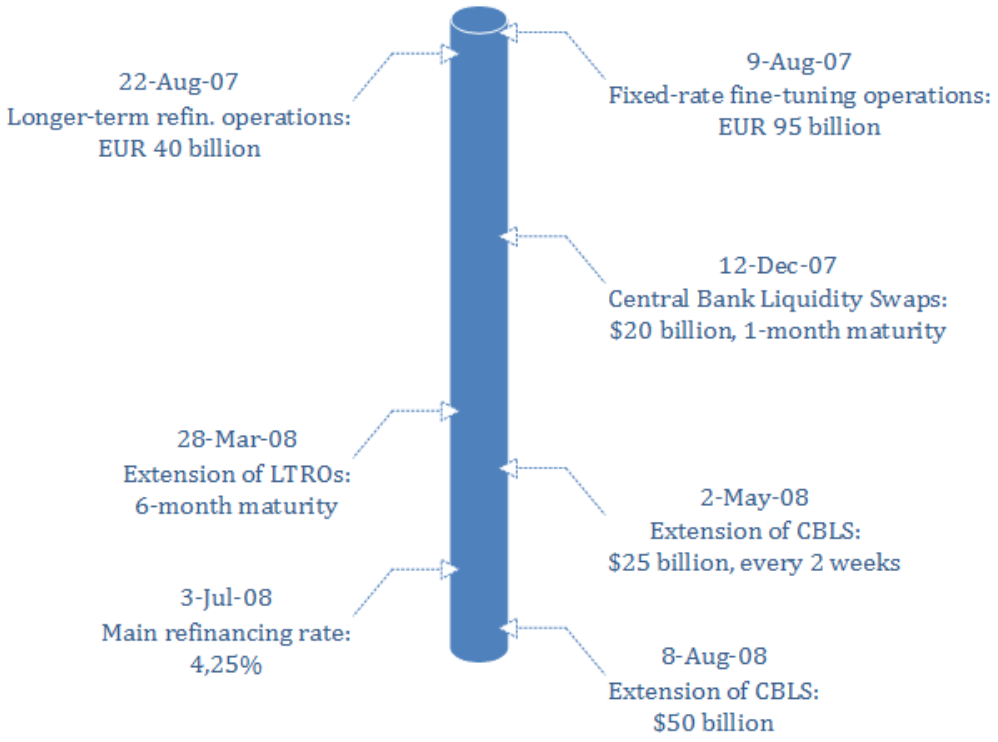
Overall, the actions taken by the European Central Bank before the intensification of the crisis had a positive effect on the markets. By making changes in its traditional tools the central bank provided liquidity to the market participants. In a speech at the University de Acala de Henares, Jose Manuel Gonzalez-Parama described the ECB's monetary policy as "supportive to the money markets and banking sector […] rather than supportive to specific institutions in trouble".[66] Indeed, this differentiates the ECB from the Fed, which in its entrance strategy didn't just use its regular tools for providing extra liquidity but extended the term of discount lending, created new facilities and rescued Bear Stearns in March 2008. However, this difference can be partially explained by the monetary policy of the both central banks conducted prior to the crisis. The main policy instrument used by the ECB was the refinancing operations, which were made with a large number of market participants and constituted about 290 billion of euros. The Fed, on the other hand, was allocating liquidity mainly through outright transactions with a much smaller number of participants and much more limited collateral, which in the conditions of a financial crisis and the freezing of the interbank market, leaves a large part of the market participants without access to the liquidity. For that reason, the Federal Reserve had to create new facilities like TAF that would cover the liquidity shortage. While the European Central Bank's crisis management resulted in an extension of its regular tools and additional liquidity swap lines.

Figure 24 succinctly lists all the outlined measures taken by the European Central Bank from the outbreak of the crisis in 2007 till it's intensification in September 2008.

[66] Speech by Jose Manuel Gonzalez-Parama, Member of the Executive Board of the ECB, University de Acala de Henares, 2009

Figure 24

The ECB's entrance strategy timeline



SOURCE: The European Central Bank

While analyzing the overall effect of these measures it is important also to understand how they influenced the Eurosystem's balance sheet. Table 5 represents the Eurosystem's Balance Sheet as reported on September 12, 2008. Comparing it to Table 4 it can be seen how the balance sheet evolved in over a year.

By mid-September 2008 the total amount of the ES's assets constituted 1 457,73 billion of euros, representing a *22,9%* growth from the previous year values. This growth is given mainly by the central bank liquidity swap lines, which on September 12, 2008 had a net position of EUR 166,9 billion. On the asset side can be also observed the structure change of the refinancing operations – the weight of LTROs increased from *34%* to *42,9%*. On the right side of the balance sheet the depositary institutions reserves increased by *19%* due to the multiple liquidity providing operations.

Table 5

Eurosystem's Balance Sheet (12.9.2008)

Assets		Liabilities	
Securities	110,01	Banknotes is circulation	682,68
Loans		Depository institutions reserves	
Main refinancing op.	176,5	Minimum reserves	229,71
Longer-term refinancing op.	299,99	Deposit facility	0,06
Gold stock	208,18		
		Other liabilities	161,6
Other assets	663,05		
Total assets	**1457,73**	**Total liabilities**	**1074,05**
		Capital	**71,68**

NOTE: Release date 12th of September 2008, data in billions of euros
SOURCE: European Central Bank statistical release, available online on <http://sdw.ecb.europa.eu/>

Comparing to the changes in the Fed's balance sheet, the ES had a more evident growth in the total assets (*22,9%* vs *5,84%*). The ECB was focusing more on extending existing facilities, while the Fed focused on creating new facilities and thus, changing the structure of its assets. However, in the both balance sheet can be noticed a considerable growth in the deposits of the depository institutions; the key difference being in the fact that in the USA the increase could be observed in the voluntary reserves.

Overall, the ECB's monetary policy conducted after the outbreak of the crisis can be characterized as a more active liquidity management policy marked by large-scale liquidity operations against a larger range of collateral, given by the changing requirements on the collateral quality, like: periodic fine-tuning operations, LTROs with an increased value and maturity, and new measures for providing liquidity on the Eurodollar interbank market, like central bank liquidity swaps. The main goal of these actions was to provide liquidity, in order to support the transmission channels of the monetary policy. As a result, the size and the structure of the balance sheet were affected.

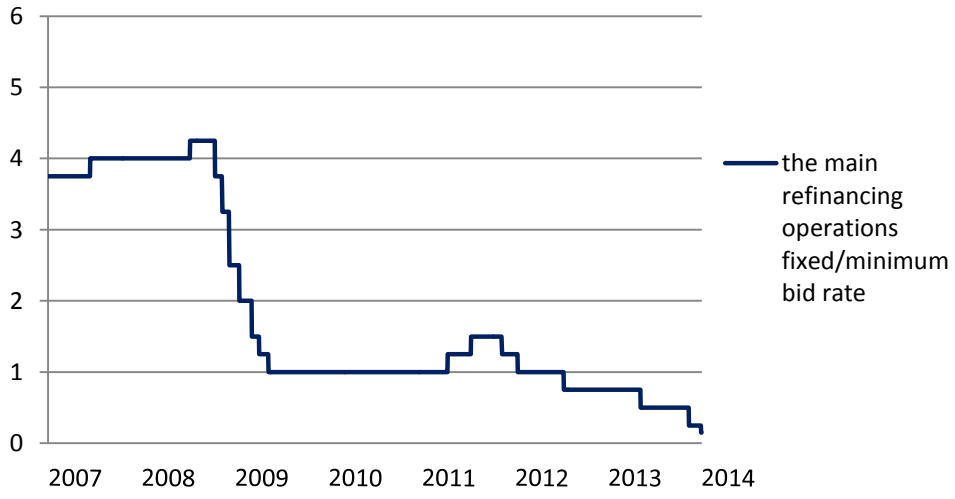
3.3 The ECB's response to the global financial crisis in 2008-2009

The measures taken by the ECB during the early stages of the crisis played an important role in helping the markets. However, by late summer 2008 the conditions didn't seem to be improving much, the uncertainty persisted and the money market interest rates spreads were high. With the failure of the Lehman Brothers on September 15, 2008 the conditions worsened, the financial shocks overflew into the global economy and the crisis became a global financial phenomenon. In the light of these circumstances, the ECB, in line with central banks, took several important steps: first, reducing the main policy rate to a historical low and afterwards, engaging in unconventional monetary policy.

In October 2008 the European Central Bank began aggressively cutting the main refinancing rate. The first cut by 50 basis points was on October 8, 2008 and continued till May 13, 2009. During these 7 months the policy rate was cut 7 times being reduced to 1% where it was kept till April 2011. The overall cut represented a 325 basis points lowering, having no historical precedent. This monetary policy action was coordinated with other central banks (the Federal Reserve, Bank of England, Bank of Canada, Swiss National Bank) and aimed to stimulate the economy through the traditional monetary channels. Figure 25 illustrates the development of the main policy rate from the beginning of 2007 till July 2014.

Figure 25

The main refinancing operations fixed/minimum bid rate



SOURCE: The European Central Bank

This measure, however, failed in stimulating the economy and the functioning of the traditional transmission channels. The tensions on the money markets were strengthening and the ECB was limited in the actions that it could implement. Therefore, the central bank had to undertake innovative measures in the monetary policy – non-traditional tools.

The type of unconventional monetary policy that was implemented by the ECB derived from the specific macroeconomic framework of the euro area and the financial conditions that prevailed in the fall of 2008. In a speech at the University of Munich, the ex-president of the ECB, Jean-Claude Trichet, stated that the non-traditional monetary policy "toolkit" aimed to "enhance the flow of credit above and beyond what could be achieved through interest rate reduction alone".[67] Indeed, the ECB called its unconventional monetary policy an "enhanced credit support". Generally, the measures taken in the late 2008-2009 period contain five key elements.

3.3.1 Fixed-rate full allotment tender

The first important innovation adopted by the ECB after the collapse of Lehman Brothers in September 2008 was the fixed-rate full allotment tenders (FRFA). On October 8, 2008[68] the European Central Bank announced about the switch of the weekly main refinancing operations to fixed-rate tender procedures with full allotment, which meant that the level of liquidity provided through FRFA had a fixed rate and was unlimited, being accommodated to the liquidity demand. From 1999 till 2000 the ECB provided liquidity via fixed-rate tenders but the banks were overbidding the allotted amount and the refinancing operations were changed to variable-rate tenders. Since then, the traditional refinancing operations were held in the following way: the ECB was announcing a minimum bid rate and the participants were sending their bids with the indicated amounts of liquidity and interest rates; after gathering all the bids, the ECB was classifying them in a descending order based on the interest rates; in this way the bids were satisfied based on the liquidity allotment.

The switch of this operation to a fixed-rate tender with full allotment was based on the liquidity tensions on the money market. The ECB was trying to reduce the damages on the financial markets by covering the shortages of short-term liquidity. On October 15, 2008 the ECB decided to extend this type of operations to LTROs, in this way, covering also the shortages of longer-term liquidity. The FRFA tenders were ended in March 2010 but then reopened in May of

[67] Speech by Jean-Claude Trichet, the ex-president of the ECB, at the University of Munich, 2009

[68] Press Release of the European Central Bank; Release date: 8.10.2008; available online on <http://www.ecb.europa.eu/press/pr/date/2008/html/pr081008_2.en.html>

the same year, due to the intensification of the sovereign debt crisis. Overall, the FRFA tender procedures had a substantial importance covering fully the demands of liquidity, thus easing the market liquidity conditions.

3.3.2 Extension of collateral eligibility

The second step that the ECB took as a response to liquidity shortage and freeze in the lending interbank markets was the extension of the eligible collateral pool accepted in the refinancing operations. Particularly, on October 22, 2008[69] the ECB lowered the accepted pool from A- to BBB- for marketable and non-marketable assets except the asset-backed securities. In this way, the banks could refinance a large range of their less liquid assets to obtain liquidity from the central bank. Jose Manuel Gonzalez-Parama mentioned that the aim of this action is to "guarantee that the availability of collateral does not become a constraint for banks' participation at the ECB's credit operations."[70] In contrast to the Fed, the ECB was already accepting private securities as eligible collateral for its monetary policy operations also prior the crisis.

In 2008 the average amount of eligible collateral increased by *17,2%* and by the end of 2009 the total increase constituted *35,1%*. The average value of marketable and non-marketable assets which were deposited as collateral increased from EUR 1 148 billion in 2007 to 2 034 billion in 2009 which is a significant growth of *77,18%.* Figure 16 shows the development of the assets which were used in the refinancing operations during 2004-2009.

On the graph below can be noticed an evident trend over these years which reflects a decrease of the share of the central government bonds. From the initiation of the financial turbulences their value dropped from *21%* to *11%*. By the end of 2009 the largest share in the total amount of forward collateral had the uncovered bank bonds – *28%*. The asset-backed securities had a significant increase in their share from 2007 to 2008 from *16%* to *28%*, which is connected with the failure of Lehman Brothers, but in 2009 their share dropped by *5%.* The share of the non-marketable assets increased by *4%* over the last 2 years of the period. While the

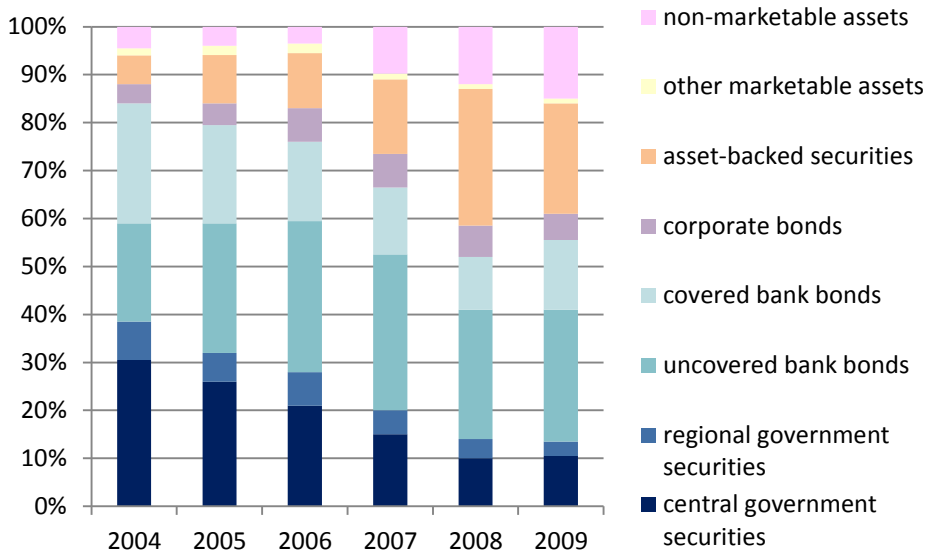
[69] Press Release of the European Central Bank; Release date: 22.10.2008; available online on <http://www.ecb.europa.eu/press/pr/date/2008/html/pr081023_1.en.html>

[70] Speech by Jose Manuel Gonzalez-Parama, Member of the Executive Board of the ECB, University de Acala de Henares, 2009

share of the new assets that became eligible constituted *3,8%* of marketable assets by the end of 2009.[71]

Figure 26

The assets put forward as collateral in ECB's refinancing operations (2004-2009)



SOURCE: The European Central Bank Annual Report - 2009

3.3.3 Extension of maturity for refinancing operations

After the first extension of the maturity of the longer-term refinancing operations to 6 months in March 2008, the ECB made a further extension on May 7, 2009,[72] when the maximum maturity of LTRO's was lengthened to 12 months. The main goal of this extension was to improve the liquidity conditions on the markets and reduce the money market spreads.

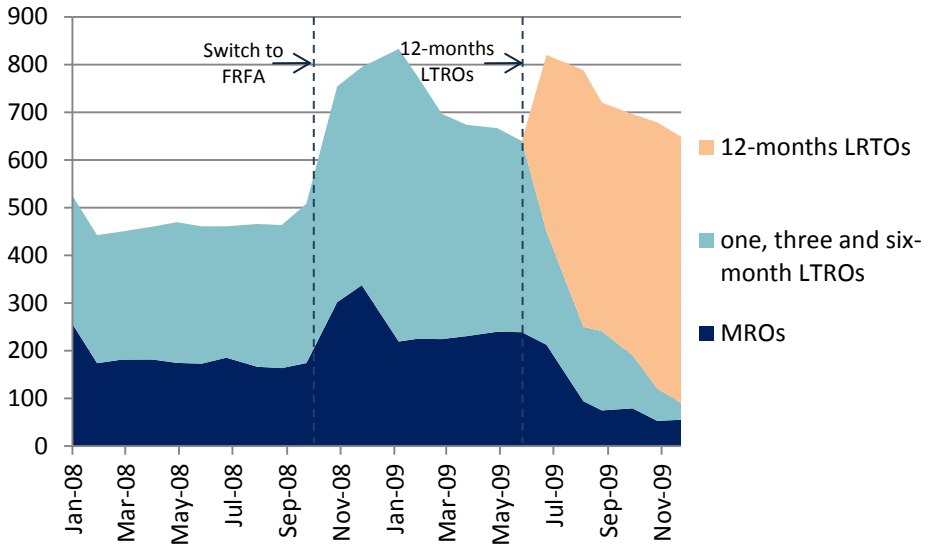
The following graph illustrates how the refinancing operations developed during 2008 and 2009.

[71] The European Central Bank Annual Report – 2009, the European Central Bank, 2010

[72] Press Release of the European Central Bank; Release date: 7.5.2008; available online on <http://www.ecb.europa.eu/press/pr/date/2009/html/pr090507_2.en.html>

Figure 27

The ECB's refinancing operations



NOTE: Data in billions of euros

SOURCE: The European Central Bank Monthly Reports – 2008-2009

In October 2008 can be noticed the increase of MROs followed by the increase of LTROs as a result of the switch to the fixed-rate tender with full allotment. Shortly after the switch of LTROs to the FRFA tender procedure their amount increased significantly representing *72%* of the total refinancing operations. In June 2009, when the 12-months LTROs were introduced, started a decreasing trend in the amount of MRO and one, three and six-month LTROs. Till the end of 2009 the share of the one-year LTROs grew up to *82%* of the total refinancing operations, the remaining shares of MROs and three and six-month LTROs were respectively *11%, 3%* and *4%.*[73]

Briefly, the one-year LTROs helped easing the conditions in the liquidity markets. The participation in the tenders was high, mainly because with the key interest rates at low levels, this meant a decrease in the cost of longer-term liquidity.

[73] The European Central Bank Annual Report – 2009, the European Central Bank, 2010

3.3.4 Central bank liquidity swaps

The fourth key element of the measures taken by the ECB in 2008-2009 was the reinforcing of the central bank swap agreements. After the events from mid-September 2008 there was a significant shortage of U.S. dollars and prevailing uncertainty in the markets. Given these circumstances, shortly after, the ECB announced an overnight operation of providing a higher amount of U.S. dollar funding and on October 15, 2008 the ECB switched the U.S. dollar facility to a fixed-rate tender with full allotment. In addition, in November the ECB started cooperating with the Swiss National Bank for proving CHF liquidity to the euro area market. The swap agreements continued through 2009 and terminated in February 2010 but were renewed shortly after.

These actions of the central bank helped to cover the shortages of foreign currency, especially of U.S. dollars and helped further easy the general liquidity conditions.

3.3.5 The Covered Bond Purchase Program

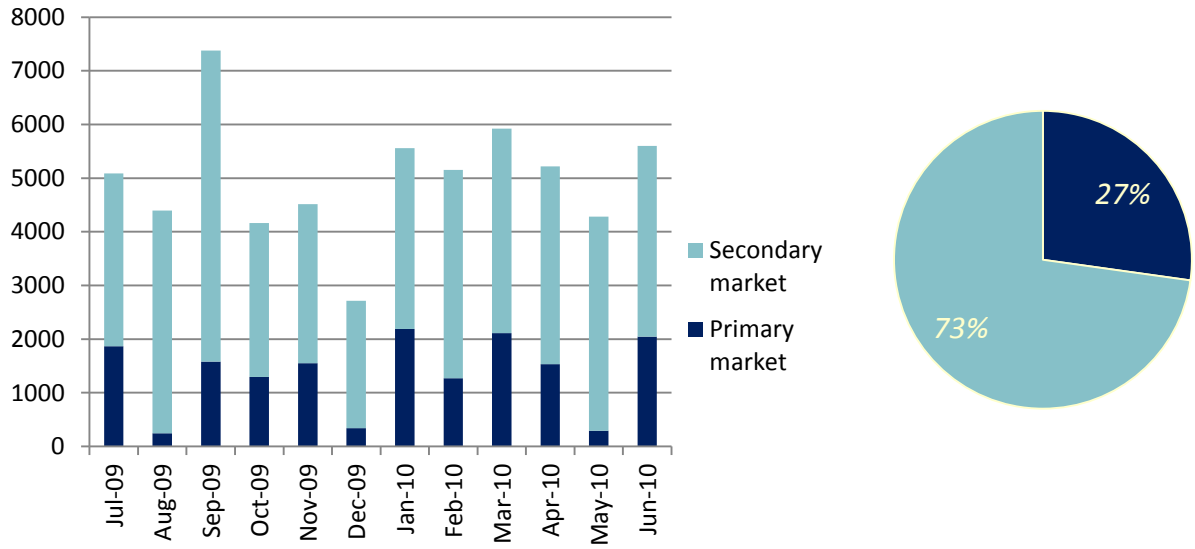
The last key element of the "enhance credit support" offered by the ECB to the financial markets in 2009 was the Covered Bond Purchase Program (CBPP). The covered bond market plays an important role in the medium and longer-term refinancing for the banks in the euro area. However, after mid-September 2008 the activity on this market significantly decreased as the market participants turned to less risker assets. In these circumstances, on May 9, 2009[74] the Governing Council announced the creation of the Covered Bond Purchase Program. Under this program the ECB was aiming to purchase 60 billion of euro-denominated euro area covered bonds, in order to support the covered bond market and stimulate its activity. The CBPP lasted from July 6, 2009 until June, 30 2010. Till the end of 2009 the ECB purchased a value of EUR 28 billion of covered bond, continuing with EUR 32 billion in the following 6 months. The maturities of the purchased bonds ranged between 3 and 7 years, the ECB intending to keep the bonds till maturity. This program had certain features of the quantitative easing. However, its primary goal was to facilitate the interbank financing and funding of the mortgage loans, which differed from the Fed that most of its purchases concentrated on the government securities.

Figure 28 illustrates the covered bond purchases under the CBPP.

[74] Press Release of the European Central Bank; Release date: 4.6.2009; available online on <http://www.ecb.europa.eu/press/pr/date/2009/html/pr090604_1.en.html>

Figure 28

Covered bond purchases under CBPP



NOTE: Data in millions of euros
SOURCE: The European Central Bank CBPP Monthly Reports – 2008-2009

From the total amount of 60 billion euros, *27%* were purchased on the primary market and the rest *73%* were purchased on the secondary market, representing respectively, EUR 16 350 million and EUR 43 650 million. The monthly purchases ranged between EUR 2 716 million and EUR 7 347 million, being relatively proportional except a high peek in September and a lower amount of purchase in December.

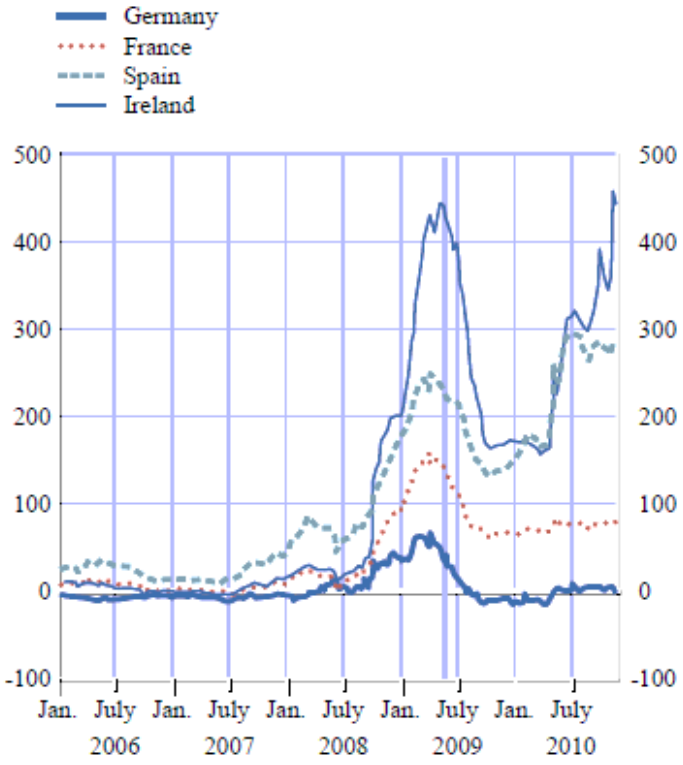
Overall, the CBPP was successful in achieving its goal – stimulating the activity in the covered bond market. As the ECB Annual Report[75] states between June 2009 and July 2010 175 new covered bonds and 55 taps were issued in the total amount of EUR 184 billion. In their paper Beirne et al.[76] argue that the CBPP eased the conditions on the money market, making the liquidity more accessible to the market participants, motivating the banks to lend.

The following graph illustrates the development of the covered bond swap spreads between the iBoxx indices for the 5-year maturity over the 5-year swap rate.

[75] The European Central Bank Annual Report – 2010, the European Central Bank, 2011
[76] BEIRNE, J et al.: *The impact of the Eurosystem's Covered Bond Purchase Programme on the primary and secondary markets,* Occasional Paper Series, the European Central Bank, No. 122, 2011

Figure 29

Covered bond swap spreads



NOTE: Data in basis points
SOURCE: BEIRNE, J et al.: *The impact of the Eurosystem's Covered Bond Purchase Programme on the primary and secondary markets,* 2011

On the graph there are indicated the announcements of the CBPP in May and the initiation of the program in July 2009. There can be observed the significant decline of the covered bond swap spreads between May and October 2009, which returned some of their values to the pre-Lehman collapse level. The biggest decrease can be noticed in the Irish covered bond swap spreads. The German covered bond swap spreads even decreased under zero for several months. Beirne et al. estimated the average effect of the CBPP on the covered bond swap spreads in the euro area at -12 basis points.[77]

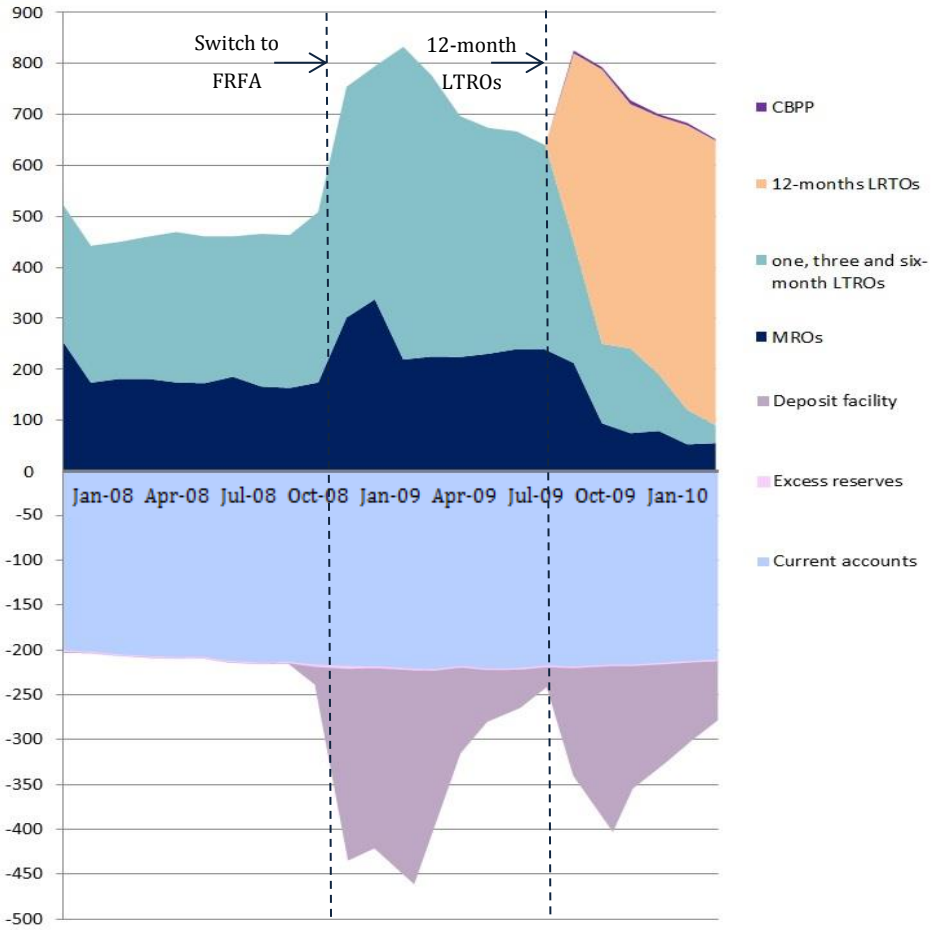
All in all, the actions taken by the ECB during 2008-2009 had a positive effect on the economy. The primary goal of the central bank was to stimulate different segments of the markets, which were "frozen" after the collapse of Lehman Brothers, by covering all the liquidity

[77] BEIRNE, J et al.: *The impact of the Eurosystem's Covered Bond Purchase Programme on the primary and secondary markets,* Occasional Paper Series, the European Central Bank, No. 122, 2011

demand through different unconventional measures and, thus stimulating the monetary transmission channels. Indeed, all the liquidity shortage was covered and banks were borrowing extra liquidity, and then, depositing it back in the central bank's deposit facility, and as a result, enlarging its balance sheet. The explanation to this is that after the previous events on the financial markets the banks were more precautious. Moreover, during this period of time the central bank didn't offer liquidity absorbing FTO's. Figure 30 reflects the evolution of the monetary policy operation and depositing activities of the banks.

Figure 30

Liquidity factors in 2008-2009



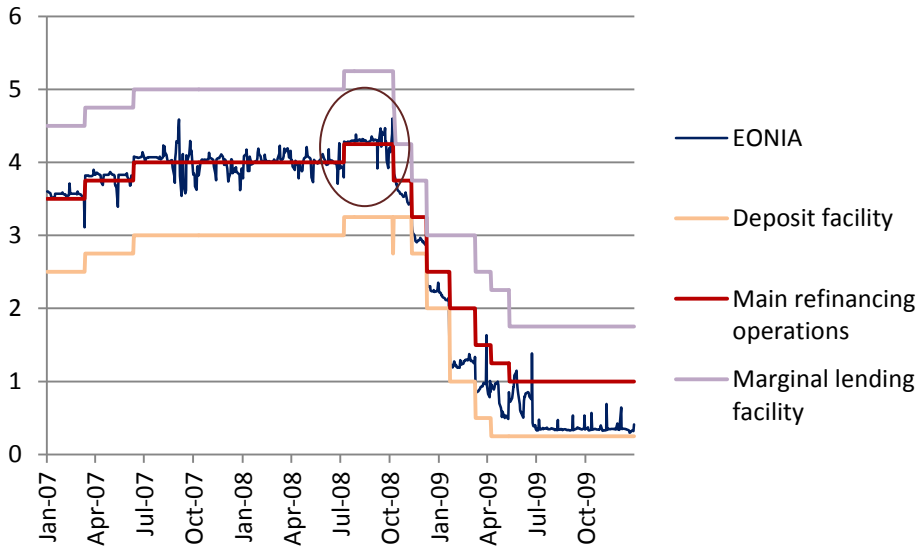
NOTE: Data in billions of euros
SOURCE: The European Central Bank CBPP Monthly Reports – 2008-2009

Indeed, after the switch to FRFA the banks started borrowing more liquidity and depositing this liquidity to the deposit facility. In this way, the cost of liquidity was the fixed rate from the

refinancing operations minus the rate on the deposit facility. The excess of liquidity in the system affected the short-term money market rates, which increased a lot shortly after mid-September. One of the goals of the ECB, as mentioned above, was to lower the spread between the EONIA (euro overnight index average) and the main refinancing rate. The following figure illustrates the development of the ECB's key rates and EONIA during this period.

Figure 31

The ECB's key interest rates and EONIA (2007-2009)



NOTE: Data in percent per annum
SOURCE: The European Central Bank

From the figure can be seen that, with a few exceptions connected with the fine-tuning operations at the end of the maintenance period, EONIA decreased and approached the rate for deposit facility. From June 2009 till the end of the period EONIA had an average value of *0,4%* and didn't exceed the fixed rate for the main refinancing operations. This contributed to easing general financing conditions. However, EONIA remained highly volatile which is connected with the fluctuations of the surplus of liquidity in the system.[78]

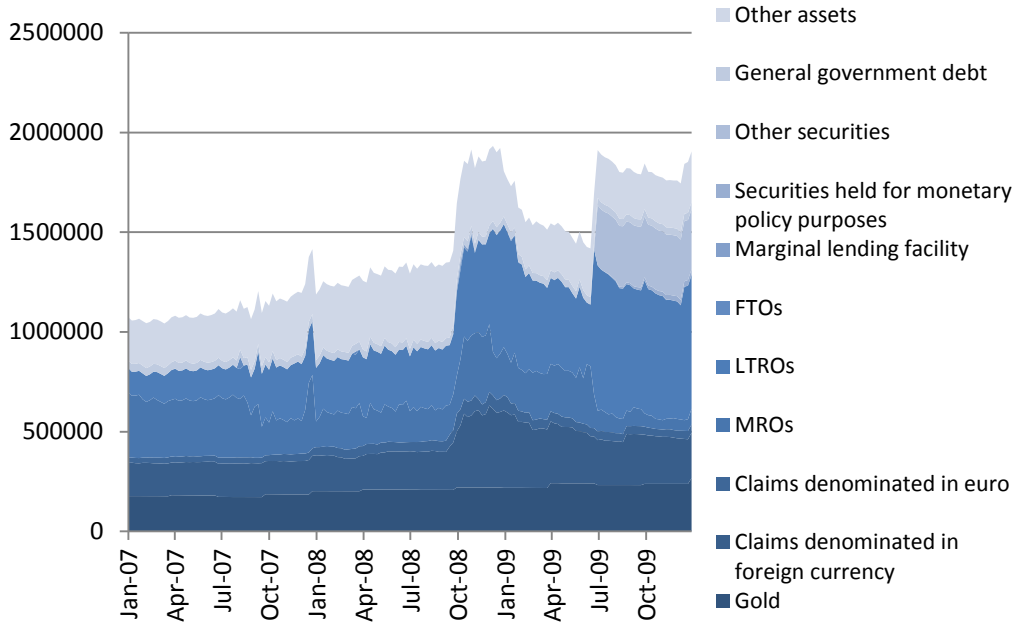
[78] The European Central Bank Annual Report – 2010, the European Central Bank, 2011

In a study Lenza et al.[79] analyzed the effects of the unconventional monetary policy applied by the ECB before 2009. Their results conclude that non-traditional monetary measures that were implemented in the euro area had an important role in helping the financial markets to recover after the events from 2008, mainly through interest rates spreads. Peersman[80] confirms this in his study, arguing that the ECB can stimulate the economy through unconventional methods by expanding its balance sheet and that one of the transmission channels are the interest rates spreads, which decreased significantly throughout this period, however, being noticed an increase after the decline of the main policy rate. Indeed, this can be observed on the graph above.

The measures applied by the ECB had also an unprecedented effect on the Eurosystem's balance sheet. From September 2008 till December 2009 its size grew by *43,13%* from 1,331 trillion to 1,905 trillion of euros, which can be observed on Figure 32.

Figure 32

The composition of the Eurosystem's assets (January 2007- December 2009)



NOTE: Data in millions of euros
SOURCE: The European Central Bank

[79] LENZA, M.; PILL, H.; REICHLIN,L.: *Monetary policy in exceptional times,* The European Central Bank, Working Paper Series, No. 1253, 2010

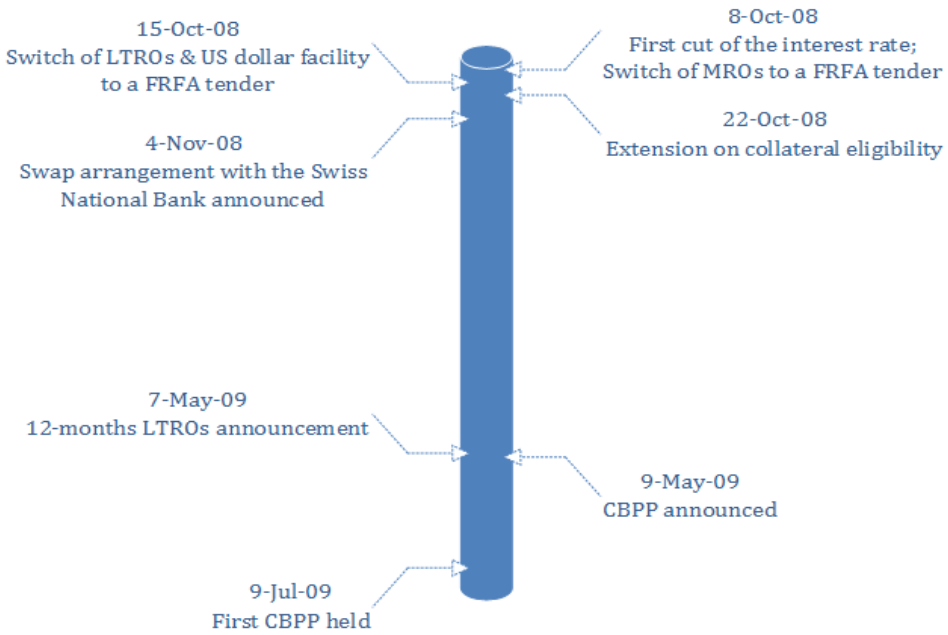
[80] PEERSMAN, G.: *Macroeconomic effects of unconventional monetary policy in the euro area*, The European Central Bank, Working Paper Series, No.1397, 2011

On the left side of the balance sheet the main increase can be noticed in the size of LTROs that over the period grew by *123,1%* from EUR 299,99 billion to EUR 669,297 billion. The MROS increased till June 2009 when they reached EUR 309,621 billion, which is a *93,5%* growth but with the introduction of the one-year LTROs, their share decreased by *74,4%* till the end of December 2009. On the liabilities' side the growth was mostly remarkable in the deposit facility, which banks used for depositing the voluntary reserves.

Overall, during 2008-2009 the ECB focused on restoring its monetary transmission mechanisms and supporting the banking sector, mainly through expansion of the amount of refinancing, by switching it to a fixed-rate full allotment tender type, by expanding the eligible collateral, by increasing their maturity, by reinforcing the swap arrangements with other central banks; and by creating a new program for the support of the covered bond markets. This differentiated it from the Fed that injected liquidity in the system by buying assets. All, these actions helped the markets, covering the liquidity shortages and decreasing the money market spreads. However, the balance sheet was also affected; growing by *43%* but this effect was much smaller than in the Federal Reserve's case. Figure 33 succinctly lists all the key events from September 2008 to December 2009.

Figure 33

The ECB's response to the crisis in 2008-2009



SOURCE: The European Central Bank

3.4 The ECB's response to the euro area sovereign debt crisis

The end of 2009 was characterized by a general revival in the economy of the euro area. The financial activity on the markets was slowly restoring, the spreads on the money markets were decreasing, the financing conditions were improving and a gradual economic recovery was forecasted. In these circumstances, the Governing Council of the ECB in December 2009 took the decision beginning from 2010 to start slowly reducing the implemented non-traditional measures. In this context, in December 2009 was held the last 12-month LTRO and the last 6-month LTRO was planned for March of the following year. Shortly after, the ECB continued phasing out other non-standard measures – the swap arrangements were terminated by February 1, 2010, and variable tenders were introduced back for LTROs from April. However, the FRFA tender type was still kept for the MROs.

Nevertheless, the beginning of 2010 can be marked as the outbreak of the euro area sovereign debt crisis. Earlier in November 2009 the Greek government admitted its budget deficit of *12,9%*, which elevated more than four times the EU's limit *-3%.* Later in 2010, when the Greek sovereign insolvency became a real possibility, the euro area government bond market marked severe strains. The situation was further worsened by the exposure of such countries as Ireland, Portugal, Spain and Italy. This resulted in the widening of the government bond spreads relatively to the German Bunds and the freezing of the euro area government bond market.

For the European Central Bank this situation was a severe threat to an effective functioning of the monetary policy and financial stability. Consequently, as a response, on May 10, 2010 the Governing Council announced its decision to bring back several unconventional monetary policy measures, including FRFA tender procedure for all the refinancing operations, 6-month LTRO and reactivation of the central bank liquidity swap lines. In addition, a new measure – the Securities Markets Program was created.

3.4.1 Securities Markets Program

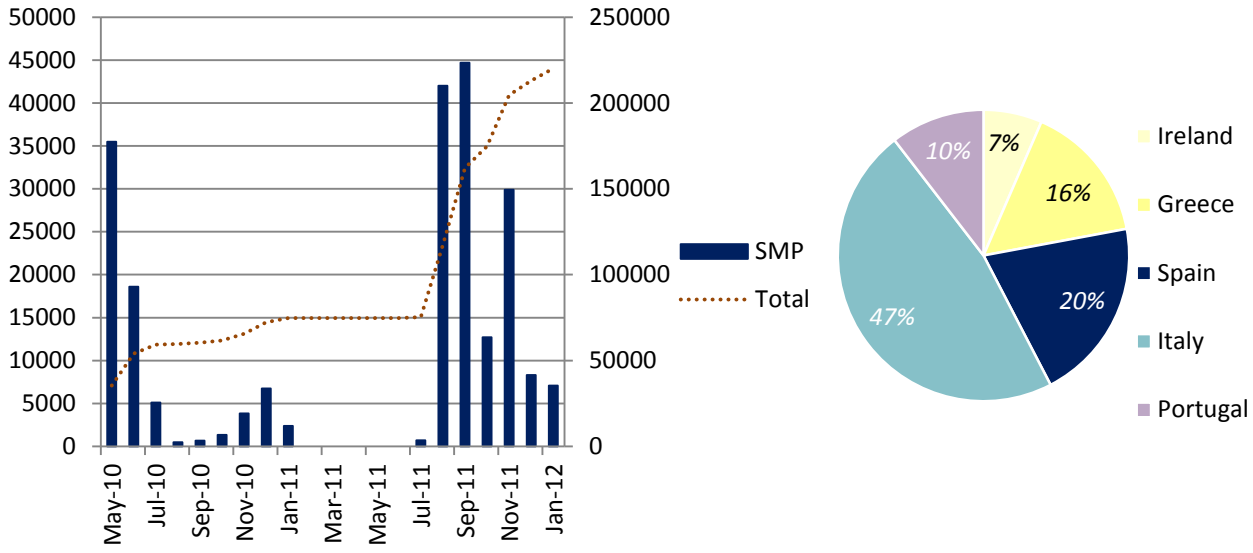
On May 10, 2010, the ECB announced the Securities Markets Program (SMP).[81] Generally, the SMP was a program to purchase bonds, particularly government bonds, on the secondary markets. This was already a quantitative easing program; however, the main difference from the Fed is that under SMP the ECB purchased securities with a high credit risk. The SMP was a sterilized program, as the liquidity that was introduced in the markets was further eliminated

[81] Press Release of the European Central Bank; Release date: 10.5.2010; available online on <http://www.ecb.europa.eu/press/pr/date/2010/html/pr100510.en.html>

via weekly liquidity absorption FTOs, meaning that the banks could make fixed-term deposits every week. The ECB didn't set any precise timing of the program or any planned amount that it would purchase. Overall, the program lasted two years, being stopped in January and renewed in August 2011, due to the sovereign debt crisis in Spain and Italy. In September 2012 the program was replaced by Outright Monetary Transaction. Figure 34 illustrates the bond purchases which were made under SMP.

Figure 34

The ECB's purchases under SMP



NOTE: Data in millions of euros
SOURCE: The European Central Bank

From the initiation of the program in May 2010 till it was paused in January 2011 the total amount of purchases constituted EUR 74,67 billion. During July 2011-January 2012 the amount of bonds purchased raised reaching EUR 218 billion. The largest purchases were made at the beginning of each part of the program, gradually decreasing till its end. The right side of the chart shows the breakdown of the ECB's holdings under SMP purchases as at December 31, 2012. As it can be noticed, almost half of the holdings were Italian bonds, followed by Spanish bonds, which represented a fifth of the total amount. This is connected with the fact that August 2011 was marked by the intensification of the sovereign debt crisis in Italy and Spain, in response to which, the ECB reactivated the program purchasing in its most part government

bonds of these two countries. The highest average remaining maturity had the Irish bonds – 4,6 years and the lowest remaining maturity had the Greek sovereign bonds – 3,6 years.[82]

The effects of the Securities Markets Program are broadly analyzed in the literature. In a study Kilponen et al.[83] argue that the most prominent effect of the SMP was through the signaling channel by lowering the 10-year sovereign bond yields. This is also confirmed by Eser and Schwaab,[84] who highlight the pronounced signal effects on the bond yields of the announcements made on May 10, 2010 and August 8, 2011. In addition, they observed that the SMP also affected the volatility of the bond yields by decreasing it. Ghysels et al.[85] also studied the yields changes under SMP. Their findings prove that the yields changes were much more evident and significant at high-frequency data – the study being based on a 15-minute interval regression. The paper emphasizes three main channels through which SMP could have affected the bond yields: the signaling, flow and stock channels. Through the signaling channel the announcements of SMP brought an important drop in the yields. The flow effects contributed to restoring the supply-demand balance in the market, by covering the excessive supply of government bonds. By absorbing the excessive supply through the stock effects, the ECB could have also pushed the bond prices upwards. By analyzing the overall duration of the effects Pattipeilohy et al.[86] concluded that they were visible during the period of the program implementation but disappeared after some weeks.

Figure 35 illustrates the development of the spreads between the 10-year government bonds of Spain, Italy, Greece and Portugal over the 10-year German Bund. It can be observed, how after the events from the end of 2009 the spread of the Greek over the German 10-year government bond significantly raised, however during the implementation of the SMP it decreased a little. Between January and August 2010, when no purchases of government bonds were made under the SMP, the spreads continued increasing. The second part of the SMP proved to be more successful in lowering the spreads. However, shortly after January 2012, when the ECB stopped purchasing government bonds, there can be noticed an increase in the spreads.

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[82] Press Release of the European Central Bank; Release date: 21.2.2013; available online on <http://www.ecb.europa.eu/press/pr/date/2013/html/pr130221_1.en.html>

[83] KILPONEN, J.; LAAKKONEN, H.; VILMUNEN, J.: *Sovereign risk, European crisis resolution policies and bond yields*, Bank of Finland Research, Discussion Papers, No. 22, 2012

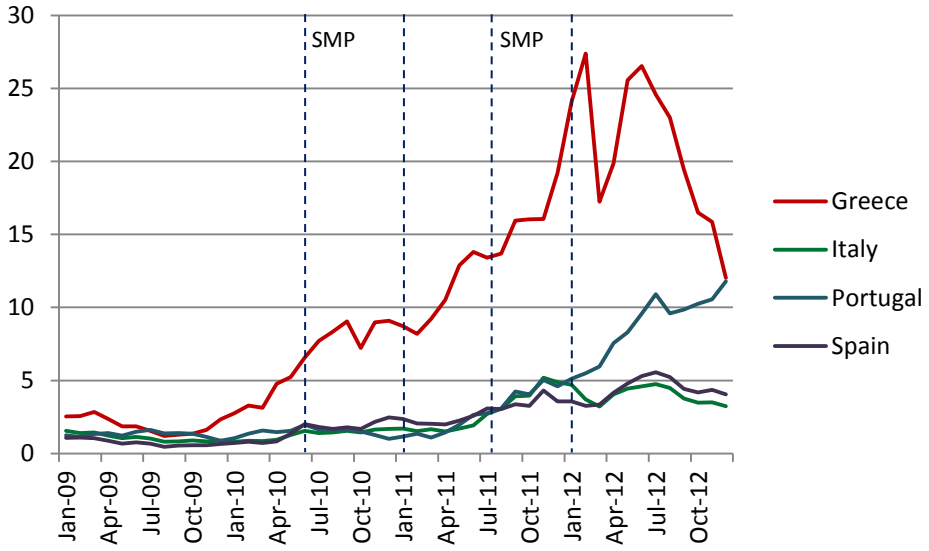
[84] ESER, F.; SCHWAB, B.: *Assessing asset purchases within the ECB's Securities Markets Program,* The European Central Bank, Working Paper Series, No. 1587, 2013

[85] GHYSELS, E. et al.: *A high frequency assessment of the ECB Securities Markets Program,* The European Central Bank, Working Paper Series, No. 1642, 2014

[86] PATTIPEILOHY, C. et al.: *Unconventional monetary policy of the ECB during the financial crisis: and assessment and a new evidence,* DNB Working Papers, No. 381, 2013

Figure 35

The spreads of the Italian, Greek, Portuguese and Spanish over the German 10-year government bond (2009-2012)



NOTE: Data in basis points
SOURCE: The European Central Bank

Briefly, the effects of the Securities Markets Program can be assessed as successful in restoring the balance in the markets, supporting the excessive supply of sovereign bonds on the euro area government bond market and decreasing the spreads, however its effects are not long lasting.

In addition to the SMP, the ECB was continuing to support the liquidity conditions in the markets and encourage the banks to lend by providing liquidity through the main refinancing operations and three-month longer-term refinancing operations on a FRFA basis.

Overall, after a slow recovery in 2009, the period of 2010 till mid-2011 marked the European economy with a sovereign debt crisis. In this context, the ECB reactivated some of its unconventional monetary policy tools and created the Securities Markets Program, in order to help the euro area sovereign bond market. In comparison with the Federal Reserve that was implementing such a program from 2008, the ECB's program had no timing or precise planned amount of purchases.

3.5 The re-intensification of the debt crisis and the bank-sector strain

By mid-2011 the tensions in several market segments kept intensifying and negatively affecting the monetary transmission mechanism and the healthy functioning of the markets. In these circumstances, starting from August 2011, the ECB implemented new measures of non-standard monetary policy, in order to re-establish the effective economic performance in the euro area. These measures involved the reactivation of the SMP, which was described in the previous paragraph, a new Covered Bond Purchase Program, several long-term operations and other measures that helped easing the liquidity conditions in the markets.

3.5.1 Covered Bond Purchase Program 2

In the third quarter of 2011 there still could be observed pressures in the funding conditions of the markets. The banks were not expanding their lending activity in the way that the ECB would expect. In these conditions, on October 6, 2011[87] the Governing Council announced the creation of the second Covered Bond Purchase Program (CBPP2). Under CBPP2 the ECB was planning to acquire euro-denominated covered bonds in an amount of EUR 40 billion. The direct purchases were planned to be made on the primary and secondary markets beginning from November 2011 until the end of October 2012, and the ECB aimed to keep the bonds until maturity. Figure 36 illustrates the purchases made under the CBPP2.

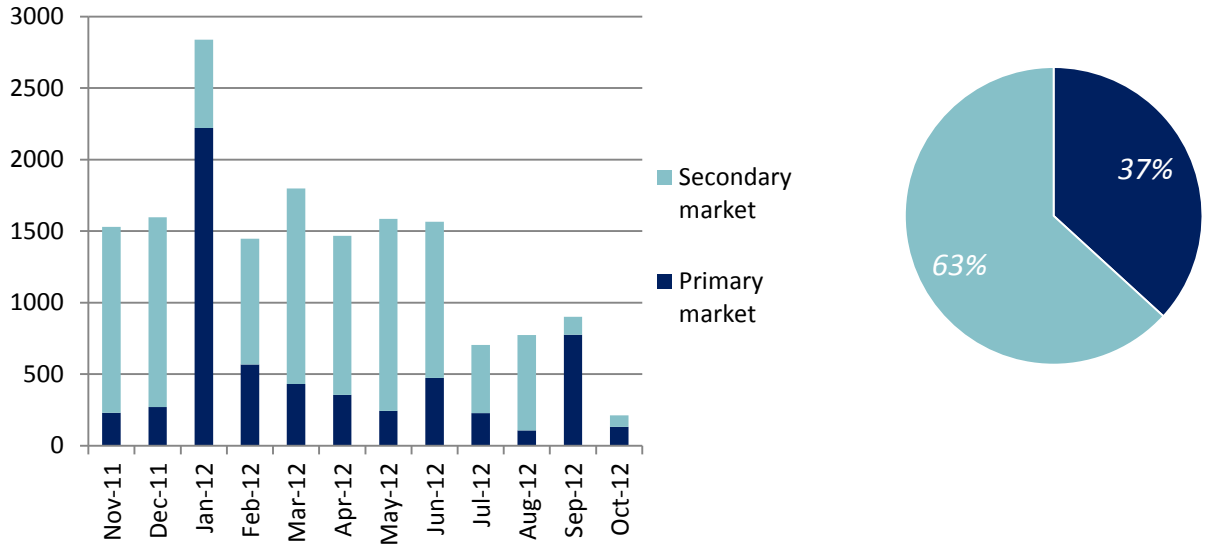
The purchases started in November 2011 and the program was ended by October 31, 2012. During 12 months the ECB purchased a total amount of EUR 16,418 billion of covered bonds – *37%* being purchased from the primary market and *63%* from the secondary market. The biggest amount of bonds was purchased in January 2012 – EUR 2 221 million on the primary market and EUR 618 million on the secondary market. However, in April 2012 the ECB announced its plan to slow down the purchases under CBPP2. This decision was based on the fact that by the end of the first quarter of 2012, there could be observed a growth in the investors' demand for covered bonds and a decrease in the total of their supply. In addition, there could be noticed the positive effects of the other measures implemented by the ECB in that period, especially the 36-month LTROs.[88]

[87] Press Release of the European Central Bank; Release date: 6.10.2011; available online on <http://www.ecb.europa.eu/press/pr/date/2011/html/pr111006_3.en.html>

[88] The European Central Bank Annual Report – 2012, the European Central Bank, 2013

Figure 36

Covered bond purchases under CBPP2



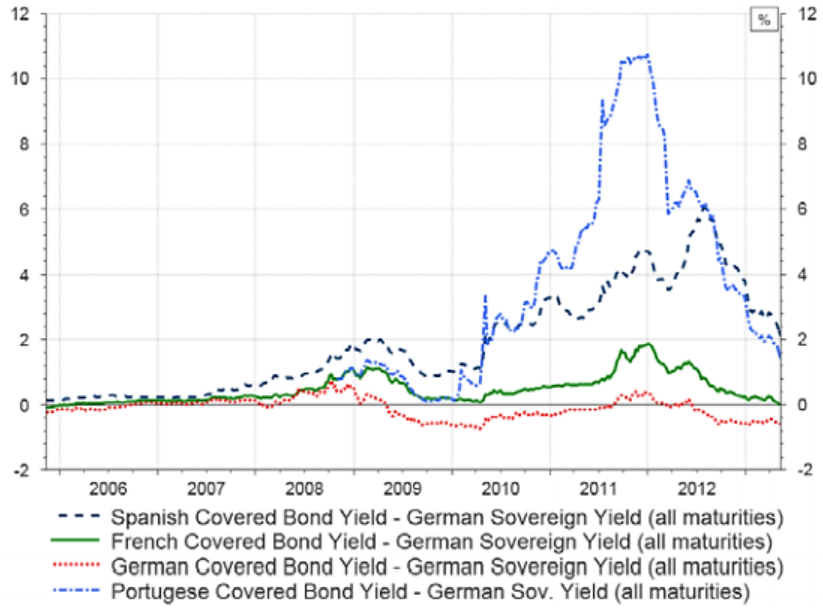
NOTE: Data in millions of euros
SOURCE: The European Central Bank CBPP Monthly Reports – 2011-2012

Overall, the CBPP2 had a relative success in stimulating the activity on the covered bond market, it was not as successful as CBPP1 but it managed to increase the demand of covered bonds, however, it didn't manage to influence their issuency on the the primary market.

Figure 37 illustrates the development of the Spanish, German, French and Portugese covered bond yields from 2008 till 2012. It can be observed how with the re-intensification of the sovereign debt crisis in mid-2011 the yields significantly increased. This is connected with the raise of the risk premium. However, after the implementation of the CBPP2 the yields decreased reaching the 2010-level by the end of 2012.

Figure 37

Covered bond yields



NOTE: Data in percent
SOURCE: SZCZERBOWICZ, U.: *The ECB's Unconventional Monetary Policies: Have they lowered market borrowing costs for banks and governments?*, 2014

In addition to the Covered Bond Purchase Program 2, in the light of the continuing strains in the liquidity market, the ECB expanded the liquidity provided through the open-market operations. Supplementary to the standard MROs and LTROS, which were conducted on a FRFA basis, on October 6, 2011,[89] the Governing Council took the decision to hold two additional LTROs with the maturity of respectively, 12 and 13 months. In 2011 the ECB also extended its swap line agreements with the other central banks till February 2013. All these liquidity measures intended to support the interbank market activity. However, the situation didn't improve and a severe credit crunch was forecasted for the whole euro zone.[90] Under these coditions, on December 8, 2011 the ECB announced that additional actions qould be taken as precautionary measures for the credit strains.

[89] Press Release of the European Central Bank; Release date: 6.10.2011; available online on <http://www.ecb.europa.eu/press/pr/date/2011/html/pr111006_4.en.html>
[90] COUR-THIRMAN, P.; WINKLER, B.: *The ECB's non-standard monetary policy measures: the role of institutional factors and financial structure,* The Oxford Review of Economic Policy, No.28, 2013

3.5.2 Two LTROs with a 36-month maturity

The keystone of the decisions taken by the ECB in December 2011 was an unprecedented measure – two longer-term three-year refinancing operations that were planned to be conducted in December 2011 and February 2012 on a FRFA basis; the first of them replacing the 12-month LTRO held in October and permitting the participants to move their holdings received from that LTRO to the 3-year LTRO.[91] The main changes brought by these operations that made them so attractive to the market participants were the considerable increase in the maturity and the possibility to start repaying them after one year. By applying this non-standard measure the ECB had three main targets: to reduce the strains in the interbank market, to increase the lending activity of the banks to businesses and households, and to assist the banks, which needed refinancing but couldn't obtain the funds for reasonable terms in the markets.

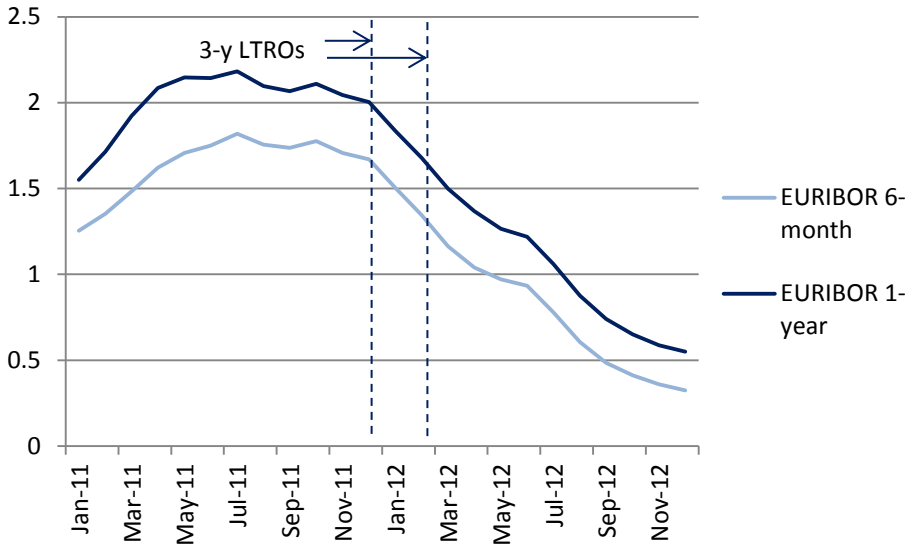
As a result, in the first 36-month LTRO, held on December 21, 2011, a total of 523 participants borrowed EUR 489,2 billion, from which EUR 45,7 billion were shifted from the 12-month LTRO held in October 2011. In the second operation, held on February 29, 2012, the participation was by *53%* higher: a total amount of 800 banks borrowed EUR 529.5 billion. Subsequently, under the two 36-month LTROs a total amount of 1018,7 billion were lent to the banks. The main borrowers were from Italy, France, Ireland, Greece, Spain and Germany. What is important to note, is that in the LTROs participated also a large amount of smaller banks, which for the ECB was an important channel to stimulate the lending activity to smaller businesses and households.

Overall, the 36-month LTROs had a positive effect on the economy by stimulating the activity in the financial markets and providing stable funding to the banks, and thus, influencing the credit flows in the economy. The following graph illustrates the development of the money market rates, specifically 6-month and 1-year EURIBOR during 2011 and 2012. As it can be observed at the beginning of 2011 the longer-term money market rates significantly increased. However, after the implementation of the two 36-month LTROs there can be observed a constant decreasing trend. Overall, the 6-month EURIBOR decreased by 134 basis points and the 1-year EURIBOR by 145 basis points. In conclusion, the 3-year LTROs had a significant impact on the longer-term money market rates.

[91] Press Release of the European Central Bank; Release date: 8.12.2011; available online on <http://www.ecb.europa.eu/press/pr/date/2011/html/pr111208_1.en.html>

Figure 38

Money market rates in Eurozone



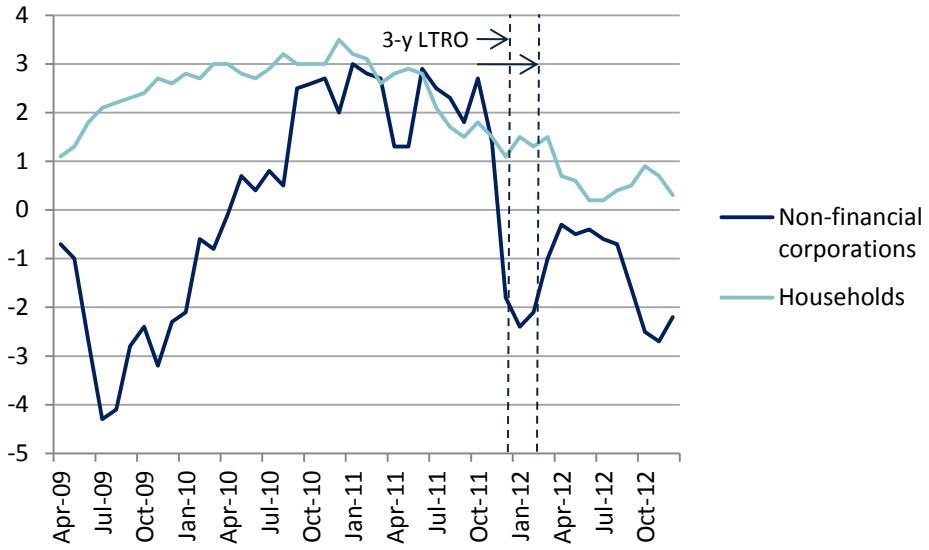
NOTE: Data in percent per annum
SOURCE: The European Central Bank

In addition, the 36-month LTROs stimulated the lending activity to the non-financial institutions and households. Figure 39 illustrates the development of the loans provided by MFI's to the non-financial institutions and households during 2009-2012 on a 3-month annualized growth rate.

There can be observed the decline in the loans provided to the private sector starting from January 2011 due to the growing strains in the credit flows and the decrease in the demand for loans, caused by the decline of the investment and consumer demand, and moreover, the subjects' interest debt repayment. As it can be seen from the graph the first LTRO had an immediate impact on the lending activity, especially to the non-financial corporations and a smaller growth in the loans to the households. The second 3-year LTRO also helped easing the pressure in the financial markets and further stimulating the loans to the private sector. However, the stimulus was not enough for a long-lasting effect in the loan growth, as after April 2012 there can be observed a declining trend in the credit flows to the private sector.

Figure 39

MFI's loans to non-financial institutions and households



NOTE: 3-month annualized growth rate
SOURCE: The European Central Bank

Besides the two 36-month LTROs in December 2011 the Governing Council took several more decisions that aimed to ease the liquidity conditions in the markets. The ECB reduced the reserve ration from *2%* to *1%* starting from January 2012. This created an extra liquidity of EUR 103 billion in the banking sector. In addition, the Governing Council increased the collateral availability, by introducing two measures: accept supplemental credit claims, such as bank loans, as collateral and expand the rating for some ABSs. This also helped reducing the pressures in the markets. Finally, the Governing Council decided to discontinue FTOs held on the last day of the maintenance period. This action positively influenced the EONIA which was usually increasing at the end of the maintenance period.

Overall, the actions implemented in December 2011 were a response to the growing strains in the banking sector, by providing a liquidity support to the banks. However, the pressures in the interbank market continued also the following year, which motivated the ECB to apply additional measures in the course of 2012.

3.5.3 Extension of collateral eligibility

Following the decisions from December 2011 the ECB further increased the eligible collateral during 2012, aiming in this way to assure that the liquidity provided through the refinancing operations was accessible to more participants.

The first announcement was made on February 9, 2012,[92] when the ECB allowed the national banks to accept as eligible collateral additional credit claims based on particular national specifications. This decision focused on the fact that the banking system in each country has its own features and this change would help accustom the refinancing operations to each of them. The second important announcement was made on June 22, 2012.[93] In the light of a decreasing trend in the loans provided by the MFI's to the non-financial institutions and households (see Figure 39), the ECB widened the accepted collateral by certain ABSs – specifically, auto loan, leasing and consumer finance ABSs, ABSs backed by commercial mortgages, residential mortgage-backed securities. Moreover, in September 2012 the ECB announced an extension in the eligible collateral to debt instruments denominated in U.S. dollar, pound sterling and Japanese yen.

Overall, all the changes applied by the ECB regarding the extension of collateral eligibility aimed to ease the liquidity conditions and stabilize the interbank market, by making the liquidity available to a larger amount of counterparties and in this way, strengthening the liquidity providing channels. Moreover, these actions could have had a direct influence on the prices of the new accepted assets by lowering them. Indeed, during 2012 the total amount of acceptable instruments grew by *8%* respectively to 2011.

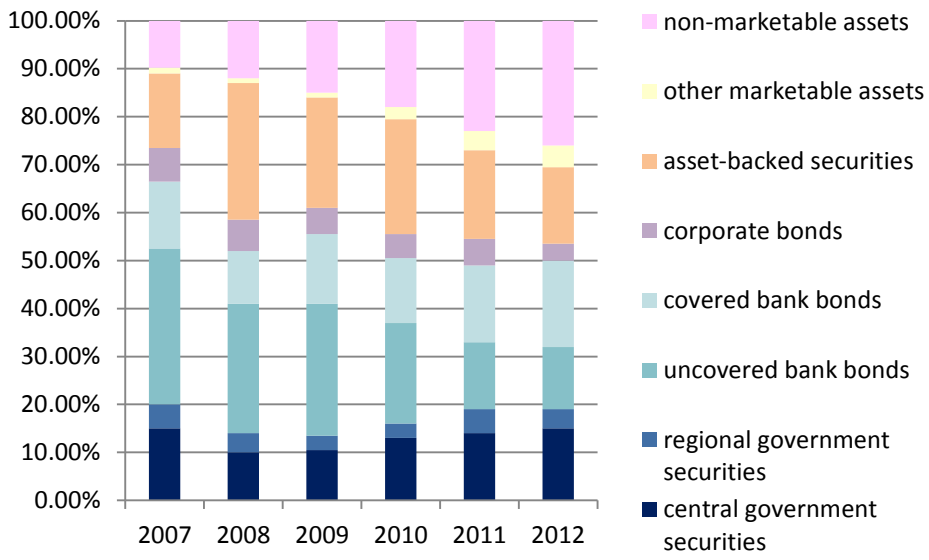
The following figure represents the development of the assets which were used in the refinancing operations during 2007-2012.

[92] Press Release of the European Central Bank; Release date: 9.2.2012; available online on <http://www.ecb.europa.eu/press/pr/date/2012/html/pr120209_2.en.html>

[93] Press Release of the European Central Bank; Release date: 22.6.2012; available online on <http://www.ecb.europa.eu/press/pr/date/2012/html/pr120622.en.html>

Figure 40

The assets put forward as collateral in ECB's refinancing operations (2007-2012)



SOURCE: The European Central Bank Annual Report - 2012

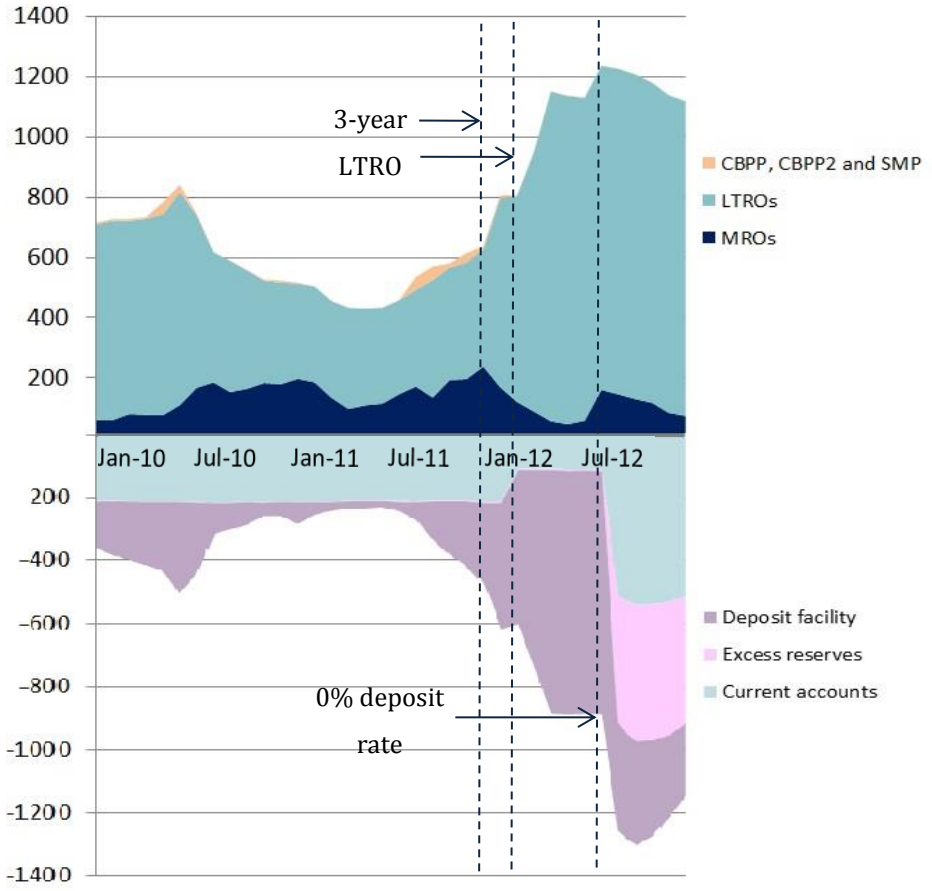
As it can be noticed since 2011 the biggest element from the total assets forwarded as collateral was the non-marketable assets – *26%*. The largest part of them was the credit claims and fixed-term deposits. This is connected with the decisions from December 6, 2011 and February 9, 2012. The second largest component was the ABSs; however since 2011 there can be noticed a decreasing trend in their evolution. On the other hand, the share of government securities increased by *3%* over the last two years, which is connected with the sovereign debt crisis in the euro area.[94]

Despite the large amount of liquidity supporting actions and the excess of liquidity in the system, the banks were not increasing their lending activity. The liquidity surplus was deposited in the deposit facility. In this context, in July 2012 the ECB announced about the lowering of the deposit rate to *0%*. The figure below reflects the evolution of the monetary policy operations and the deposit activity during 2010-2012.

[94] The European Central Bank Annual Report – 2012, The European Central Bank, 2013

Figure 41

Liquidity factors in 2010-2012



NOTE: Data in billions of euros
SOURCE: The European Central Bank CBPP Monthly Reports – 2010-2012

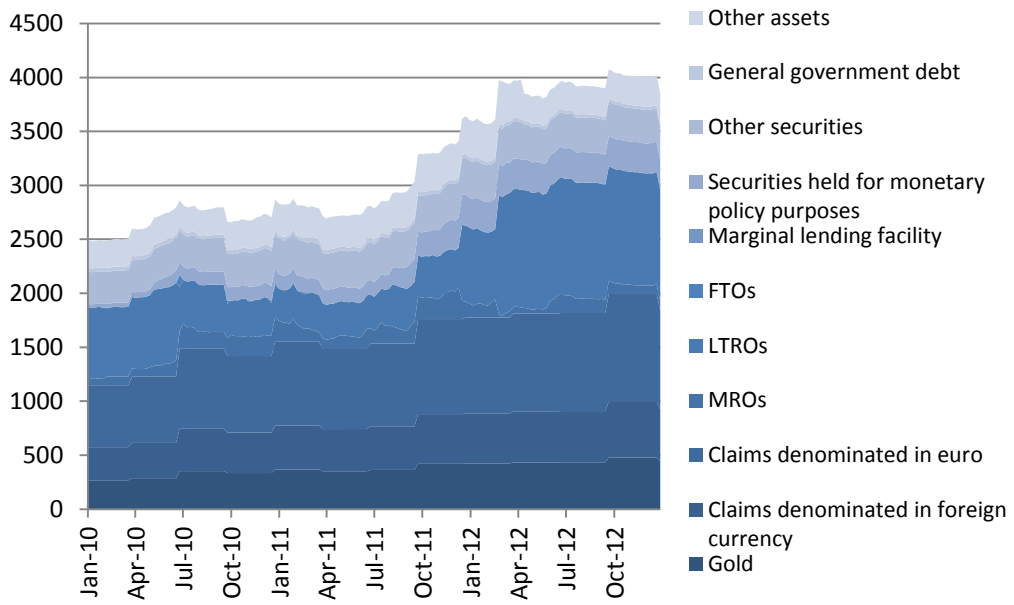
On the figure can be noted the marked increase of the amount of LTROs from December 2011 connected with the two 3-year LTROs. At the same time the amount of MROs decreased significantly between December 2011 and May 2012. The increase of the refinancing operations was followed by an increase in the deposit facility. However, from July 2012, when the ECB lowered the rate of deposits to *0%*, there can be noticed an increase in the excess reserves, as the banks were not motivated any longer to deposit the liquidity in the deposit facility.

The measures applied by the ECB during this period of time affected its balance sheet. The total amount of assets grew by *61,45%* from EUR 2,5 trillion in 2009 to EUR 4 trillion in the

second half of 2012, however, beginning a slow decrease at the end of the year. The evolution of Eurosystem's assets is illustrated on the figure below.

Figure 42

The composition of the Eurosystem's assets (January 2010- December 2012)



NOTE: Data in billions of euros
SOURCE: The European Central Bank

The main increase on the assets side was brought by the 36-month LTROs. The gross increase was of 1 018,7 billion but considering the maturing operations in December 2011, the net increase constituted approximately EUR 500 billion. In line with the increasing share of LTROs on the left side of the balance sheet, there can be observed the decrease of MROs as well. The increase produced by the CBBP2 and SMP programs was approximately of EUR 279,8 billion. In the balance sheet evolution is also reflected the extension in the eligible collateral during 2011 and 2012 – which is observed on the graph in the increase of claims denominated in euro and in the foreign currency.

In spite of the actions taken by the ECB throughout 2011-2012, the level of uncertainty in the markets was still very high, the funding stress in the interbank markets declined a little, but it was still elevated, the investment activity was low and the unemployment rate high. The situation worsened with the continuing sovereign debt crisis of the euro area. In the second half

of 2012 in the markets appeared doubts about the preservation of the euro and the monetary union. In this context, in September 2012, the Governing Council announced about the Outright Monetary Transactions program.

3.5.4 Outright Monetary Transactions

The first suggestion that the ECB would implement a new program of quantitative easing as a response to the worsened economic outlook of the summer 2012 was given by the president of the ECB, Mario Draghi, in his speech on July 26, 2012, when he called the euro an "irreversible" currency and mentioned that the ECB within its mandate "is ready to do whatever it takes to preserve euro".[95] Further announcement followed in August 2012, when the ECB announced the preparing of the OMT program. And a month later, on September 6, 2012 the technical features of the Outright Monetary Transactions were made public. Along with this, the ECB also announced the termination of the Securities Markets Program and thus the OMTs became its follower. However, it is important to emphasize that the SMP and the OMTs have significant differences and are not identical programs, even if they were targeting very close goals – "safeguard an appropriate monetary transmission and the singleness of the monetary policy".[96]

The main difference between the two programs is that while under SMP the ECB was purchasing longer-term government bonds, under the OMTs the ECB was planning to purchase shorter-term government bonds, with a maturity from one to three years, in this way targeting the short segment of the yield curve. The second not less important difference is the conditionality of the two programs. The OMTs are connected to the European Financial Stability/ European Stability Mechanism program. The ECB stated that the OMTs would be implemented in case if the uncertainty and disorders in the markets would increase. Moreover, the OMTs can be concentrated on purchasing the bonds of just one member state. In contrast to that, the SMP was implemented regardless any potential conditions in the markets and wasn't focused on just a country; however, it did focus on troubled countries. Another difference is the timing. While during the initiation of the SMP the ECB didn't set any precise timing or planned amount or purchases, though mentioning that the SMP was a temporary program, in September 2012 the ECB made it clear that if the OMTs would be implemented, the central bank will make potentially unlimited acquiring of the government bonds. The ECB was arguing that the OMTs

[95] Speech by Mario Draghi, the ECB's president, at the Global Investment conference, London, 26.7.2012

[96] Press Release of the European Central Bank; Release date: 6.9.2012; available online on <http://www.ecb.europa.eu/press/pr/date/2012/html/pr120906_1.en.html>

would be able to exclude the elevated tensions connected to the uncertainty about the preservation of the euro and the monetary union.

Till August 2014, when this paper was written, the ECB didn't apply the OMTs. Even though, the announcements of this program had an effect on the markets. Starting from July 2012, with the first suggestion made by Mario Draghi and continuing with the announcements in August and September, the ECB sent clear "signals" to the markets about its monetary policy and the measures that it is willing to take if certain conditions would increase the fears regarding the reversibility of the euro. The effects through the signaling channel on the markets were analyzed in a series of papers. Altavilla et al.[97] studied the impact of the announcements on the two-year government bond rates. Their results show that the ECB announcements reduced the rates of the Italian and Spanish bonds by approximately 200 basis points. De Santis[98] analyzed the effect on the 10-year government bonds. His findings show that the largest impact was on the Spanish and Italian bonds, followed by Portugal and Ireland, and Greece. Szczerbowicz[99] finds that the OMTs proved to decrease the tensions in government bond markets, especially in the peripheral Eurozone. Moreover, the paper argues that they had a spill-over effect on the bank covered bond spreads.

The following graphs show the evolution of the spreads between the 10-/2-year government bonds of Spain, Italy, Greece and Portugal over the 10-/2-year German Bund. The vertical lines illustrate the three key announcements made on, respectively: 26.7, 2.8 and 6.9 2012. From the first graph can be deducted that the most stimulating signaling effect had the first announcement, followed by the second shortly after, and the last one from September having the smallest effect on lowering the spreads. An evident impact was on the Portugal and Greece 2-year bond spreads. However, the announcements also managed to stop the increasing trend of the Italian and Spanish spreads, turning it into a decreasing one. The same effects can be observed also in 10-year government bond spreads. The announcements reversed the increasing spreads of the 10-year Italy and Spain government bonds over the German Bund. Overall, the "signals" provided by the ECB helped in stabilizing the government bond markets in

[97] ALTAVILLA, C.; GIANNONE, D.; LENZA, M:*The financial and macroeconomic effects of the OMT announcements*, Center for Studies in Economic and Finance, Working Paper, No. 352, 2014

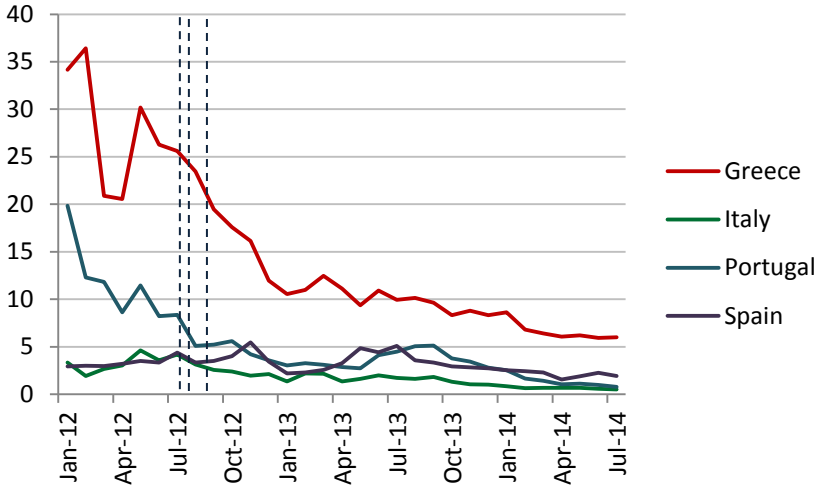
[98] DE SANTIS, R.: *The euro area sovereign debt crisis: Identifying flight-to-liquidity and the spillover mechanisms,* Journal of Empirical Finance, Vol. 26, 2014

[99] SZCZERBOWICZ, U.: *The ECB's Unconventional Monetary Policies: Have they lowered market borrowing costs for banks and governments?*, The Research Institute of Economy, Trade and Industry, Discussion Paper Series, No. 14-E-008, 2014

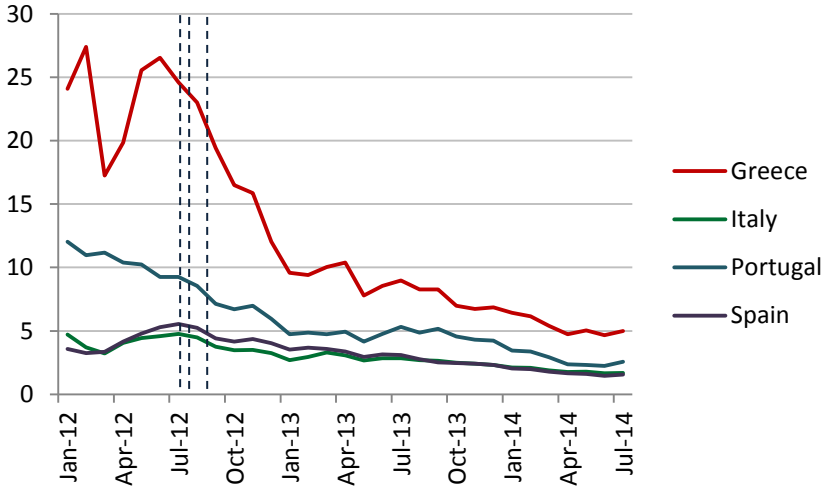
the third quarter of 2012 and together with the other actions, which were implemented further, supported the long-term evolution of this markets, by decreasing the spreads.

Figure 43

The spreads of the Italian, Greek, Portuguese and Spanish over the German 2-year government bond (2012-2014)



The spreads of the Italian, Greek, Portuguese and Spanish over the German 10-year government bond (2012-2014)



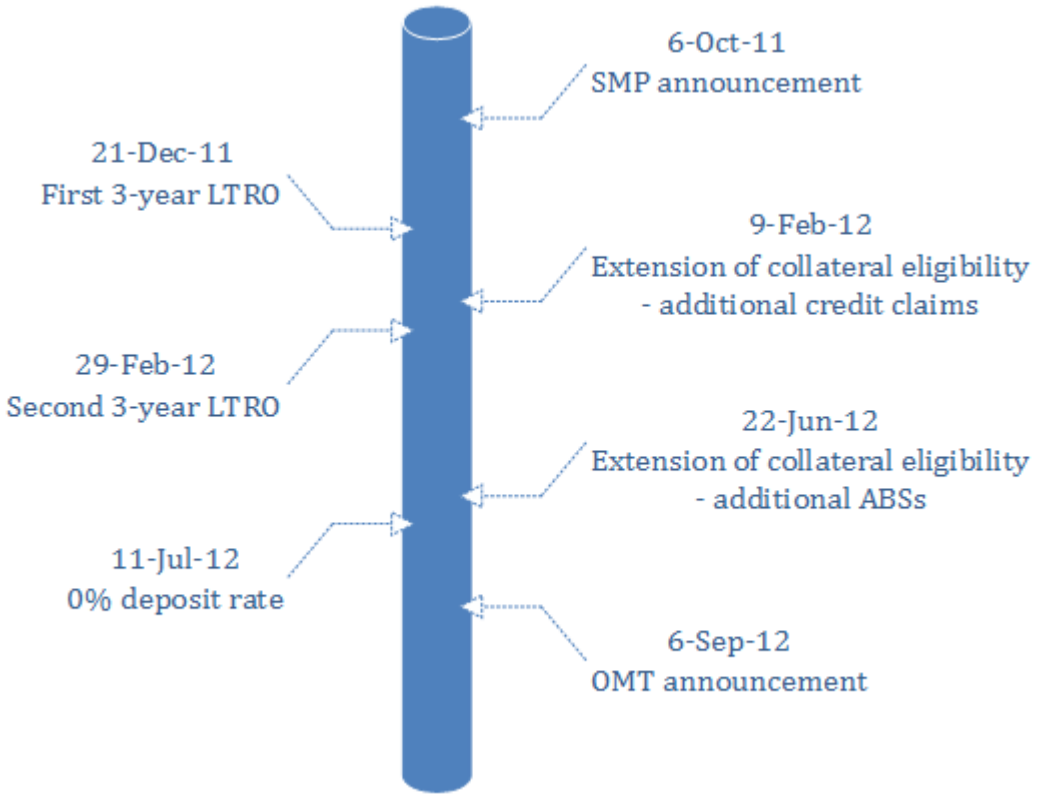
NOTE: Data in basis points
SOURCE: The European Central Bank

Briefly, during 2011-2012 the ECB implemented non-standard monetary policy measures, as a response to the re-intensification of the sovereign debt crisis and the worsened economic outlook. The actions and the programs applied aimed to ease the conditions on the interbank market, provide additional liquidity and stabilize the government bond markets.

The following figure highlights the main monetary policy actions that were implemented from mid-2011 till 2012.

Figure 44

The ECB's response to the sovereign debt crisis



SOURCE: The European Central Bank

3.6 The ECB's forward guidance in the context of low inflation

Towards the end of 2012 the financial conditions eased and the pressures in the financial markets started to decline. However, at the beginning of 2013 the economic outlook was not improving much. The surplus of liquidity in the markets started decreasing, while the banks were gradually repaying the liquidity within the LTROs, the inflation was low and the money market rates volatile. Even if the government bond markets were stabilizing, the tensions in the money markets were rising. In this context, the ECB continued applying non-traditional measures, in order to help the economy, focusing its monetary policy on an effective transmission channel and concentrating on the market participants. In May 2013 the Governing Council further lowered the main refinancing rate to *0,5%* and decreased the corridor of the key interest rates to 100 basis points. However, towards the middle of 2013 the volatility of the money market rates was increasing, which represented a barrier to the monetary policy transmission mechanism. The elevated volatility mirrored the market participants' expectations about the future evolution of the main policy rates. In these circumstances, in July 2013 the ECB adopted forward guidance on interest rates.[100]

In the initial announcement on July 4, 2013 Mario Draghi stated that the "monetary policy stance will remain accommodative for as long as necessary" and that the Governing Council is intending to keep the "key ECB interest rates at present or lower levels for an extended period of time".[101] By applying the forward guidance the ECB was targeting two main goals: reaffirming its main mandate – the price stability and supporting the transmission channel by adjusting the market expectations about the future interest rates. The framework of the ECB's forward guidance has three main characteristics. First, the ECB is aiming to increase the lowering inflation to its target of close to 2% over the medium term. Secondly, the Governing Council didn't set any time limitations regarding the maintaining of the low level of the key interest rates. Finally, the ECB complexly analyzes the economic outlook and the risks to the price stability and doesn't rely just on concrete indicators.[102] In this way, there is an important difference between the ECB's and the Fed's forward guidance. The ECB "suggested" the possible development of the main policy rates and the desirable economic outlook. The Fed, on the other hand, formulated the desirable results in terms of inflation and unemployment, specifying them numerically.

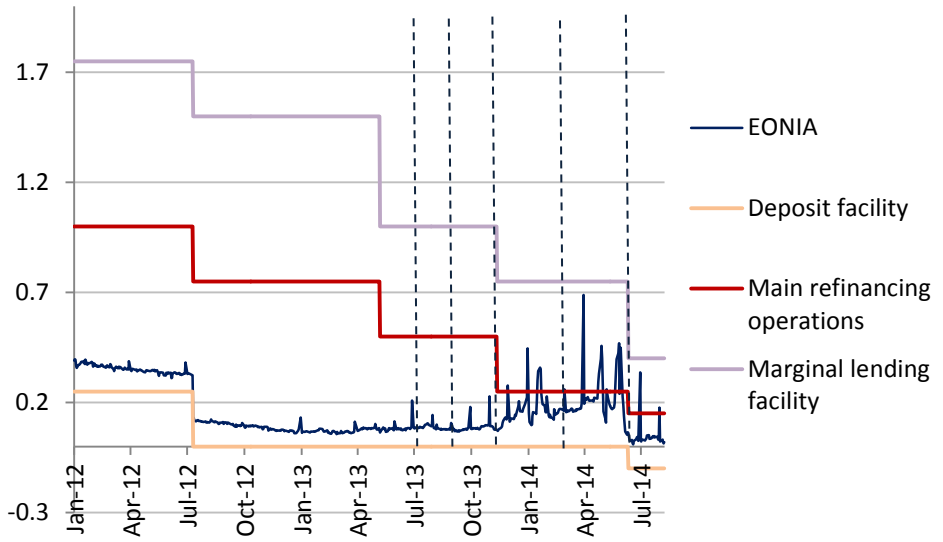
[100] The communication provided by a central bank regarding the further direction of the monetary policy and the future development of the key interest rates.
[101] Speech by Mario Draghi, the ECB's president, Press Conference, Frankfurt am Main, 4.7.2013
[102] The ECB's forward guidance, The European Central Bank Monthly Bulletin, April 2014

The next important announcement followed in September 2013 when the ECB's president reconfirmed that the Governing Council was intending to keep the forward guidance on the key interest rates for as long as it would be necessary. Later, on November 7, 2013, the ECB cut the main refinancing and marginal lending facility rates by 25 basis points in order to decrease the price pressures. In January and February 2014 the ECB restated its monetary policy. And on March 6, 2014 Mario Draghi stated that the ECB will maintain a high degree of monetary accommodation and is prepared to take further actions if necessary. In this context, in June 2014 the Governing Council took the decision to further cut the key interest rates: the MRO's rate to *0,15%* , the rate on marginal facility to *0,4%* and the interest rate on the deposit facility to *-0,1%.* This unprecedented historic development aims to motivate the bank to increase the lending to businesses and households.[103]

Overall, the forward guidance helped communicating to the markets the ECB's monetary policy orientation. At the end of 2013 it positively affected the conditions in the money markets. The following graph represents the development of the EONIA and of the main policy rates from January 2012 till August 2014.

Figure 45

The ECB's key interest rates and EONIA (2012-2014)



NOTE: Data in percent per annum
SOURCE: The European Central Bank

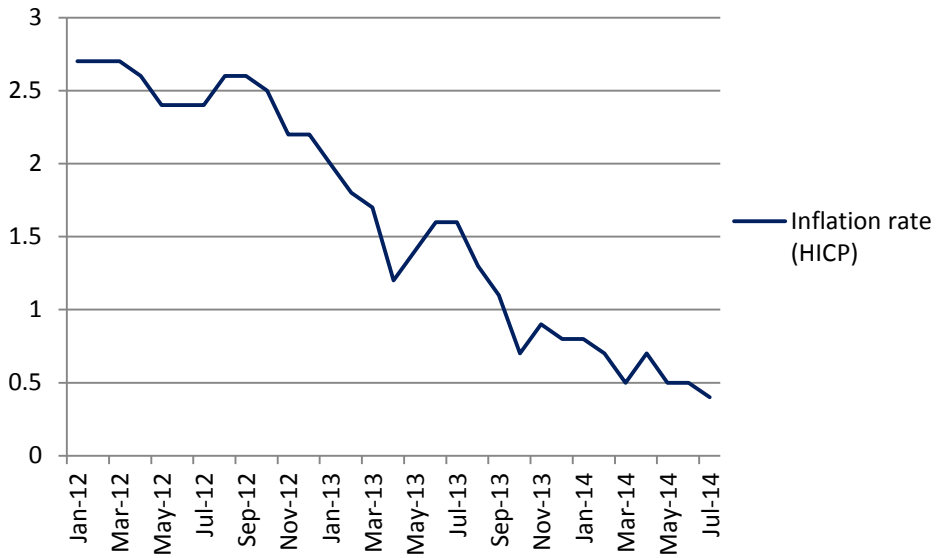
[103] The European Central Bank Monthly Bulletin, August 2014

As it can be observed on the graph during 2013, the announcements made by the ECB were stabilizing the level of the overnight market rate. However, at the beginning of 2014 EONIA became very volatile. The trend developed during the first two quarters of the year as well. Nevertheless, after the cutting of the main policy rates in June the volatility decreased.

However, the main goal of the forward guidance was not achieved over the last year. As it was described before, the forward guidance was applied to restore the effective functioning of the transmission mechanism of the monetary policy. The ECB uses its transmission mechanism to assure price stability over a medium term. The graph below shows the development of the inflation in the euro area over the past two years.

Figure 46

The inflation rate in the euro area (2012-2014)



NOTE: Indices of Consumer prices, percentage change
SOURCE: The European Central Bank

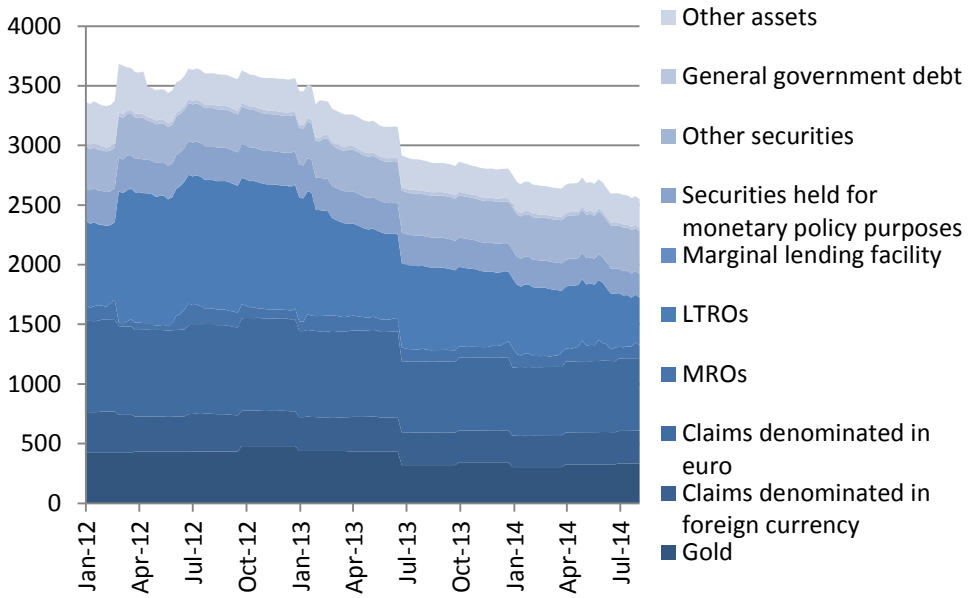
As it can be observed the announcements made by the ECB had short-term effects on the development of the inflation. However, in the longer-term it has a decreasing trend, reaching *0,4%* by the end of July 2014.

In addition, to the forward guidance, in June 2014 the ECB took supplementary non-standard measures to support the economic development: (1) creation of a series of targeted longer-term refinancing operations (TLTROs) estimated for an amount of EUR 400 billion; (2)

extension of FRFA basis for the MROs and LTROs until December 2016; (3) ending of the SMP sterilization FTOs; and (4) preparation of the ABS purchase program.[104] These measures aimed to support bank lending by inject supplementary liquidity in the banking system, which was decreasing with the repayments of the 3-year LTROs. The balance sheet of the Eurosystem also decreased over the past the past two years. The figure below shows the development of the Eurosystem's assets from 2012 to 2014.

Figure 47

The composition of the Eurosystem's assets (January 2012- August 2014)



NOTE: Data in billions of euros

SOURCE: The European Central Bank

The graph shows how the value of the assets on the balance sheet gradually decreased from its peak of EUR 3,3 trillion in February 2012 reaching EUR 2,2 trillion in August 2014, which is a *33%* fall. The biggest fall can be noticed in the value of LTROs – *43,6%,* followed by the claims denominated in euro – *20,49%.* However, in the light of the latest announcements it is clear that the ECB will not abound the non-standard monetary policy measures and a further increase of the balance sheet can be expected.

[104] Press Release of the European Central Bank; Release date: 5.6.2014; available online on <http://www.ecb.europa.eu/press/pr/activities/mopo/html/index.en.html>

3.7 Conclusion

The European Central Bank' unconventional monetary policy approach focused mainly on the repairing of the dysfunctional markets by restoring the effective functioning of the monetary policy transmission channels. From the outbreak of the crisis till 2014, the ECB faced numerous challenges starting with the financial disorders and the crisis itself, followed by the sovereign debt crisis till 2014, and its re-intensification and moreover, the decreasing inflation in the past years, which altogether made the task of the central bank much more difficult.

In its QE program the European Central Bank injected reserves in the system by providing unlimited amounts of liquidity at a fixed rate under its monetary operations; by expending the eligible set of collateral; by implementing LTROs that became very attractive to the market participants. This differentiated it from the Federal Reserve that injected reserves through large-scale asset purchases. But it is important to note, that the responses derived from the financial structure of each economy and the challenges that they were facing at the time. The ECB also implemented asset purchase programs aiming to stabilize the covered bond markets (CBPP1, CBPP2) and the government bond markets (SMP, OMP – announced) – as a response to the sovereign debt crisis. The new implemented programs allowed the ECB to make outright purchases of the selected assets, which is an unprecedented measure. The programs were, however, much smaller than the Fed's LSAPs. That is why, the effect on the Eurosystem's balance sheet was not so pronounced; it tripled from the summer of 2007 but decreased by *33%* over the last two years.

Overall, the measures that were taken helped stabilize the economy in certain time periods and partially repaired the transmission mechanism. However, the economic outlook is not positive and it is not likely to get much better any soon. In this context, in June the ECB announced a new wave of unconventional measures that will be applied further and will create an additional excess of liquidity in order to decrease the tensions from the markets.

4 The Exit Strategy

From the outbreak of the crisis in 2007 till nowadays the central banks around the world have implemented various programs, including unconventional measures, in order to support the financial markets and stabilize the economy. These tools varied from country to country depending on the specific economic environment and the problems that the economies were facing. The two previous chapters highlighted two different examples of implementation of the quantitative easing – the ECB and the Fed. The actions of the authorities have helped in supporting the economy and the global financial markets and prevented the uncontrolled collapse of the global economy. Nevertheless, despite the success that these measures had, they failed in bringing back the world economic balance, the consequences of the crisis being felt till nowadays. In addition, these programs had a destabilizing effect on the economy affecting its different areas, the most evident being the effects in the monetary and fiscal markets. In the monetary policy the central banks are facing two main problems: the inability to use the traditional monetary tools, in the context of the zero interest rates and the systemic excess of liquidity created in the system, in the context of the expanded central banks' balance sheets. In the fiscal area the main problem is the significant increase of the public debts and the budget deficits, which also threatens the economic balance of the countries.

In this context, the main goal of the central banks today is to design the gradual return to the stable functioning of the economies and the elimination of the negative effects of the persisting imbalances. The set of measures and tools that aim to serve this purpose are called the exit strategy.

4.1 The conceptual basis of the Exit Strategy

As the economies come out from the Great Recession the attention of most of the economists and central bankers is moving towards a new issue – how to correctly orchestrate the exit strategy from the quantitative easing and return to traditional monetary policy. However, as mentioned above, the new unconventional measures have created certain imbalances in the markets that need to be taken in consideration while designing the optimal exit strategy.

First of all, under the quantitative easing, the central banks' role as the main source of liquidity for the financial markets has grown very much. In the conditions of a financial crisis this is very important, as the credit markets are frozen and the elevated demand for liquidity is

not covered. The loosening of the conditions for obtaining the liquidity by the central banks is one of the key elements for restoring the activity on the credit markets. However, when the function of the credit markets is restored the central bank has to tighten back the conditions.

Secondly, the quantitative easing programs have an impact on the structure of the central banks' balance sheets. Under these programs the central banks purchased different securities that are not very liquid and have a longer-term maturity. This action aimed to help certain markets of the economies, specifically: the Fed's GSE and MBS purchases and the ECB's covered bond purchases. However, by acquiring these securities the central banks also assume the risks associated with them. In other words, the QE affected the structure of the balance sheet of the central banks by adding an amount of riskier and less liquid assets. That is why, the exit strategy has also to include measures that would help to restore the pre-crisis structure of the balance sheets and remove the "new" assets.

The third issue is also connected with the central banks' balance sheets. As described before, the quantitative easing policy injects an excess of liquidity in the banking system. The banks deposit this liquidity in their accounts with the central bank and in such a way the "pumped" liquidity significantly increases the size of its balance sheet. In this way, the next imbalance created by the QE is the systemic excess of liquidity. Thus, another challenge for the exit strategy is to reduce the surplus of liquidity in the system.

Moreover, at the initial stages of the crisis the central banks reduced the key interest rates to the zero lower bound. This made the traditional monetary policy instrument ineffective and pushed the central banks to turn to less conventional tools. However, in order to aboard these non-traditional policy and return to the traditional one, the central banks need to restore the traditional monetary policy tools and mechanisms, which means the increase of the key interest rates to the pre-crisis levels.[105]

Consequently, the monetary policy authorities are facing a number of important challenges in creating the exit strategy, which has to be designed according to a plan of eliminating all the negative effects and imbalances and include instruments that would help achieving these goals.

[105] GORUNOV, E.; TRUNIN, P.: *Monitoring the 'Exit Strategy' from a Foreign Country Regime Crisis Measures and Recommendations For the Russian Federation*, Russian Presidential Academy of National Economy and Public Administration, 2013

In theory, there are a number of measures that can be implemented by the central banks in response to the existent challenges. First, the restoring of the functions of the credit markets will naturally reduce the banks' demand for the central bank's liquidity through the credit facilities. In this context, the central bank can abolish the created credit facilities and the longer-term providing liquidity operations. This would mean a gradually repayment of the provided liquidity. In addition, the central bank can moderately reduce the supply of liquidity through the open-market operations close to the minimum reserves, making it no longer a "full supply endogeneity". Moreover, the central bank can tighten the price and non-price conditions for obtaining liquidity, which would include the raise in the interest rates and the shortening of the eligible collateral. To normalize the structure of the balance sheet the central bank can apply an active or a passive approach: it can hold the securities till maturity or it can sell the purchased assets. However, the second method implies some risks – it can push the interest rates upwards, which will consequently decrease the price of the securities and the central bank can suffer losses.[106]

All these measures would help the central banks eliminate the excess of liquidity from the banking system and the negative effects brought by the unconventional measures, and return to the traditional mechanisms of the monetary policy. In this sense, the president of the Federal Reserve Bank of St. Louis, James Bullard, mentioned that the central banks should adopt a "last in, first out" exit strategy. This means that first the central banks would have to concentrate on removing the purchased assets under the QE from their balance sheets and absorb the provided liquidity, and secondly, they would have to raise the key interest rates. In practice, however, there are numerous factors that can affect the exit strategy, which include the current economic outlook, inflation and the efficiency of the monetary policy transmission mechanisms. These and other factors can significantly complicate the shift towards the traditional monetary policy and make the central banks' task much more complex.

[106] BRŮNA, K.: Lectures from Financial Stability, University of Economics, Prague, Winter Semester 2013/2014

4.2 The literature review

The issue of the monetary policy directions and the implementation of an exit strategy is broadly discussed in the literature. Probably one of the most relevant researches on this topic was made by Minegishi and Cournede.[107] In their paper they discuss the unconventional measures implemented by seven central banks (Fed, ECB, BOJ, BOE, BOC, Riksbank and SNB) and analyze the possibility of an exit strategy and its framework. They highlight that the different measures that were implemented by the banks request certain differences in the exit strategies. Moreover, the paper underlines the importance of a right timing and sequence of an exit strategy. The authors advice the central banks to analyze the stability of the markets on a macro- and micro-level as the improvement of the general financial conditions doesn't always mean the financial health of all the financial institutions. And in the context of a post-crisis period, when the financial system is still very weak, the heterogeneity among the financial institutions influences the market stability. As a consequence, the exit strategy should be rightly timed, in order to avoid a premature application.

The next article that also addresses this topic was written by Klyuev, Imus and Srinivasan.[108] They accentuate the importance of a gradual exit strategy that would start from implementing a larger amount of short-term facilities that would replace the longer-term ones. In addition, they offer several methods of contracting the liquidity on the liabilities side. One of the possible ways would be by raising the reserve requirements. However, the raise would have to be very significant, in order to drain a larger amount of liquidity. Other measures include issuing central bank securities or performing reverse repo operations. Moreover, the authors emphasize the importance of right communication with the markets and transparency of the policy.

The subject is continued by Cottarelli and Vinals,[109] who stress the importance of coordination of the monetary policy with the fiscal policy, both in shorter- and longer-term, and continuing the cooperation between the central banks on an international level. The main challenge in the last point will be the fact that different economies will develop differently;

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[107] MINEGISHI, M.;COURNEDE, B.: *Monetary policy responses to the crisis and exit strategies,* Organization for Economic Co-operation and Development, Working paper, No. 753, 2010

[108] KLYUEV, V.; IMUS, P.; SRINIVASAN, K.; *Unconventional choices for unconventional times: Credit and Quantitative easing in advanced economies,* IMF Staff Position Note, 2009

[109] COTTARELLI, C; VINALS, J.: *A strategy for renormalizing fiscal and monetary policies in advanced economies,* IMF Staff Position Note, 2009

consequently, some economies will introduce earlier the exit strategies, which will make the cooperation harder.

Morgan[110] analyzes the risks that are connected with the exit strategies. An important risk that was mentioned above is the losses associated with the selling of the new purchased assets. Another risk is the inflation that can be caused by a fast revival of the interbank market in a context of a too slow liquidity absorbing policy. Moreover, if the central bank has on its balance sheet a large amount of illiquid assets it will be complicated to reduce them, if the central bank chooses not to hold them till maturity. Lastly is the risk connected with an elevated increase of the interest rates, which can destabilize the economy.

4.3 Historical evidence on QE Exit Strategy

It is clear that the exit strategy represents a significant challenge for the central banks nowadays; however, it is not unprecedented. As described in the first chapter, the Bank of Japan already experienced the application of quantitative easing policy at the beginning of the 2000s. Indeed, the Japanese example is the only case of a full cycle of unconventional monetary policy application in the context of a financial crisis. Even if the package of the measures and tools used by the central banks as a response to the current financial crisis is unprecedented in nature and size, the Japanese experience is very useful for identifying factors that could guarantee a success of an exit strategy.

Bank of Japan started its exit strategy in March 2006 by announcing that it would begin to gradually absorb the injected liquidity and continue keeping the policy rate close to the zero lower bound. Consequently, by July 2006 the BOJ's balance sheet has decreased considerably by ¥ 29 trillion or *20%*; after which the key policy rates were raised. The reduction of the amount of the reserves on the liabilities' side was accompanied by a decrease of the amount of the bonds on the asset side. In this way, the BOJ implemented an exit strategy just in a few months returning back to the traditional monetary policy.

The exit policy itself had several strong key elements that facilitated its application. The most important action that was implemented by the Japanese monetary authorities was the communication with the markets about the intended steps of the policy and its transparency through numerous speeches, press releases and conferences, in order to correctly influence the

[110] MORGAN, J.: *The role and effectiveness of unconventional monetary policy,* Asian Development Bank Institute, Working paper, No. 163, 2009

markets' expectations. In this way, the markets could predict BOJ's further actions and the new announcements didn't cause any shocks. The factor of an effective communication between the central bank and the market participants played an important role especially while raising the key policy rates. This was one of the most challenging parts of the exit strategy as at its beginning the BOJ announced its intention to keep the rates low in a longer-term. Consequently, a sudden raise of the rates would be unexpected by the market participants and could have had a negative impact on the economic recovery. To avoid this, the BOJ communicated its intended steps and so influenced the markets' expectations regarding the interest rates. Moreover, the policy transparency helped to avoid shocks, while selling the purchased stocks. Altogether, the policy gave a clear signal to the markets and had an important effect on their expectations.

It is important also to note that the contraction of the balance sheet was given mainly by two factors: the reduction of liquidity providing-operations and the maturity of the acquired assets. As the market activity increased, the financial institutions naturally lowered their demand for the central banks liquidity. In this way, on one hand, the amount of liquidity decreased without the need of sterilizing it. On the other hand, the excess of liquidity decreased with the maturing ABCPs and ABSs. This is due to the fact that the purchased assets were relatively short termed and the BOJ simply held them till their maturity, thus avoiding the negative impact that could be produced by their selling. However, on the other hand, the selling of these assets can also put upward pressure on the interest rates as the subjects, which issued these securities will need refinancing in the market and thus, by repaying the previous emission to the central bank will simultaneously emit new issue for the private investors.

However, besides the ABSs and ABCPs, the BOJ also purchased stocks which clearly have no maturity and therefore, have to be sold. The central bank forwarded this task to special trust banks, at the same time, communicating the markets its intended plan. The trust banks were gradually selling the shares with the highest possible price. The selling began in October 2007 but due to the current financial crisis was stopped in October 2008.

In addition, it's worth noting another key element of the exit strategy. The BOJ didn't return to its initial pre-crisis monetary policy, but it created new elements in the monetary policy architecture. In March 2006 a document with the new monetary policy features was made public. The main change in the policy was the fact that the BOJ redirected its attention towards the expected economic growth and price trends putting the current economic performance

indicators on the second place. Moreover, the central bank analyzed the risks associated with the creation of price bubbles and excessive credit expansion.

All these features of the Japanese exit strategy were analyzed in an IMF paper by Yamaoka and Syed.[111] They conclude that overall, the exit strategy, as the QEP, was partially successful. The BOJ managed to reduce its balance sheet; however it never reached the pre-crisis level of the 1990's. Nevertheless, the authors agree that there are important lessons to be learned from the Japan's case and the key elements of the policy implementation in Japan represent the main directions for developing an exit strategy today.

4.4 Implications for the current exit strategies of Fed and ECB

The lessons learned from the application of the exit strategy in Japan and the numerous researches made on this topic that were mentioned above create a foundation of basic principles for an effective and stable exit strategy from the non-traditional monetary policy:

- a right timing and sequence of the measures;
- effective communication and policy transparency;
- co-operation between monetary and fiscal policy;
- sufficiently wide package of measures and tools that target all the imbalances created by the QE;
- a right combination of active and passive approaches of the central bank's measures;
- a comprehensive design of each exit strategy that addresses the distinctive features of each economy and the possible risks;
- a new monetary architecture, which will further be implemented.

The first paragraph of this chapter described the imbalances that were created in the markets as a result of the QE application. Therefore, the separate tools of the exit strategy would have to target these imbalances, specifically: the over-reliance of the market subjects on the central bank's funding; the high share of illiquid assets in the central bank's balance sheet; the systemic excess of liquidity; and the inability to use the interest rates as the main monetary policy tool. Moreover, it is worth noting that these imbalances are strongly interconnected, therefore, the tools that the central bank will use should form a comprehensive program. This

[111] YAMAOKA, H.; SYED, M: *Managing an exit: Lessons from Japan's reversal of unconventional monetary policy*, IMF Working paper, 2010

paragraph will summarize the different possible approaches that the central banks can apply as a response to each of the challenges.

4.4.1 Exit from the special refinancing operations

The first point of the exit strategy is the exit from the special refinancing operations and the return to the standard liquidity-providing operations. With the recovering activity of the interbank markets the banks demand for the central bank's liquidity decreases as they can get a part of the necessary liquidity from the market, the other part being provided by the central bank, which retains its function to cover liquidity needs that result from the minimum reserve requirements and from the autonomous factors - currency in circulation and government deposits. In this way, the natural functioning of the markets is restored and the central bank can undo its previous decisions that loosened the conditions for obtaining liquidity. Some of these actions include: the termination of the special financial programs, reducing the maturity of the operations, tightening the eligibility of the collateral, reducing the number of the participants in the refinancing operations to the pre-crisis level. All these actions should be done gradually. In addition, the central bank should leave an "emergency funding possibility" for the banks as the financial system is still weak and recovering after the crisis.

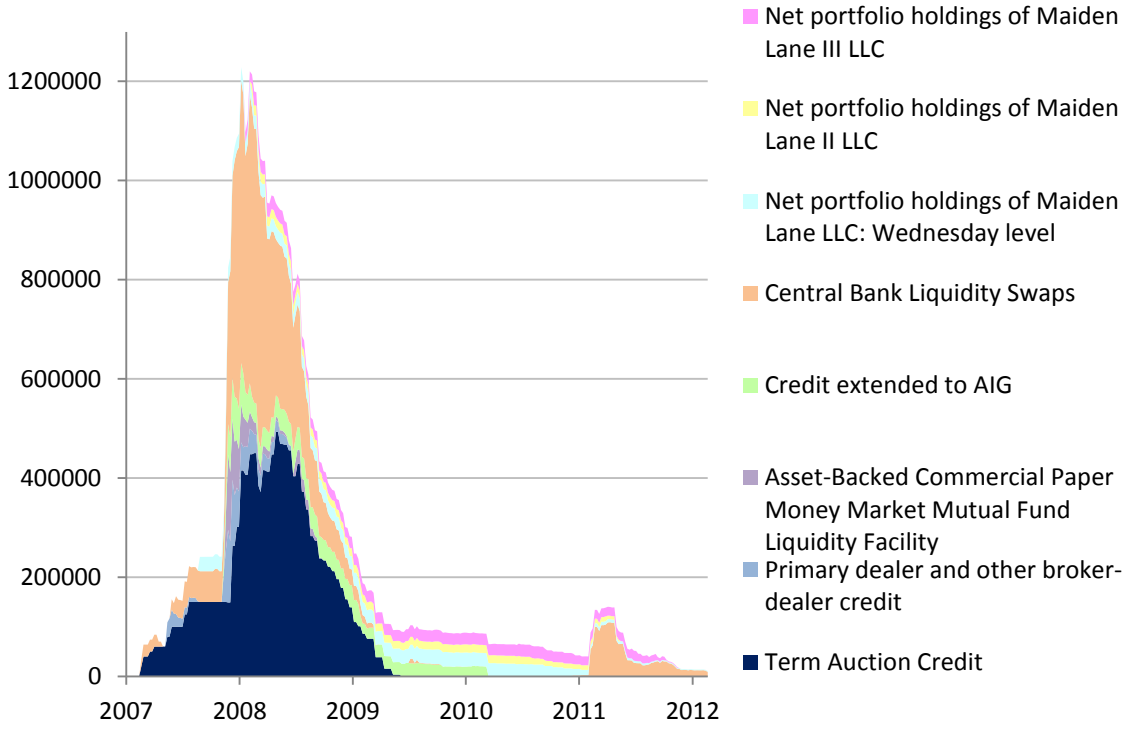
Nevertheless, the exit from the special refinancing operations is the simplest one as it flows naturally with the recovering markets. The central bank's actions in this sense are usually predicted by the banks and don't cause any shocks. Nowadays, most of the central banks already exited and closed their special refinancing programs.

Fed

At the beginning of the financial crisis the Fed created a number of programs to cover the elevated demand for liquidity of the financial market. These programs included: TAF, TSLF, PDCF and the loans to Maiden LLC (I, II, III) to rescue Bear Stearns and AIG. All the credit facility programs were terminated by the first half of 2010 and the loans were repaid by 2012. In this way, the Federal Reserve already exited from these operations. The following figure represents the evolution of the facilities created by the Federal Reserve between 2007 and 2012. It can be observed that the biggest amount was repaid between 2008 and 2009, and decreased gradually afterwards. Just in the first half of 2011 can be noticed an increase in the central bank swap lines due to the re-intensification of the euro area sovereign debt crisis and the strains on the Eurodollar market.

Figure 48

The Fed's credit facilities and loans



NOTE: Data in millions of dollars
SOURCE: The Federal Reserve Statistical Release H.4.1.

Minegishi and Cournede[112] analyzed the exit strategy of the Fed and its traditional monetary policy and advise the central bank to loosen the refinancing conditions. They believe that the more flexible refinancing approach of the ECB played an important role during the crisis. Indeed, the ECB's initial response was not as aggressive as the Fed's and the changes were not so massive, due to the existent smoother refinancing conditions. However, on the other hand, loosened conditions can cause moral hazard and increased risk appetite.

ECB

In the first stage of the crisis, as described above, the ECB didn't create new funding facilities as the Fed did, but just smoothened the liquidity obtaining conditions in the existing ones: transforming the standard refinancing operations to fixed rate full allotment tenders,

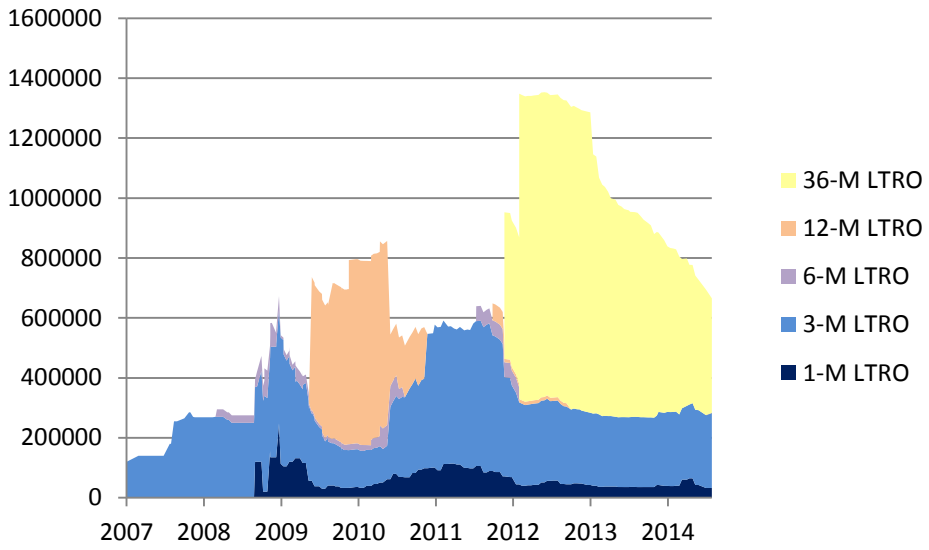
[112] MINEGISHI, M.;COURNEDE, B.: *Monetary policy responses to the crisis and exit strategies,* Organization for Economic Co-operation and Development, Working paper, No. 753, 2010

extending the maturity of the operations and the eligible collateral. In addition, an important measure was the 3-year LTROs.

It can be stated that the ECB is also gradually exiting from the special refinancing operations with the repayments of the 3-year LTROs. The development of the liquidity allotted through the LTROs from 2007 till August 2014 is represented in the figure below.

Figure 49

The ECB's long term refinancing operations



NOTE: Data in millions of euros
SOURCE: The European Central Bank's Weekly Financial Statements

The figure breaks down the LTROs according to their maturity. Indeed, it can be observed that the banks fully repaid the 12-month LTROS and from mid-2012 started gradually repaying the 36-month LTROs. However, in June 2014 the Governing Council extended the special liquidity-providing conditions until December 2016 and created TLTROs, which means that the ECB will continue supposing the financial markets as the main source of liquidity.

4.4.2 Exit from the big share of illiquid and risky assets in the central bank's balance sheet

The second point of the exit strategy implies the reduction of illiquid and risky assets from the central banks' balance sheet. During the crisis, in order to revive certain segments of the

markets, the central banks were acquiring riskier and less liquid assets that they were never purchasing in normal times. These assets included corporate bonds, shares, commercial papers, mortgage-backed securities. This dramatically changed the structure of the central banks' balance sheets. Some of these assets that had shorter maturity naturally fell of the balance sheet; however, a lot of the assets had a longer maturity and are still in its structure.

In this situation the central bank has three possible ways to exit: an active strategy, a passive strategy or a combination of the both. Under the passive strategy the central bank would choose to hold the assets till maturity. This is a less risky choice, however, for the central banks that hold assets with a longer maturity it would mean a very slow exit strategy.

The second way is the active strategy that implies the selling of the purchased assets. However, this strategy is connected with several risks. The selling can have a destabilizing effect on the markets by raising the interest rates and thus, lowering the price of the assets. This will consequently cause losses to the central bank. In this situation, the central bank can "print money", but it can affect the price stability by causing higher inflation. On the other hand, the government can help the central bank, but the new debt can also have a destabilizing effect on the markets. The Japanese experience teaches an important lesson regarding this subject. If the central bank chooses to exit using the active strategy it has to carefully monitor the markets and stop the selling if any imbalances occur.

The last and probably the most optimal strategy is the combining of the active and the passive approach. The Central Bank can choose holding till maturity the shorter- and medium-term assets and sell the longer-term ones. This strategy implies fewer risks as the active one, but at the same time, doesn't prolong the exit as the passive one. Nevertheless, the reduction of the share of illiquid and riskier assets is much more challenging for the central banks in comparison to the previous imbalance. It is connected with many risks, therefore, the central bank has to be careful while choosing the strategy and apply it gradually to avoid any negative effects on the markets.

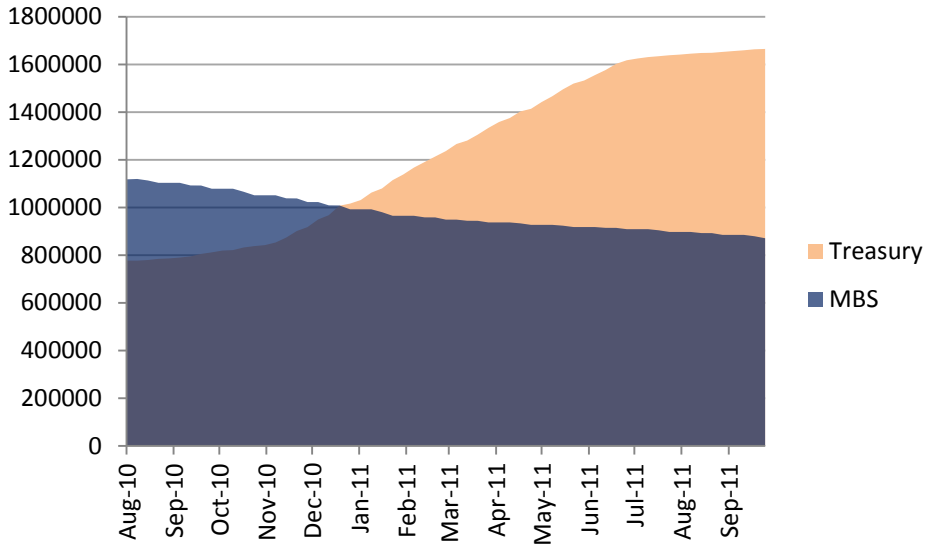
Fed

For the Federal Reserve this will probably be the most challenging task as under its QE programs the Fed acquired a big amount of non-governmental longer-term assets such as MBS and GSEs. Although, it is important to note that the Fed never purchased securities with a rating lower than AAA, in other words, avoiding the risky assets. As it was mentioned in the second

chapter, in August 2010, the Fed announced its intensions to start reinvesting the principal payments on agency debt and MBS in Treasury securities, which was continued also after the end of QE2 and terminated in September 2011, due to the weakness of the mortgage markets, when the Fed changed the reinvestment into MBS. Therefore, it can be stated that during August 2010-September 2011 the Federal Reserve already started the exit from the MBS portfolio. The following graph represents the central bank's holdings of MBS and U.S. Treasuries during this period of time.

Figure 50

The Fed's U.S. Treasuries and MBS holdings (2010-2011)



NOTE: Data in millions of dollars
SOURCE: The Federal Reserve Statistical Release H.4.1.

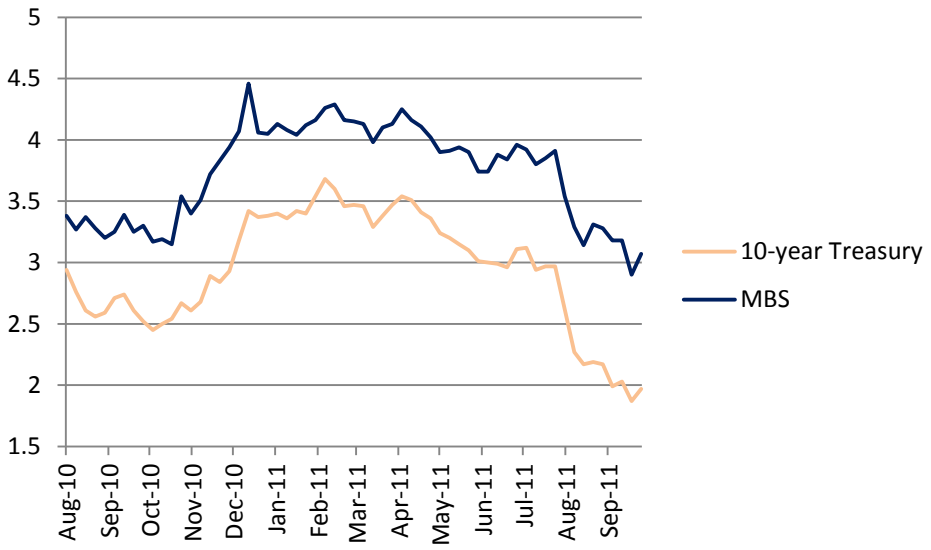
As it can be observed, the holdings of MBS declined by *22%* in 13 months reaching $ 870883 million by the end of September 2011. The Treasury holdings increased by *21,6%*, both under QE2 and the reinvestment of principal payments. It can be also noticed the continuing gradual increase of Treasury holdings after the termination of QE2 in June 2011.[113] Through its actions Fed was trying to lower the yields on U.S. Treasury securities. The following figure shows the evolution of the 10-year U.S. Treasury yield and 30-year agency MBS yield of the Freddie Mac

[113] See Figure 11 on Fed's Treasury purchases in 2010-2011.

from August 2010 till September 2011. Both yields have a decreasing trend starting from February 2011. Overall, the 10-year Treasury yield decreased by 145 basis points and the MBS yield by 122 basis points.

Figure 51

The U.S. Treasury and MBS yields (2010-2011)



NOTE: Data in percent per annum
SOURCE: The Federal Reserve Bank

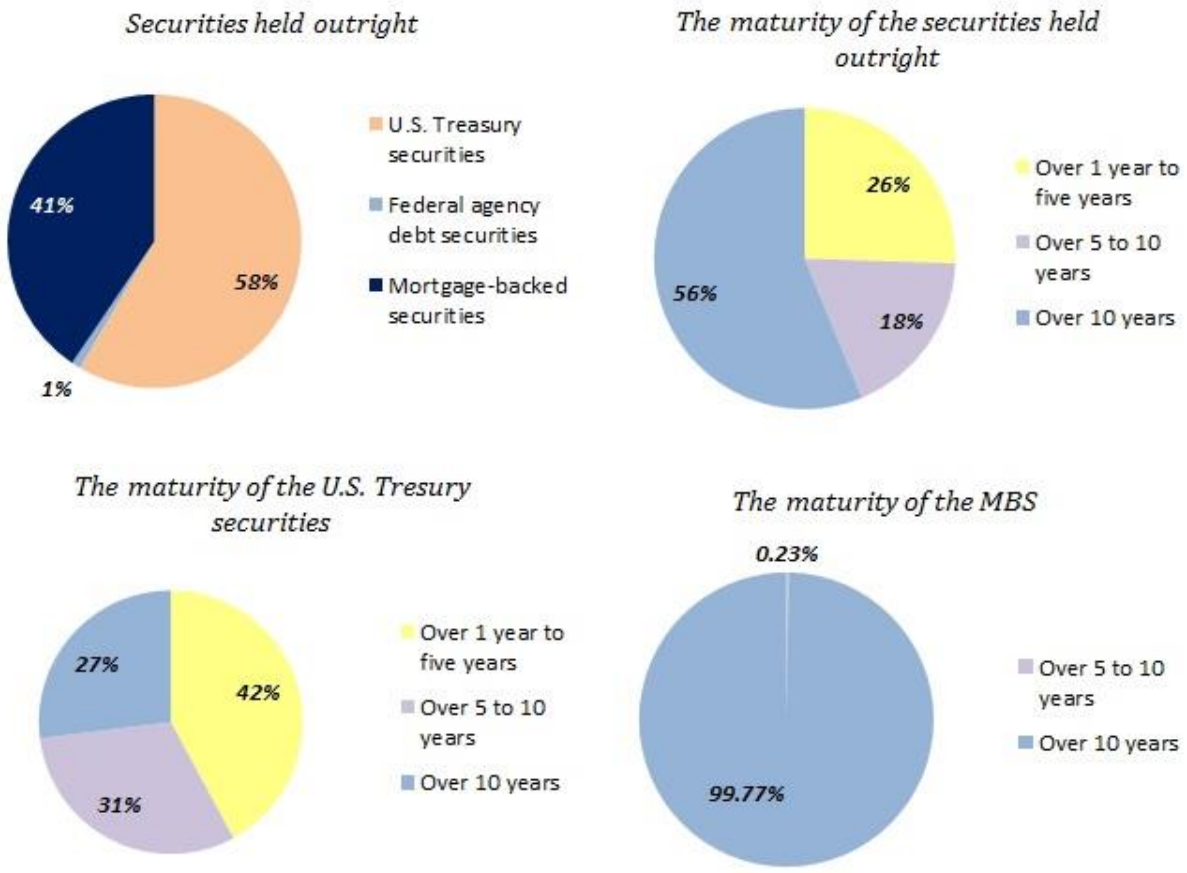
However, with the changing of the principal reinvestment in MBS and the initiation of the QE3, Federal Reserve's MBS holdings grew significantly. Even if from January 2014 the Fed started tapering the purchases under the QE3 the amount of MBSs in the balance sheet is still very large.

The following graph represents the structure of the securities held outright and their maturity breakdown. As it can be seen from the total amount of securities held outright, which by the end of August 2014 was $4,159 trillion, *58%* are U.S. Treasuries, *41%* are MBS and just *1%* are GSEs. More than a half are maturing in over 10 years, almost *1/5* in five to ten years and *1/4* of them are maturing in one to five years. It is important to note that the securities maturing from one to ten years are given mostly by U.S. Treasuries with an insignificant amount of GSEs. However, the securities maturing in over 10 years are given mostly by MBS. Indeed, by August

21, 2014 $1667,992 billion MBS were maturing in over ten years, which is *99,77%* of the total amount of the MBS held by the Fed. This breakdown is due to the fact that during the QE3 program the Fed concentrated on purchasing the mortgage-backed securities. However, the Federal Reserve doesn't need to sell all the assets because according to its original monetary policy, the securities held outright fully cover the amount of currency in circulation.

Figure 52

The Fed's securities held outright and their maturity (21.08.2014)



NOTE: Data as of August 21, 2014
SOURCE: The Federal Reserve Statistical Release H.4.1, available online on http://www.federalreserve.gov/releases/h41/.

As it can be seen from the total amount of securities held outright, which by the end of August 2014 was $4,159 trillion, *58%* are U.S. Treasuries, *41%* are MBS and just *1%* are GSEs. More than a half are maturing in over 10 years, almost *1/5* in five to ten years and *1/4* of them

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Therefore, the exit having $1,67 trillion of long-term MBS might not be so challenging for the Federal Reserve. Analyzing the possible strategies - the active strategy by itself is very risky and can result in losses for the Fed; on the other hand, holding all the securities till maturity is also risky because it can produce distortions in the mortgage market. Mishkin[114] provides two more arguments against the holding of securities till maturity. First, he argues that the risk of suffering losses is not excluded, even if the central bank chooses to hold the securities. Secondly, the fact that the Fed holds such a large amount of long-term MBS can result in a highly politicized real estate market and mortgage lending policy.

Probably, an optimal policy for the Federal Reserve, taking in consideration its original monetary policy, would be to hold the shorter- and medium-term securities and start selling the longer ones. This process should, however, be very slow and gradual in order not to affect the economic recovery. Nonetheless, regardless what policy will the Fed chose to apply its balance sheet will probably remain significantly increased in the upcoming years.

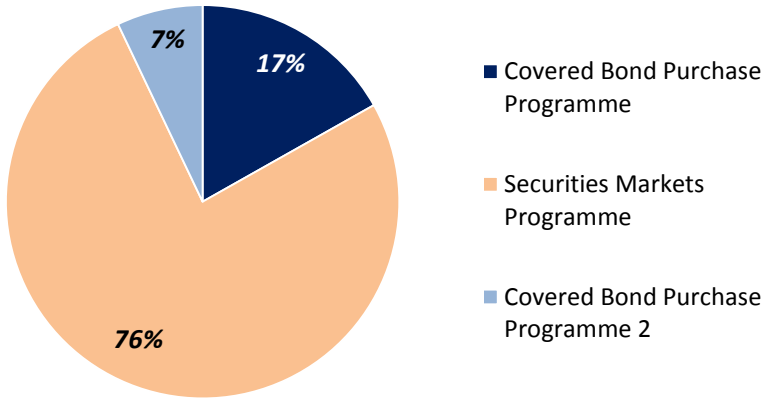
ECB

For the ECB the process will be much easier because the systemic excess of liquidity was created through the open-market operations and the asset-purchase programs were much smaller than in the Fed's case. However, an important difference between the two central banks is that under its QE programs the ECB purchased much riskier assets than the Fed did. The following figure represents the monetary policy portfolio as of August 22, 2014.

[114] MISHKIN, F.: *Over the Cliff: from the Subprime to the Global Financial Crisis*, Journal of Economic Perspectives, Vol. 25, No.1, 2011.

Figure 53

The ECB's monetary policy portfolio (22.08.2014)



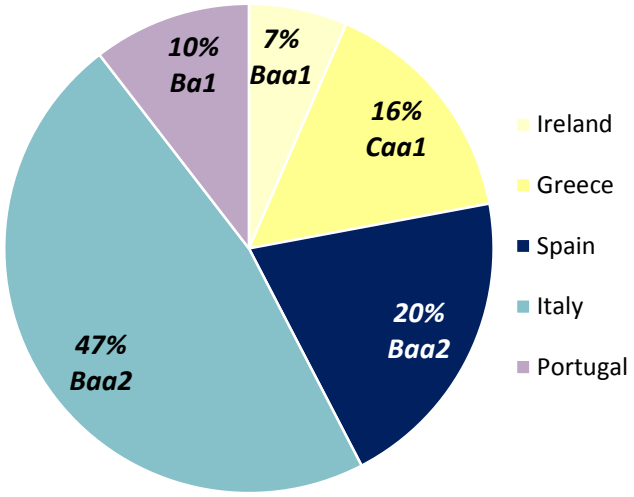
NOTE: Data as of August 22, 2014
SOURCE: The European Central Bank

By the end of August the total value of the monetary policy portfolio was of EUR 195,445 billion. Just *24%* were securities purchased under CBPP and CBPP2. The rest *76%* or EUR 148,728 billion were government bonds purchased under SMP. The acquired government bonds had a high credit risk; however, their maturity ranges between three and five years. The next figure shows the structure of the issuers of the government bonds that ECB holds and their ratings according to Moody's. As it can be observed, compared to the Fed, the ECB's government bond holdings are much riskier. *74%* of the total amount of these bonds has a lower medium grade; *10%* are considered speculative and have a non-investment grade; and *16%*, which is the Greek sovereign debt, represents an investment with substantial risks.

Therefore, on one hand, the Euro system's exit will be easier than the Fed's as it can choose holding the assets till maturity and in this way, its balance sheet will decrease gradually over the next years. Although, on the other hand, the assets that the ECB holds are much riskier. However, in June the Governing Council announced the preparation of an ABS purchase program, which will engage ECB in a new round of QE. Nonetheless, it is not expected the program to be large.

Figure 54

The ECB's government bonds holdings



NOTE: Moody's rating explanation: Baa1, Baa2 – lower medium grade; Ba1 – non-investment grade speculative; Caa1 – substantial risks.
SOURCE: The European Central Bank; Trading Economics.

4.4.3 Exit from the systemic excess of liquidity

The third point in returning to the traditional monetary policy is the reduction of the systemic excess of liquidity that was created in the result of the unconventional measures applied by the central banks. The systemic excess of liquidity has several threats to the stability of the markets, the most important being the risk of high inflation. In this way, when the economy recovers, the central bank has to find a way to neutralize them. There are several approaches to this challenge. On one hand, the central bank can reduce the reserves and so decrease its balance sheet, which was discussed in the previous paragraphs, and on the other hand, it can absorb the excess of liquidity by changing its liabilities portfolio.

This point is very closely connected to the next point of the exit strategy – the return to the traditional monetary policy tool, the policy rates. This is due to the fact that as long as there is a surplus of liquidity in the banking system, the money market rates will be close to the zero lower bound and any changes in the key interest rates will be ineffective in influencing the aggregate demand, the economic activity or the inflation. Therefore, it is very important to set a right

timing and sequence of the central bank's actions. The exit from the systemic excess of liquidity should be initiated simultaneously with the tightening of the monetary policy. Otherwise, the extra reserves will be directed towards the credit markets and may cause their destabilization and in addition, risk of high inflation. On the other hand, a premature absorption of the reserves can cause the re-intensification of the crisis.

The actions that can be done by the central bank, in order to decrease the surplus of liquidity include selling assets from the balance sheet, reverse repo operations, raising the reverse requirements, issuing central bank securities.[115] The simplest choice would be selling assets. In this context, the central bank can sell the government bonds from its balance sheet. Indeed, many central banks purchased government bonds under their QE programs. However, there would be necessary to sell a very large amount of assets, which is connected with several risks that were explained in the previous paragraph (destabilization of the markets, central bank's losses).

The next instruments that can be applied are the reverse repo operations and the issuing of the central bank securities. These tools will not decrease the balance sheet but will change the liabilities portfolio. The two instruments have several advantages. First of all, they can absorb a large amount of liquidity without causing imbalances in the markets. Secondly, they can be implemented simultaneously with the tightening monetary policy. Minegishi and Cournede[116] draw the attention to the fact that, in this case, the repo operations should have a longer maturity and a broad enough circle of counterparties. The option of reducing the systemic excess of liquidity through central bank securities, on the other hand, is not available for all the central banks because not all of them are allowed by law to issue their own bonds.

Another instrument that is analyzed in several studies and recognized as a very attractive tool in decreasing the systemic excess of liquidity is the deposit facility rate. Basically, the central bank can offer an attractive deposit rate and in such a way absorb the liquidity. Moreover, the central bank can also attract longer-term deposits. The deposit facility rate is a traditional tool of monetary policy that is already broadly used by the banks. As in the case of the reverse repo operations, this tool can also be applied together with the tightening conditions of the monetary policy. In addition, due to the liquidity surplus in most of the economies the money market rates

[115] KLYUEV, V.; IMUS, P.; SRINIVASAN, K.; *Unconventional choices for unconventional times: Credit and Quantitative easing in advanced economies,* IMF Staff Position Note, 2009

[116,13] MINEGISHI, M.;COURNEDE, B.: *Monetary policy responses to the crisis and exit strategies,* Organization for Economic Co-operation and Development, Working paper, No. 753, 2010

fell close to the deposit facility rates (see Figure 45), in this way making it an important monetary policy tool. Keyster, Martin and McAndrews[117] analyzed the possibility of using the deposit facility rate as a key rate in the monetary policy. They conclude that due to the fact that the value of the short-term money market rate is usually contained between the deposit facility and the lending facility rates, the central banks can influence the economic activity by moving these two rates. This topic continued by Minegishi and Cournede,[118] who also highlight the advantages of this instrument but, at the same time, they warn that the transition to the deposit facility as a key monetary instrument should be communicated and explained to the market participants, in order to obtain the desired result and avoid unwelcomed shocks.

Finally, the last possible instrument is the raising of the reserve requirements, which is an interest-bearing sterilization instrument. The central banks pay an interest in the amount of the main policy rate. Indeed, this is one of the technically easiest ways to sterilize the excess of liquidity in the system. In 2009 the Federal Reserve started paying interest on the reserves held by the deposit institutions. However, the researches don't rely too much on the option of raising the minimum reserve requirements. Klyuev, Imus and Srinivasan,[119] argue that the raise would have to be very significant to drain enough liquidity from the markets. Minegishi and Cournede,[120] agree and add that this tool can be effective in short-term if the amount of loans will start increasing significantly, creating a risk of high inflation.

Briefly, the central bank has a variety of tools that it can use in order to absorb the systemic excess of liquidity. One part of these tools decreases its balance sheet, although bringing several risks. The other half are not as risky and are considered to be more effective but they don't decrease the volume of the balance sheet. Probably the best strategy would be combining the instruments in such a way that the economic recovery and stability would not be affected.

The following graph represents the increase in the excess reserves of the Federal Reserve and the Eurosystem over the past 7 years, from July 2007 till July 2014.

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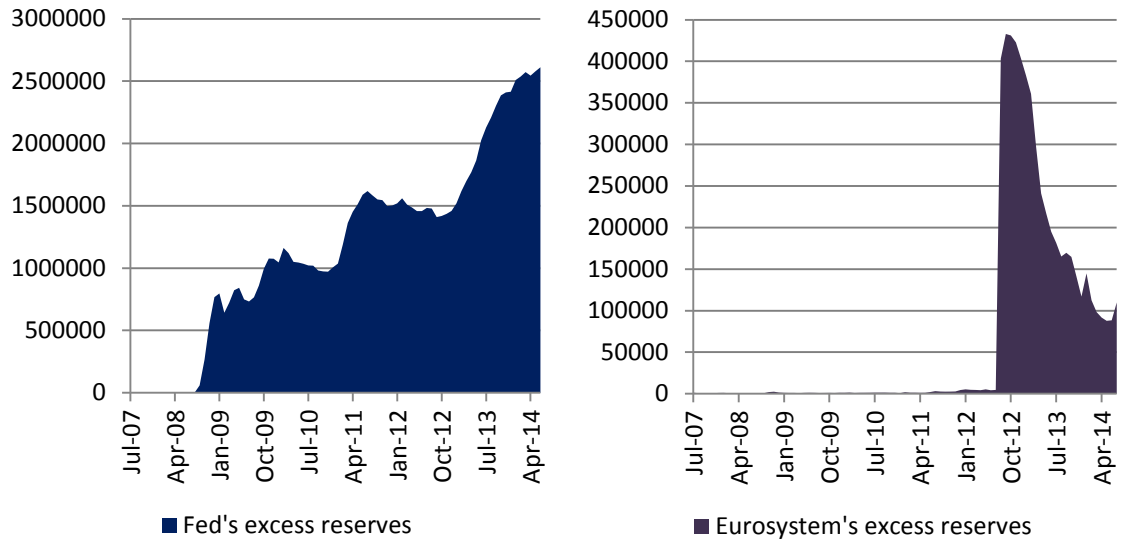
[117] KEYSTER, T.; MARTIN, A.; MCANDREWS, J.: *Divorcing Money from Monetary Policy,* FRBNY Economic Policy Review, 2008

[119] KLYUEV, V.; IMUS, P.; SRINIVASAN, K.; *Unconventional choices for unconventional times: Credit and Quantitative easing in advanced economies,* IMF Staff Position Note, 2009

[120] MINEGISHI, M.;COURNEDE, B.: *Monetary policy responses to the crisis and exit strategies,* Organization for Economic Co-operation and Development, Working paper, No. 753, 2010

Figure 55

The Fed's and Eurosystem's excess reserves (2007-2014)



NOTE: Data on the left graph in millions of dollars; on the right graph in millions of euros.
SOURCE: The Federal Reserve System, the European Central Bank

Fed

As it can be observed from the graph the increase of the Fed's excess reserves is significant. The large change reflects all the measures that the Federal Reserve implemented during the financial crisis – the large-scale asset purchase programs and the liquidity facilities. The Fed will have to implement measures to absorb the liquidity excess from the markets. Considering the large amount of long-term MBS on the left side of the balance sheet – their selling is not the most effective instrument as it is connected with many risks. However, as described above in 2009 the Federal Reserve started paying interest on required reserves and on excess balances, thus implementing one of the technically simplest tools for absorbing the excess of liquidity from the system.

ECB

The Euro system's situation is not as complicated as the Fed's. The increase of the excess reserves can be noticed in 2012, after which it decreases gradually. However, it is important to remember the decreasing trend of the balance sheet volume, due to the maturing of the 3-year LTROs. The exit strategy itself should be conducted gradually through traditional monetary

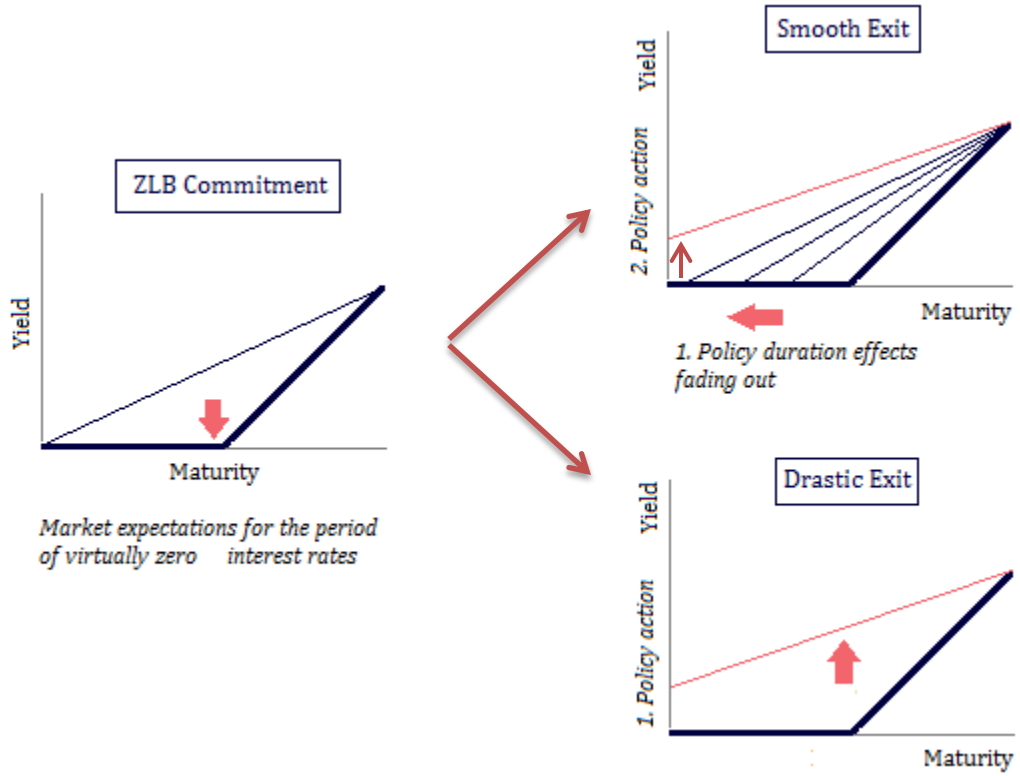
policy operations. However, in the light of the current economic situation in the euro area it is not expected that the ECB will implement the exit strategy any soon.

4.4.4 Exit from the zero lower bound of the interest rates

The last point of the exit strategy and of the return to the traditional monetary policy is the raising of the interest rates by exiting from the commitment to the duration of the zero lower bound. As it was already mentioned above, this strategy should be implemented together with the absorption of the excess of liquidity from the markets and the central bank should communicate to the markets about its policy intentions. Yamaoka and Syed[121] identify two possible exits from the zero lower bound commitment: the smooth and the drastic exit.

Figure 56

The exit from the ZLB commitment



NOTE: The yield curve and the effects of monetary policy commitment
SOURCE: Adopted from Yamaoka and Syed

[121] YAMAOKA, H.; SYED, M: *Managing an exit: Lessons from Japan's reversal of unconventional monetary policy*, IMF Working paper, 2010

The figure above illustrates the two strategies. In the first graph is illustrated the commitment of the central bank to the ZLB policy with the markets expecting lower interest rates for a longer period of time. Under the drastic exit strategy, the market participants can't adjust their expectations and the yield curve shifts up. This strategy can have negative effects on the markets. The smooth strategy allows the market participants to adjust their expectations regarding the future interest rates and the yield curve moves up smoothly, without creating imbalances and shocks on the markets.

The hardest part of the returning to the traditional monetary policy tools is the right timing. This step is strongly connected to the price stability and the inflation expectations. Most of the researches that were mentioned in this chapter agree that the main goal of the central bank is to ensure price stability; therefore, the raise of the interest rates should be done, in the case of a sustainable and significant increase in the consumer prices.

If the timing of this step is wrong there are several risks that can threat the economy. If the raise of the interest rates is premature the risks as recession, deflation and problems in the weak financial institutions can occur. If the raise of the interest rates is delayed this can lead to a surge in inflation. That is why, policy transparency and communication with the market participants is very important to assure a smooth exit.

4.5 The fiscal exit strategy

The current financial crisis had also a negative effect on the fiscal area. The massive increase of the government spending that aimed to support the economy (such as "American Recovery and Reinvestment Act" in USA and "European Economic Recovery Plan" in EU) together with the significant reduction in the budget incomes, resulted in a sharp increase of the budget deficit and of the public debt. That is why, one of the main goals of the authorities today is to stabilize the budget in longer-run. Therefore, one of the basic principles for an effective and stable exit strategy is the co-operation between the monetary and fiscal policy.

Nowadays, the governments of various countries are implementing different programs to reduce the fiscal imbalances and stabilize the budget. All these programs are part of the fiscal exit strategy that has several characteristic features. First of all, it involves the termination of the anti-crisis programs that aimed to stimulate the economy. Secondly, the exit strategy includes a fiscal tightening policy, which has two main components – reduction of the costs, through cutting the transfers and the public spending; and increase of the revenues, by changing the

structure of the taxing policy. In addition, the fiscal exit strategy had an institutional feature, specifically: the strengthening of the fiscal institutions and improving the effectiveness of the public spending. Lastly is the cooperation between the government institutions on an international level.[122]

Overall, by cooperating the countries managed to develop a common strategy of the fiscal exit policy. Moreover, most of them have already started applying the fiscal tightening of the budget policy, which aims to stimulate the economic growth by cutting the public spending. However, these programs have also some weaknesses. Firstly, the programs are not enough detailed, containing just some principle features. Secondly, some of the countries didn't set a clear long-term goal for the budget deficit and the public debt. Moreover, other countries construct their measures package based on longer-term scenarios, which have optimistic assumptions about some macroeconomic indicators. This makes their forecasts not very credible. Therefore, for obtaining of a better forecast and in a result, for application of the right fiscal policy decisions the fiscal authorities have to set clear long-term goals but carefully analyze the current economic situation.

In addition, the researches made on the current financial crisis and the possible exit strategies argue that the monetary and fiscal policy should co-operate while designing the exit strategy. Specifically, Cottarelli and Vinals[123] analyzed the performance of the monetary and fiscal policy under the financial crisis from 1930s in the USA. Their results show that the premature tightening of the fiscal policy made the monetary policy ineffective for several years, thus postponing the economic recovery. Therefore, the tightening of the fiscal policy needs to be connected with the initiation of the economic recovery, when the monetary authorities can also tighten their policy. Moreover, it is important to note that the central bank's exit means for the government that it will have to refinance its debt held by the central bank in the open market, in this way, obtaining funding from the private investors. However, this is connected with several risks. First of all, there can be pressure on the interest rates that may result in a destabilizing effect on the markets. Secondly, there is a potential risk that the funding my not be provided. Therefore, the central bank and the fiscal authorities have to coordinate their actions and, at the

[122] GORUNOV, E.; TRUNIN, P.: *Monitoring the 'Exit Strategy' from a Foreign Country Regime Crisis Measures and Recommendations For the Russian Federation*, Russian Presidential Academy of National Economy and Public Administration, 2013

[123] COTTARELLI, C; VINALS, J.: *A strategy for renormalizing fiscal and monetary policies in advanced economies,* IMF Staff Position Note, 2009

same time, provide an effective communication to the market participants about their intended steps.

4.6 Conclusion

In conclusion, the main challenge for the central banks is to rightly time the exit strategy programs, in order to avoid a surge in inflation or a deflationary trend. Moreover, it is necessary to gradually decrease the size of their balance sheets eliminating the riskier and less liquid assets. To successfully achieve this goal, the central banks have to be professional, disciplined and implement a transparent monetary policy. In addition, the effectiveness of the exit strategy can be guaranteed only by constant communication of the central bank with the market participants that can assure an effective influence of the market expectations. Moreover, the monetary authorities have to co-operate their actions with the fiscal institutions as this can guarantee a smoother exit strategy, both in the fiscal and monetary sectors.

The Federal System already started the exit strategy with the termination of the special funding facilities. It is expected that in October 2014 the Fed will announce the closing of the QE3 and the further direction of its monetary policy. The exit from the big share of illiquid assets will be more challenging because the Federal Reserve on its balance sheet holds $ 1,67 trillion of long-term MBS. However, the Fed doesn't need to sell all of these assets because according to its original monetary policy, the securities held outright fully cover the amount of currency in circulation. In addition, the Fed already started the exit from the systemic excess of liquidity by introducing in 2009 the interest on required and excess reserve balances.

The European Central Bank's exit strategy will be much easier and smoother as it didn't apply such an aggressive unconventional monetary policy as the Fed did. The absorption of the surplus of liquidity and the decrease of the balance sheet's size can flow naturally without any special instruments. The assets on the Eurozone's balance sheet are much riskier than on the Fed's but their quantity and maturity are much smaller. However, the current economic environment with the low inflation don't allow the ECB to move towards the exit strategy and therefore, it will engage in a new round of unconventional measures to support the markets.

Conclusion

The Great Recession, which affected the world's largest financial institutions and the major world economies, showed that the traditional monetary policy that was applied by the central banks, failed in helping the financial institutions and in stimulating the economic activity. At the outbreak of the crisis the central banks reacted by lowering their main policy rates close to the zero lower bound, aiming to encourage the economic recovery. However, the expected result wasn't achieved and the central banks turned to less conventional monetary policy measures.

The Federal Reserve's unconventional monetary policy that was implemented for the last 7 years can be generally divided in two phases. The first one was a first aid phase when the Federal reserve reacted very promptly to the upcoming crisis, the decisions were taken very fast and there were implemented a number of liquidity and credit programs like: TAF, TSLF, PDCF, the support of several financial institutions, including Bear Stearns and AIG. The main purpose of these programs was to inject the liquidity in the markets. This was achieved through the prolonged loan term and broadened eligible collateral that was offered by the new facilities to a larger number of market participants. However, all the decisions taken were not systematic; they could be described more as responses to certain problems that appeared in the markets.

On the contrary, the second phase of the monetary policy was more organized; the Federal Reserve had a fixed goal that it was targeting with the help of well-thought programs: QE1, CPFF, TALF, QE2, MEP, and QE3. The first round of quantitative easing was an outstanding success as at that time the markets were short of liquidity. The program supported the economic activity by influencing the long-term interest rates (10-year Treasury, MBS, GSE, Swap rate, Baa corporate bond), especially through the signaling channel; the biggest impact being observed during the first two important announcements made on 25.11.2008 and 1.12.2008. Moreover, the QE1 improved the market liquidity and removed the high-risk assets from the investors' portfolios. In addition, it ameliorated the conditions in the mortgage markets – the mortgage rate decreased by *5%* during a year after the initiation of the program.

The QE2 wasn't such a big success as the QE1 was, but it definitely had some strong points. First of all, it accomplished one of its main goals – the rising of the inflation expectations, saving the U.S. economy from Fed's fear of a deflationary trend. Secondly, another positive effect of the QE2 that can be noted is the depreciation of the dollar, which consequently had a positive, stimulating effect on the economy. Moreover, it raised the equity prices through the portfolio

rebalancing channel. However, the effect on the longer-term real interest rates was less pronounced as in the case of QE1.

The next measure – the Maturity Extension Program wasn't a quantitative easing program; however, it also positively stimulated the economy. It achieved its primary goal in bringing down the long-term interest rates, even if the effect was relatively moderate. Although, the effects on the long-term interest rates were not long-lasting and vanished within a month.

The QE3 was also not as successful as the QE1; however, the overall effect of the QE3 program can be appreciated as a positive one. The program also helped in lowering the long-term interest rates but the effect was short-term, being observable mostly just on the important announcements dates and disappearing shortly after. Another benefit of the QE3 is that it affected the U.S. Dollar by depreciating it. The weakened currency is a stimulus for the exports and the economic growth. Officially the QE3 is still continuing, however, the Federal Reserve started tapering the purchases since January 2014.

The European Central Bank' unconventional monetary policy approach focused mainly on the repairing of the dysfunctional markets by restoring the effective functioning of the monetary policy transmission channels. From the outbreak of the crisis till 2014, the ECB faced numerous challenges starting with the financial disorders and the crisis itself, followed by the sovereign debt crisis till 2014, and its re-intensification and moreover, the decreasing inflation in the past years, which altogether made the task of the central bank much more difficult.

The ECB's initial response to the financial crisis can be characterized as a more active liquidity management policy marked by large-scale liquidity operations against a larger range of collateral, given by the changing requirements on the collateral quality, like: periodic fine-tuning operations, LTROs with an increased value and maturity, and new measures for providing liquidity on the Eurodollar interbank market, like central bank liquidity swaps. The main goal of these actions was to provide liquidity, in order to support the transmission channels of the monetary policy.

During 2008-2009 the ECB continued focusing on restoring its monetary transmission mechanisms and supporting the banking sector, mainly through expansion of the amount of refinancing, by switching it to a fixed-rate full allotment tender type, by expanding the eligible collateral, by increasing their maturity, by reinforcing the swap arrangements with other central banks. All these actions helped easing the conditions in the liquidity markets. The ECB achieved

its goal to decrease the spread between EONIA and the main refinancing rate. The next measure that was implemented during this period of time was the Covered Bond Purchase Program. The CBPP was successful in stimulating the activity in the covered bond markets, by reducing the covered bond swap spreads to the pre-Lehman collapse level. It is important to note that he liquidity providing measures implemented by the ECB in 2008-2009 differentiated it from the Fed that injected liquidity in the system by buying assets.

The next measure applied in response to the euro area sovereign debt crisis – the Securities Markets Program was already a quantitative easing program. The SMP was successful in restoring the balance in the markets, supporting the excessive supply of sovereign bonds in the euro area sovereign bond market and decreasing the spreads between the 10-year government bonds of Spain, Italy, Greece and Portugal over the 10-year German Bund, however its effects were not long lasting.

In the light of the re-intensification of the sovereign debt crisis, the ECB implemented the CBPP2, which however, had a relative success in stimulating the activity in the covered bond market, being not as successful as CBPP1. The CBPP2 influenced the covered bond yields by decreasing them and managed to increase the demand for covered bonds, however, not managing to influence their issuency in the the primary market.

In addition, the ECB implemented two 36-month LTROs that had a positive effect on the economy by stimulating the activity in the financial markets and providing stable funding to the banks, and thus, influencing the credit flows in the economy. Particularly, the 3-year LTROs decreased the 6-month and the 1-year EURIBOR rate by, respectively 134 and 145 basis points; and stimulated the lending activity to the non-financial intuitions and households.

The OMT also had a positive effect on the economy through the signaling channel. The key announcements of the program managed to decrease the spreads between the 10-/2-year government bonds of Spain, Italy, Greece and Portugal over the 10-/2-year German Bund.

The last monetary policy measure applied by the ECB – the forward guidance was not so successful. In the first phase it positively affected the conditions in the money markets; however, at the beginning of 2014 EONIA became very volatile. Moreover, the forward guidance didn't manage to change the decreasing long-term inflationary trend. Therefore, in June 2014 the ECB announced a new wave of unconventional measures that will be applied further and will create an additional excess of liquidity in order to decrease the tensions from the markets.

The unconventional monetary policy measures that were applied by the two central banks helped in stabilizing the financial markets and the overall economic conditions. However, these policies also created certain imbalances. Therefore, the separate tools of the exit strategy would have to target these imbalances, specifically: the over-reliance of the market subjects on the central bank's funding; the high share of illiquid assets in the central bank's balance sheet; the systemic excess of liquidity; and the inability to use the interest rates as the main monetary policy tool.

The exit strategy of the Federal Reserve System already started in 2010, when a part of its special refinancing operations was terminated. By 2012 the Fed exited from the special refinancing operations as the last loans were repaid. The exit from the big share of illiquid assets will be more challenging as the Federal Reserve on its balance sheet holds $ 1,67 trillion of long-term MBS. However, the Fed doesn't need to sell all of these assets because according to its original monetary policy, the securities held outright fully cover the amount of currency in circulation, which by August 28, 2014 was $ 1,28 trillion. Therefore, the Fed can combine an active and passive strategy, when reducing the share of the illiquid assets. The absorption of the excess liquidity from the system the Federal Reserve initiated in 2009, when it started paying interest on required reserves and on excess balances, thus implementing one of the technically simplest tools for extracting the excess of liquidity from the system.

The exit of the European Central Bank was also started with the exit from the special refinancing operations through early repayments of the 3-year LTROs. However, in June 2014 the Governing Council extended the special liquidity-providing conditions and created TLTROs, which means that the exit will be postponed. The exit from the big share of illiquid and risky assets for the ECB will be less challenging as its asset-purchase programs were much smaller than in the Fed's case and the its assets have a significantly smaller maturity. However, the assets that the ECB holds are much riskier than the Fed's. Nonetheless, in June the Governing Council announced the preparation of an ABS purchase program, which will engage ECB in a new round of QE.

In conclusion, I believe that the unconventional monetary policies that were applied over the past 7 years had a positive effect on the economy, preventing its collapse and stimulating different segments of the markets. However, the aftermath of the crisis is still being felt today. Moreover, the non-traditional policies created certain imbalances in the markets. Therefore, the most important question that needs to be addressed today is the design of a right exit strategy

that will allow the central bank to return to the traditional monetary policy tools. This strategy needs to be orchestrated according to the specific features of each economy, taking, as well, in consideration the possible risks. The exit strategy has to be rightly timed and the central bank has to conduct a transparent monetary policy and effectively communicate all its decisions to the market participants. The measures implemented under the exit strategy have to target the imbalances created by the non-standard monetary policy tools and have also to take in account the fact that these imbalances are strongly connected. A question that is still left open is whether the central bank has to return to its pre-crisis monetary policy or create a new monetary policy architecture.

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