The money multiplier in Eurozone: an analysis of its fluctuations and their consequences on ECB’s monetary policy

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Abstract

The aim of this paper is to analyse the monetary policy of the European Central Bank during Eurozone debt crisis. The analysis will be conducted through the money multiplier framework, with the implementation of a model that allows the study of financial sector’s behaviour and its consequences on the monetary policy transmission mechanism. Then, the ECB’s action will be compared to the ones of the Federal Reserve and of the Bank of England and it will be deeply examined. The paper will finally address the measures taken in the last years, with special regards to the LTROs and to the recent reaction to low inflation, and will inspect their consequences on the monetary policy and therefore on the economy. As a result of the study of money and credit aggregates, the paper will conclude that the ECB has been slow in reacting to the lowering of inflation and that this lack of action could have severe consequences, although the recent package of measures seems appropriate to tackle the dangerous deflationary downswing occurring in Eurozone.
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Introduction

Monetary policy and theory have experienced a radical overturn during last years. From being an austere and sober discipline, mostly - and willingly - unknown to the greater public, it transformed into an everyday topic of policy discussion in newspapers and magazines, where central bankers committed themselves to specified targets. Why did this happen? Because after the greatest financial crisis of ever, as former Fed President Ben Bernanke said, the central banks all over the world had to invent themselves again.

Reached the zero-lower bound, central bankers had to experiment unconventional measures of every sort. The majority of central banks focused on broad asset-purchasing programs, called Quantitative Easing (QE). By contrast, the European Central Bank, the object of analysis of this paper, did not so and focused on acting as a substitute of the impaired interbank market, supplying liquidity to the banking system. This was due to three peculiarities of the Eurozone system:

- **Financial**: the financial system is heavily weighted down the banking sector.
- **Institutional**: ECB’s mission is to ensure *price stability* above others goals. The Federal Reserve, for instance, has also the goal to reach full employment, in addition, ECB has always followed the *separation-principle*.
- **Political**: the Eurozone is not politically united and it does not have a supranational Treasury Ministry to coordinate fiscal policy.

Moreover, the 2008 financial crisis hit the European financial system more moderately than, for instance, the American one, where the distress originated. But after a recovery in 2010 and early 2011, the confidence of the market dropped again and the Eurozone knew its most difficult time in the so-called *debt crisis*. The periphery countries of Europe suffered a dramatic rise in the yield spreads between their sovereign bond and the German Bund, that was seen as a safe haven. As a result, the Eurozone almost split up into “northern” countries, with almost all AAA-credit ratings on their sovereign debt, and “southern” countries (like Greece, Portugal, Spain, Italy) that saw the government deficit surge and therefore risked the default on their debt, under financial markets’ high pressure.

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2 See Chapter 3.1.
This heterogeneity inside the same monetary union made the work of the European Central Bank one of the most difficult ever faced by a central bank. It had to react to impelling liquidity needs of banks, to fight a dangerous credit-crunch and restore investors’ confidence, in an environment of strong political debate between Eurozone members. Such heterogeneity should always been considered when analysing ECB’s monetary policy, in order to evaluate also the political and institutional feasibility of its measures.

The study on ECB’s monetary policy arose in this environment and, as its President Mario Draghi said, “The ECB has grown a lot during the crisis”. It was therefore natural to adapt, in a detailed manner, the money-multiplier model to the Eurosystem, and this is actually the core of this paper. In addition to the differences described above, in fact, the ECB presents some technical peculiarities. By calculating the money multiplier and examining monetary aggregates, we will have a well-rounded framework to analyse monetary policy during the recent crisis.

We will be able to ask ourselves, as a consequence, if the monetary policy stance of the ECB, that has been exceptionally accommodative during the last years, has been effectively accommodative enough to tackle the arising threat of deflation in Eurozone. This is obviously still an open question, as too little time has passed to give a definitive answer.

About the structure, the author divided this paper in four chapters. After this Introduction, we will quickly remind on Chapter 1 some relevant topics on monetary policy theory and review the standard model for the money multiplier, expanding a little on the academic debate over it. On Chapter 2 we will adapt this model to the Eurozone, and then analyse money multiplier fluctuations and the effects on money aggregates. We will compare on Chapter 3 ECB’s monetary policy to the ones of the US Federal Reserve and of the Bank of England. Finally, on Chapter 4 we will study ECB’s reaction to deflationary pressures in the Eurozone and examine the possibility of an European quantitative easing. On the conclusive remarks we will shortly recall the main points of this paper, and highlight some policy implications of the research.

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1 The money multiplier

1.1 Money aggregates and monetary policy

Analysing monetary aggregates has always been fundamental in order to understand the effective stance of the monetary policy, and thus its effects on macroeconomic aggregates. But it is not simple, because first there is not a single agent involved in the process of money issuing, and second we have to specify accurately what we consider for money.

According to the recent theory, money is anything that is generally accepted as means of payment for goods or services or in the repayment of debts. As a result, it is a vague concept. If we can be sure to consider coins, banknotes and equivalents (from now called currency in circulation) as money, it is up to different interpretations to what extent include deposits, i.e. to what maturity.

As the area of interest of this paper is Eurozone, we will analyse European Central Bank’s framework and system. The ECB is not the single actor in the monetary policy, because it is assisted in its implementation by national central banks. National central banks and the ECB form together the so called Eurosystem. Eurosystem defines and monitors three different liquidity degrees of money, in decreasing order of liquidity:

- **M1**: includes currency in circulation + overnight deposits; it is the narrowest definition of money.
- **M2**: includes M1 + deposits with an agreed maturity of up to two years + deposits redeemable at a notice up to three months.
- **M3**: includes M2 + repurchase agreements + money market fund shares + debt with a maturity up to two years; it is the broadest definition of money.

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Money supply relevance notwithstanding, the Eurosystem cannot control it directly. In a fractional-reserve system indeed the central bank influences the liability side of his balance sheet, that is composed by currency in circulation plus the current accounts of the financial institutions that keep reserves with the central bank. In case of the Eurozone, on the liability side of ECB’s balance sheet we have also the deposit facility, a facility where Monetary Financial Institutions (from now “MFIs”) can deposit excess liquidity obtaining an interest rate set by the ECB. Thus the balance sheet of the ECB is approximately the one described in the table below.

### 1.2 ECB’s Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinancing to credit institutions</td>
<td>Currency in circulation</td>
</tr>
<tr>
<td>Marginal lending facility</td>
<td>MFI’s holdings on current accounts (Reserves)</td>
</tr>
<tr>
<td>Net foreign asset</td>
<td>Deposit Facility</td>
</tr>
</tbody>
</table>

The liability side of the balance sheet is called monetary base (or base money). The central bank has the monopoly of the creation of base money, and thanks to that

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5 Monetary financial institutions (MFIs) are central banks, resident credit institutions as defined in Community law, and other resident financial institutions whose business is to receive deposits and/or close substitutes for deposits from entities other than MFIs and, for their own account (at least in economic terms), to grant credits and/or make investments in securities. Money market funds are also classified as MFIs. (ECB, 2011)
it has the power to control his interest rates and thereby to influence the funding cost of banks, providing or draining liquidity in the money market. Monetary policy decisions affect thus the monetary base and interest rates, and economic expectations. These are the instruments, or targets, through which the monetary policy can influence the economy in general, and the price level in particular, given the widely accepted long-run neutrality of money. This process is called monetary policy transmission mechanism, constituted of a number of mechanisms and actions by economic agents that ultimately influence the development of economic activity.

The monetary policy transmission mechanism is complex, it involves several economic agents and there is no unique view about all the aspects involved in it. It is indeed fundamental and it should work correctly, otherwise the central bank would be like a puppet master with cut strings. The ECB, for instance, launched two government–bond purchasing programmes, the SMP and OMTs, and as Bruegel (2014) notes “both were motivated by the goal of restoring the monetary transmission mechanism”.

1.2 The standard theory of money supply

Although the central bank can control only the monetary base, it is the money supply that in monetary quantities matters the most. This is a point of strong relevance and we should always consider it. But we have seen that the money supply is something different from the monetary base, thus the central bank cannot determine it alone.

The relation between the money supply and the monetary base is expressed by the money multiplier. More precisely, the money multiplier describes how many times the money supply multiplies the base money. Why does this happen?

To understand the money supply process we have to introduce the concept of multiple deposit creation. Let us now suppose that a central bank conducts an open

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market operation with Bank A, i.e. the ECB buys 100€ of bonds from Bank A (with a repurchase agreement, i.e. the commitment from the bank to buy the bond at a certain time at a certain price from the ECB). To pay the price, ECB credits Bank A 100€ in his current account at the central bank, in the form of reserves. With this grown liquidity accounted as reserve, Bank A can lend up to 100€. When the bank then makes the loan, it credits the borrower 100€ in a deposit account. At this moment – not before – the money is effectively issued, because the money supply is composed by deposits and not by banking reserves.

In a banking system, the bank who receives the liquidity from the ECB, Bank A, can loan the amount to another bank, let us say Bank B, who in turns can lend to Bank C, ..., etcetera. This is the multiple deposit creation, because every time the money is lent the amount is credited in a deposit account, thus money is created. In other terms, the more the liquidity lent by the central bank circulates among banks, the more money is ultimately issued.

Thus, in the money supply process banks and financial institutions in general play a decisive role, sometimes even bigger than the central bank itself. The money created is called by some economists “fountain pen money”\(^8\), issued “at the stroke of bankers’ pen when they approve loans” (BoE, 2014).

Having said that, this model is far too optimistic, because it is built upon three unrealistic assumptions:

- there is no reserve requirement: on the contrary, multiple deposit creation cannot last endlessly, because banks must satisfy a reserve requirement with the central bank, and thus can lend only \((1-r)\) of the new deposits they receive.\(^9\)
- banks do not keep any excess reserve: in contrast, banks do not always lend all the amount in excess of the reserve requirements, but sometimes they keep excess reserves at the central bank, essentially for precautionary or liquidity reasons.
- there is no holding of currency: in reality not all the amount borrowed is held in deposits, but a part of it is used to increase the holding of currency;


\(^9\) where \(r\) is the reserve requirement, a percentage of the deposits entrusted at the bank.
currency has trivially no multiple deposits expansion capability, only deposits have a multiplying effect, and because of that the more the economy holds currency the smaller is the multiple effect.

Therefore, it is needed a deeper analysis of the money supply process, and a more analytical study of the money multiplier, that can be obtained with the following mathematical derivation\textsuperscript{10}.

The relationship between the money supply and the monetary base is expressed by the following equation:

\[ M = m \times MB \]

Where \( M \) is the money supply, \( MB \) the monetary base and \( m \) the money multiplier.

Reserves with the central bank can be split into required and excess reserves, thus:

\[ R = RR + ER \]

And for money supply we consider\textsuperscript{11}:

\[ M = C + D \]

According to the list above, we see that there are three factors that influence the money multiplier:

- required reserve: it is expressed by the required reserve ratio \( r = \frac{RR}{D} \)
- excess reserve: it is described by the excess reserve ratio \( e = \frac{ER}{D} \)
- currency holding: represented by the currency ratio \( c = \frac{C}{D} \)

If the monetary base is \( MB = R + C \), it can be rewritten as:

\[ MB = (r \times D) + (e \times D) + (c \times D) = (r + e + c) \times D \]

That is:

\[ D = \frac{1}{r + e + c} \times MB \]

Using the definition of money supply as currency plus deposits, we obtain:

\[ M = \frac{1 + c}{r + e + c} \times MB \]

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\textsuperscript{10} From Mishkin, F. (2010)

\textsuperscript{11} Later on we will discuss what kind of deposits.
The money multiplier \( m \) is, thus:

\[
m = \frac{1 + c}{r + e + c}
\]

That is an elegant, and clear, description of the factors influencing it. The money multiplier is inversely correlated to the required reserve ratio, to the excess reserve ratio and to the currency ratio. So, if monetary base is held constant, the money supply is affected by these factors.

Generally speaking, the money multiplier should be bigger than 1, that is why the monetary base is sometimes called *high-powered money*: a €100 change in the base money increases the money supply for more than €100. This is true except for particular moments of recessions, as M.Friedman and A.Schwartz (1963) noted for the Great Depression of the 1930s and Von Hagen (2009) and others pointed out for the Great Recession of 2008.

The money multiplier model here presented is just a mathematical derivation, and a logical identity. The interpretation of the money multiplier though has been very controversial during last decades, with different views from prestigious scholars. Sometimes it was described as a rigid and constant parameter. Other times it was treated as a simple inequality, an upper bound to the money creation, and not an equality that precisely indicates the amount of money that the central bank can create with a change in the monetary base. In the next chapter we will review some relevant academic contributions to the debate.

### 1.3 The debate over the money multiplier

One of the first great contribute to the concept of money multiplier came from the monetarist school. Milton Friedman and Anna J. Schwartz’s (1963) *A Monetary History of the United States* was a widely acclaimed contribution to the study of monetary policy and especially of the causes of the Great Depression. According to them the magnitude of the crisis, the biggest of the XX\(^{th}\) century, was mainly due to the lack of reaction by the Federal Reserve to the severe monetary collapse,
a reduction of one third of the money supply from 1929 to 1933\textsuperscript{12}.

This concept was thoroughly described in the milestone work of the two economists, with the description of the dynamics of money aggregates during the crisis. We can say that this was a major contribute to the money multiplier concept because the book explains how, while the monetary base remained almost steady during the period, the money supply shrunk because of the fall in the money multiplier. The money multiplier dropped because of the rise in the excess reserve ratio and especially of the currency ratio, that nearly doubled from being 0.20 to 0.40.\textsuperscript{13}

1.3 CURRENCY AND RESERVE FACTORS IN THE GREAT DEPRESSION

Monetarists in general have always supported an important role of money in the transmission mechanism\textsuperscript{14}, with the important role of the bank lending channel, that “suggests that changes in open market operations and the quantity of reserves directly affect the amount of lending that banks can do.” (Carpenter et al, 2010) This is the main feature of the Reserve Position Doctrine (RPD), an approach that has dominated the academic world for decades. According to this theory, an increase in reserves at the central bank is associated to an increase of loans.


\textsuperscript{14} S. Carpenter and S. Demiralp (2010): Money, Reserves and the transmission of monetary policy: does the money multiplier exist?, Finance and Economics Discussion Series, n. 41, Division of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington D.C.
Several arguments have been raised against the monetarist faith in the central bank as a key player in the money issuing process. Especially in the last years, arguments in support of the *endogenous* theory of money have been raised in papers from central banks themselves, like the Federal Reserve Board’s paper of 2010 and the Bank of England’s insight in the Quarterly Bulletin of 2014, both above quoted.

As the Fed points out, in fact “in the past couple of decades, New Keynesian models used for macroeconomic policy analysis have excluded money”, stating therefore that “the assumed link in the textbook version of the money multiplier between the creation of loans and the creation of demand deposits is dubious. […] The data do not reflect any such link.” (Carpenter et al, 2010). This lack of relation might have been caused by the recent launch of quantitative easing programs by some major central banks, that increased dramatically the quantity of reserves balances, without directly influencing the credit issuing process.

In addition, McLeay *et al* argue even that “in contrast to descriptions found in some textbooks, the Bank of England does not directly control the quantity of either base or broad money” (BoE, 2014). It naturally follows that his academic view is often called *endogenous theory of money*.

Another view of the money multiplier could be a synthesis between the two previous ones. The money multiplier has often been interpreted as a rigid and constant relation on which central banks could rely upon, increasing the money supply simply leveraging on reserve balances. But as the Goodhart’s Law illustrates, “any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes”15. Thus, the money multiplier should not be considered as a rigid relation, but as a simple framework of analysis. If the money multiplier is viewed as a variable, it can become a tool through which we can analyse the different roles of the financial players who contribute to the money-issuing process, and as a consequence study the monetary policy transmission mechanism and the effective stance of the monetary policy.

This is the approach of this paper, and we will study the money multiplier dynamics in Eurozone in the next chapter.

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2 The monetary dynamics in Eurozone

2.1 The money multiplier of the Euro: a theory

We have seen in the first chapter the standard theory of the money multiplier, as it is generally taught in the vast majority of macroeconomics and monetary economics textbooks. This is unfortunately often related and inspired to the Federal Reserve system in the USA, therefore it should be readapted to the Eurosystem if we want to analyse the monetary policy and its transmission mechanism in Europe.

The main difference is the presence of an original facility in the Eurosystem, namely the deposit facility. This tool is used by the MFIs to deposit excess liquidity for an overnight maturity, remunerated at a rate that is normally 50 basis points under the Main Refinancing Operations interest rate; as a result, it is considered the floor of the money market overnight rate, while the ceiling is the marginal lending facility rate (ECB, 2011).

While in the Federal Reserve system the excess liquidity is entirely held in reserve accounts, on which Fed pays interests since 2008 (these excess reserve are added to the required reserve evaluated as a percentage of deposits), in the Eurozone the excess liquidity can be both stored in the deposit facility, where the ECB pays interests, or treasured as excess reserve in the reserve account. In the latter case the ECB pays interests only on required reserves, while no interests are paid on excess reserves. As a consequence, according to Bindseil et al (2003) “there is in fact no a priori rationale for excess reserves since [...] it always pays to deposit them at the deposit facility.” In the Eurozone thus “the only reason for excess reserve can be that a bank does not care, or that the transaction costs associated with the recourse to the deposit facility are higher than the remuneration expected from placing those funds in the deposit facility.”16 This is the - logical - theory, and we will see later how the excess reserve grew dramatically only after the deposit facility rate was brought to zero.

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In order to evaluate and study the money multiplier in the Eurozone, we have to adapt the model above presented to the ECB system of reserves and excess liquidity. In the money multiplier an important factor is the excess reserve ratio, \( e \), that is calculated as

\[
e = \frac{ER}{D}
\]

This represents the excess liquidity in the banking system, i.e. liquidity that is stored in central bank accounts essentially for precautionary reasons and not used for loans or in the interbank market. To represent the equivalent factor in Europe we have to consider that excess reserves alone does not take account of all the excess liquidity, but we have to include also the recourse to the deposit facility.

Thus, building on Perotti (2013), we can evaluate the daily excess liquidity as:

\[
DEL = ER + DF
\]

We can thus simply consider the monetary base as follows:

\[
MB = DEL + RR + C
\]

And as a consequence we extract the money multiplier:

\[
m_i = \frac{1 + c}{el + r + c}
\]

Where

\[
el = \frac{DEL}{D_i}, \quad r = \frac{RR}{D_i}, \quad c = \frac{C}{D_i}
\]

and \( i = M1, M2, M3 \)

The subscript \( i \) wants to identify the different measures of money. As we saw in paragraph 1.1, there are three definitions of money, that go from the narrowest, M1, to the broadest, M3. In order to analyse thoroughly the dynamics of money and its multiplier during the Eurozone crisis, we will investigate the behaviour of different money multipliers in the next paragraph.

### 2.2 Money multipliers in the Eurozone crisis

First of all, we should clarify what we mean for Eurozone crisis. While Eurozone suffered recession in 2008-2009 after the collapse of Lehman Brothers and the
surge of the international financial crisis, this crisis was not originally caused in Europe. Thus we consider the Eurozone crisis, that to some extent is still ongoing at the moment of redaction of this paper, the second recession occurred in the last years in Europe, the so-called debt crisis occurred in 2011-2012. This recession, suffered especially in the countries of the so-called periphery of Euro, was mainly due to problems with refinancing sovereign debts, fears of a contagion through European countries and, eventually, tangible risks of a break-up in Eurozone.

The partial solution to this crisis can be recognised in the intervention of the European Central Bank. On 6 September 2012 ECB’s President Mario Draghi announced the Outright Monetary Transactions program (OMT), through which it offered bond purchasing programs for all the European countries involved in the sovereign debt crisis. This program would have been subjected to the conditionality of an EFSF/ESM program, i.e. implied some loss of sovereignty for countries that would have asked for it. Although no countries asked for ECB’s intervention, the simple credible announce of a central bank ready to purchase government debt eliminated the “bad expectation equilibrium” that was making staggering the Eurozone.\(^\text{17}\)

2.1 EUROZONE 10 YRS BOND YIELDS

![Eurozone 10 Years Bond Yields](image)

Source: ECB (2014)

As we can see from the graph above, the beginning of the debt crisis can be pointed out from 2010, when Greek bonds’ yields skyrocketed. The true risk of a break-up of Euro and the recession itself though started at the second half of

2011, when bigger countries like Spain and Italy were severely hit by the debt crisis. The normalisation of the bond yields happened gradually after ECB’s intervention and from 2013, though as we will see later on the Eurozone economy lacked recovery and, eventually, risked deflationary scenarios.

Calculating the money multiplier in the way here presented earlier, we obtain an insightful framework of analysis. We will generally analyse in this paragraph the dynamics of the M1 and M3 money multiplier, following ECB’s practice of confronting M1 and M3. The latter can give a broader definition of money, being also “less affected by substitution between various liquid asset categories than narrower definitions of money, and is therefore more stable”\(^{18}\).

As we can see from figure 2.2, the money multiplier in Europe decreased sensibly during the Eurozone crisis, especially with regard to the M3 multiplier.

### 2.2 EUROZONE MONEY MULTIPLIERS

![Money Multipliers Graph](source: ECB Statistical Warehouse)

The drop in the money multiplier happens in the middle of 2011, that is when the debt crisis expands to bigger and of more relevance countries like Spain and Italy. This fall in the money multiplier was entirely due to the dramatic rise of the excess liquidity factor in Europe, as the Figure 2.3 clearly imply. The money multiplier started to recover from 2013, when we will see in the next paragraph that commercial banks started to give back LTROs funds, that formed the greatest part of the excess liquidity.

\(^{18}\) European Central Bank’s definition of euro area monetary aggregates, www.ecb.europa.eu
2.3 M3 MONEY MULTIPLIER FACTORS DURING EUROZONE CRISIS

The *el* factor surged from 0.0024 at June 2011 to 0.089 at April 2012, thus in less than one year grew more than thirty-seven times, and the excess liquidity rose up to be almost 9% of the M3, i.e. the broadest definition of money. This means that a huge amount of liquidity was parked at ECB in form of excess reserves or deposit facility, and not employed for loans or in the interbank market. If we notice that in April 2012 the excess liquidity ratio almost reached the currency ratio, we have to think that in those days the amount of liquidity dropped off at the central bank was almost equal to *all* banknotes and coins in Eurozone, that give the feel of the level of panic of European banks.

2.4 EUROZONE’S EXCESS LIQUIDITY

Source: ECB Statistical Warehouse; € millions
The excess liquidity was mainly left to the deposit facility until July 2012. Then the ECB cut the interest rates of the deposit facility from 0,25% to 0,00%, and banks decided to move immediately half of the liquidity there treasured to the reserve accounts, that counted almost no excess reserves until that moment. As we said earlier, in normal times in Eurozone there is no reason to hold excess reserves, as they are not remunerated, in contrast to the interest paid on deposit facility. This rule is respected until 2012, in fact there is no blue area in the figure 2.4 before the cut in the interest rate in the deposit facility. After the cut, the excess liquidity is simply moved to the current accounts at the ECB. As the figure shows the excess liquidity overall decreases only from September 2012. It is not a surprise, because we should remember that in those days Mario Draghi launched the OMT program that eventually normalized the Eurozone debt crisis. The downward path speeded from 2013, when banks throughout Europe start to give back in advance the portion of LTROs funds deposited at the ECB until that moment.

2.3 Money growth, LTROs and credit supply

As we saw earlier, the dramatic rise of the recourse to deposit facility and excess reserves contracted the money multiplier, but fortunately this did not transfer in a contraction of the money supply.

The monetary base in fact, as the figure 2.5 shows, increased sharply from July 2011. As a consequence, the money supply continued to grow at the precedent pace, the drop in the money multiplier notwithstanding. The monetary base was expanded of more than 60% in less than one year due to two unconventional programs by ECB: the Securities Markets Program (although the operation was “sterilized”, it counts as well in the monetary base19), that was extended to Italian bonds from August 2013, and the two rounds of 3-years fixed rate LTROs of December 2011 and February 2012. But as Pisani-Ferry and Wolff (2012) note, “If the expansion of the monetary base was simply the counterpart of a drop in

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19 See Perotti (2013)
the monetary multiplier, there is no reason to consider that it has had an impact on the economy, […] beyond the banking system”²⁰.

### 2.5 Money Dynamics in Eurozone Crisis

The out-of-ordinary 36-months LTROs in fact had a huge impact on the behaviour of reserves and on monetary aggregates in general, feeding European banks with a substantial amount of liquidity. But “large portions of this liquidity, however, were parked in overnight deposits at the ECB, reducing its effectiveness for the overall monetary policy stance” (Pisani-Ferry and Wolff, 2012).

Represented by the red line above, we can easily notice that LTROs dynamic is very similar to the one of the monetary base. This great amount of liquidity was mainly lent to Eurozone periphery banks (Italy and Spain together borrowed approximately 55%, according to Perotti (2013)), that used it as a substitute for interbank market and increased their holding of sovereign local bonds. Broadly speaking, we can say that southern European banks “used the LTRO funds to make a simple carry trade with their own sovereign bonds” (2013). The excess liquidity parked at ECB by contrast appeared to come essentially from core European banks. As a matter of fact, according to Perotti (2013), only 40% of deposit facility use came from banks that borrowed funds from ECB.

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To conclude, LTROs have had an important role in stabilising the banking system. They played, in addition, a crucial part in lowering government spreads throughout Europe, thanks to the massive bond-buying by periphery banks. And eventually they probably prevented a collapse in the banking funding process, that could have had very severe consequences in Europe.

On the other hand, LTROs probably failed in their main goal, that was to enhance credit conditions, and thus have had little effects beyond the banking system, therefore on loans and money supply.

2.6 LOANS: NON-MFIS EXCLUDING GENERAL GOVERNMENT

Source: ECB Statistical Warehouse, one-year % change
3 Money multiplier and monetary policy in USA and UK: a comparison with Eurozone

3.1 Quantitative easing

After the collapse of Lehman Brothers, central banks of all the world intervened to manage the financial crisis. With different timing and different pace the ECB, the US Federal Reserve and the Bank of England reduced dramatically interest rates. Fed and BoE acted with more energy, as figure 3.1 highlights, to balance the harsh distress in the leveraged anglo-saxon financial sector. They soon reached the so-called zero-lower bound and, as a consequence, ran out of conventional measures.

3.1 INTEREST RATES DYNAMICS DURING THE GREAT RECESSION

The reaction was the launch of several large scale asset-purchasing programs, called quantitative easing, by the Federal Reserve from November 2008 and by BoE since March 2009. This huge expansion of central bank’s balance sheets did not aim just at increasing the monetary base, but also at raising asset prices and encourage risk-taking by lowering yields and restoring confidence. The European Central Bank, in contrast, did not start any quantitative easing policy in response to the crisis, for two reasons. First, the stress in Eurozone’s financial system has
been milder during the Great Recession. Second, there is an important underlying peculiarity of ECB. Since its foundation it adopted in fact the so-called separation principle, according to “the ECB makes a clear separation between the determination of the monetary policy stance and its implementation using liquidity operations”\textsuperscript{21}.

3.2 DYNAMICS OF CENTRAL BANKS’ BALANCE SHEET (INDEXED JAN 2007 = 100)

Following this principle, therefore, the goal of ECB’s unconventional measures was to intervene in the impaired interbank market in order to transmit interest rate changes, through the bank lending channel, not to fight the zero lower bound with a Quantitative Easing program. The ECB thus expanded less its balance sheet, and also with a different modality, focusing more on liquidity initiatives and stabilising interbank market for banks.

The Eurosystem never reached the level of liquidity injection of BoE and Fed, even after the LTRO program and especially after Fed’s QE3, as the figure above clearly shows.

3.2 Money multiplier and money supply

The money multiplier fell dramatically throughout the world, as a consequence of the 2008 financial crisis. This sharp decline was especially evident in the United States, where the M1 money multiplier fell even under one. This meant that the expansion in the monetary base, huge and prompt, increased less than proportionally the money supply. The central banks though reacted to the financial shocks with unconventional policies, expanded their balance sheets in unprecedented ways and probably avoided an even worse recession. As Von Hagen (2009) pointed out, the money multiplier collapsed in September 2008 exactly like it did during 1929 crisis, but this time the Fed reacted vigorously. Thus, “If Friedman and Schwartz are right in their judgement that what turned the economic developments of the late 1920s from a serious recession into the Great Depression was the huge monetary contraction, […] the Fed stopped a Great Depression emerging from the 2008 crisis.”

3.3 M2 MONEY MULTIPLIER IN EUROZONE, UK AND US

![Money Multiplier Chart]

Source: ECB Statistical Warehouse

The figure here presented shows the dynamics of the money multipliers in the three areas under scrutiny. It was not easy to find uniform data, as every central bank gives his own definition of money. We analyse here the M2 multiplier,

according to the widely accepted proposition that M2 is a more accurate description of money, and for practical reasons too\textsuperscript{23}.

As the figure shows, the collapse in the money multiplier was smaller in Eurozone than in UK and US. This is true except for the period from late 2011 to 2012, when Eurozone’s multiplier dropped to a level very close to the one of the others. As we saw earlier, the money multiplier fell exceptionally for the surge in the excess reserves after the sovereign bond contagion. But another point of view could be that the money multiplier falls when the central bank increases his monetary base, and actually when ECB launched LTROs programs the multiplier continued to decrease. But the movement is clearly antecedent to that moment for the Eurozone, while for UK and US there is a clear correlation between the launch of large scale bond-purchasing programs and the fall of the money multiplier. This means that a substantial portion of the quantitative easing programs have been upset by the increase of liquidity parked at the central bank, and thus by the drop of the money multiplier. This is true also for LTRO, but we should recall again that it was the multiplier that first shrunk. To conclude the analysis, we should now focus on the money supply.

3.4 M3 MONEY SUPPLY, INDEXED JAN 2008 = 100

![Graph showing M3 money supply for US, UK, and Eurozone]

Source: ECB Statistical Warehouse

\textsuperscript{23} More precisely:

- For the US: all data taken from FRED database, that publishes only the M1 money multiplier; the author calculated the M2 money multiplier here presented dividing the M2 money supply for the St.Louis Adjusted Monetary Base.

- For the UK: the Bank of England does not publish explicitly the monetary base, therefore the author considered banknotes, coins and commercial banks’ reserves at BoE as base money; in addition, BoE does not publish intermediate monetary aggregates, thus the so-called Retail M\# was considered as a good equivalent to the M2.

- For the Eurozone: see chapter 2.1. for details.
Indexing to 100 the M2 money supply at January 2008, we can now analyse the evolution of the monetary aggregates in recent years. The clear pattern is that the US knew the fastest growth of money of the three, especially starting from mid-2011. UK’s money supply surprisingly did not grow sensibly more than Eurozone’s, probably because of the sharp decline in the money multiplier highlighted above. This is true until 2012, when paths diverged especially thanks to BoE’s last round of quantitative easing.

Therefore, this analysis clearly shows that the Eurozone knew the mildest, though substantial, growth of monetary aggregates of the three. Eventually, it was not completely surprising that the latter had deflationary problems, and in the next chapter we will analyse how it tried, and is trying, to react to the dangerous downswing in prices.
4 The threat of deflation: ECB’s reaction

4.1 Deflation: an inevitable end?

After the normalization of bond yields throughout Eurozone, the reduction of spreads between core and periphery European bonds and the diminishing of risks of Euro break-up, the European economy still suffered lack of growth and low inflation.

The ECB’s treaty clearly defines its primary objective, that is to ensure that price stability is maintained over the medium term. The definition of price stability was clarified in 2003 as “maintain[ing] the inflation rate below, but close to, 2% over the medium term.” Over 2013 and the first half of 2014 inflation in Eurozone declined constantly, raising fears of a fall into deflation.

4.1 HICP - ANNUAL % RATE OF CHANGE

![Graph showing HICP annual rate of change from 2007-01 to 2014-07]

Source: Eurostat

It is interesting to notice that since January 2013 inflation has been lower than ECB’s goal of 2%. The ECB reacted to the lowering of inflation rate with two interest rate cuts in 2013, namely from 0,75% to 0,50% in May 2013 and of additional 25 basis point on November 2013. These measures were essentially insufficient in the goal of supporting economic activity and sustaining inflation, as

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the figure above can easily show. ECB’s President Mario Draghi stated repeatedly that “inflation expectations are well anchored in the medium term”\textsuperscript{25}, but eventually the inflation rate decreased gradually until 0.5% in June 2014 and money and credit dynamics remained on a downward path. The lack of reaction by ECB seems particularly difficult to explain, especially with regard to the constant decrease of M3 money growth and to the negative performance of non-financial loans, that manifestly had a sizeable impact on the dynamic of inflation.

\section*{4.2 Money and Credit during Eurozone Crisis}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{m3_loans.png}
\caption{M3 and Loans Growth during Eurozone Crisis}
\end{figure}

Source: ECB Statistical Warehouse

\subsection*{4.2 ECB’s reaction}

On June 2014 the ECB reacted “to a risk of a too-prolonged period of low inflation”\textsuperscript{26} with a set of important measures:

- It lowered the interest rate on main refinancing operations by 10 basis points to 0.15% and, above all, put negative interest rates of -0.10% on the deposit facility (and on excess reserves).
- It announced the conduction of a series of Targeted Long Term Refinancing Operations (TLTROs) with 2018 maturity, in order to


support credit to households (excluding mortgage loans) and to non-financial corporations, for an amount estimated between € 450 billion and € 850 billion.

- It intensified preparatory work for asset purchasing operations in the Asset Backed Securities (ABS) market, and it clarified that additional unconventional measures could follow up if needed.

We will analyse in this paragraph the negative interest rate and TLTROs, while in the next one we will expand on asset-purchasing programs and the possibility of a European quantitative easing.

Negative nominal interest rates on deposits (or reserves) at the central bank have always been a proposed, and debated, tool to fight the zero-lower bound, and have been applied in recent years to some countries like Sweden and Denmark.

The idea behind it is very simple: to discourage commercial banks to hold excess liquidity at central bank’s accounts or deposit facility, by taxing them with a negative interest rate. By doing that, the ECB wants to force banks to lend the liquidity so far parked at the central bank.

This measure should have had an immediate impact on the money multiplier, as it discourages excess liquidity and, thus, it should have increased the money multiplier. At the date of the publication of this paper, we have only two months of data available to analyse the effects of this measure. It is probably too little, but on the other hand we could say that the effects of this tool should have been immediate, as negative interest rates are effective from the 11th July 2014.

4.3 EXCESS LIQUIDITY AFTER NEGATIVE INTEREST RATES

Source: ECB Statistical Warehouse; € millions
Instead, the evidence so far available shows that the measure has had barely no impact on excess liquidity and, therefore, on the money multiplier.

A great attention and relevance has been given to this measure by the media since June ECB Governing Council’s meeting, but two relevant aspects have been undermined in author’s view. First, the problem of Eurozone now is not the excess liquidity parked at central bank, as it is much lower than in the near past and it is declining fast. As a matter of fact, European banks generally gave back LTROs funds with great advance. Second, the measure was more psychological than directly effective. No big central bank has ever experienced negative nominal interest rates. Therefore, it was probably a signal of the very accommodative stance of monetary policy in Eurozone, and of the willingness of the Governing Council to tackle low inflation with every tool available.

But another channel of transmission could be undervalued, in a superficial analysis of the negative interest rates measure. As Claeys et al (2014) notice, there is a precedent in July 2012 Denmark’s negative interest rate on bank deposits. This policy was taken in order to discourage excessive capital inflows, and eventually had the outcome to reduce Danish government-bond yields and to slightly depreciate the Danish Krona.27 And as Mario Draghi said in June 2014 Press Conference, “it was the exchange rate that has accounted for the decline in inflation”28. Therefore, the cut of nominal interest rates could sustain inflation by lowering yields on core-Europe government bonds, discourage the inflow of capital (that has been substantial in the last year) and thus depreciating the Euro. This might have been the main goal of ECB’s action.

Given that the exchange rate between Euro and Dollar is, at the time of this paper, approximately 3% down29 from June the 5th, the depreciation-effect could be confirmed by reality, even if it is always difficult to identify causality and it is arguably too early to judge.

The other important act announced by ECB at June 2014 Press Conference was the TLTROs starting from September 2014. They are the equivalent of the Long

29 Thomson Reuters Datastream
Term Refinancing Operations launched in 2011 and 2012, i.e. large provisions of liquidity to banks in form of long term (in this case up to 4 years) repurchase agreements, but now with the main feature of the conditionality of use.

The amount borrowed from the ECB, up to a maximum of € 1 trillion, in fact must be lent to non-financial corporations and households (except for house purchasing loans), and the ECB will implement checking-mechanisms in order to control the use of this funding.

Some commentaries have been raised over these measure, but one should wait to see how much banks will take-up. As the early repayment of LTRO shows, the need for liquidity have lowered in the past year and a half, and some commentators argue that the credit crisis is more due to lack of demand than to unwillingness by commercial banks to lend. On the other hand, the funding scheme is designed at very profitable conditions for banks, i.e. very low interest rates fixed for a long-term, and thus could incentivize credit expansion, especially to Small and Medium Enterprises.

4.3 The option of a European Quantitative Easing

The third arrow of June 2014 meeting was the declaration that the ECB was preparing itself to intervene in the ABS market. The Asset Backed Securities are bond obligations whose payments derive from a specified pool of assets that are collateralized. ABS, especially the more advanced and complicated ones like CDOs, had a key role in the financial crisis of 2008 in United States. This notwithstanding, ABS can be a potential tool to improve the efficiency of financial intermediation through diversification and better risk sharing. Moreover, they often pool illiquid assets that could not be sold individually to investors. One example consistent with European needs could be the one of Small-Medium Enterprise’s bonds (called in Italy “minibond”) or loans. In addition, as the joint report by European Central Bank and Bank of England underlines, “From the perspective of central banks, securitisation can play an important role in supporting both monetary and financial stability. In the current fragile macroeconomic environment, for example, high-quality ABS can support the
transmission of accommodative monetary policy in conditions where the bank lending channel may otherwise be impaired.”

As Mario Draghi noticed several times, the main problem in the Eurozone crisis is the interruption of transmission of the monetary policy, because of the impairment of the banking lending channel (fundamental in a zone where 80% of financial intermediation is conducted through the banking sector) and of the fragmentation of the European financial sector. The ECB’s President therefore motivated the central bank’s unconventional measures with the goal of fixing the credit channel, and the ABS purchase program could be thus in line with ECB’s policy so far. A drawback of this measure is that the ABS market is not very deep and developed in Europe, as it was severely undermined by the 2008 financial crisis. As a consequence, Mario Draghi repeatedly pointed out that ECB’s potential intervention in the market is conditional to other actor’s actions, namely an overhaul of ABS regulation and financial institutions’ securitization of loans.

In contrast, a broad asset-purchase program could be inconsistent with ECB’s philosophy according to the so-called separation principle. Moreover, a central bank purchasing of government bonds would be very critical in the Eurozone, where the decision about which government bonds to buy would be subject to strong political arguments between sovereign states, as a consequence of the moral hazard issues that this policy could foster.

Another option would be the purchase of banks and corporate bonds. These are the second and third categories of largest asset-classes in the Eurozone bond market, and count for € 3.8 and € 1.5 trillion respectively. Buying these kinds of bonds could have the same indirect effects of sovereign bond purchasing, namely portfolio-rebalancing, lowering yields, depreciation of exchange rate and wealth effect. On the other hand, it could be argued that an intervention of the central bank in private bond markets could alter efficient risk pricing.

As we have seen here, a large scale asset-purchase program in Europe would be a very controversial and complicated measure, mainly because of the lack of a

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31 See chapter 3.1

32 From Claeys, Darvas, Merler and Wolff (2014)
supranational bond issuer with a supranational Treasury as a counterpart. Having said that, the ECB could act if very necessary with the purchase a broad mix of assets, trying to differentiate and thus to minimize distortionary effects.

To conclude, the ABS market seem to be above all the most appropriate one in which intervene, even if not already fully developed in Europe, to restore the credit channel and therefore enhance the monetary policy transmission mechanism.
Conclusion

This paper investigated the European Central Bank’s monetary policy during the Eurozone debt-crisis, and expanded especially on the dynamics of money supply determinants, namely the money multiplier and the monetary base.

In order to do this, we firstly reviewed the literature on the money multiplier, as different interpretations of it have raised debates in the last years. We stressed the point that if we look at the money multiplier as a simple framework of analysis, it loses all the dogmatism and it becomes a very useful tool.

Secondly, we adapted the money multiplier model to the Eurozone and we analysed its fluctuations, and the determinants of them. Among the main points of this part, we saw that the money multiplier collapsed from July 2011, when the debt-crisis spread to Spain and Italy. This drop was caused by a dramatic rise in the liquidity parked at the central bank, and it continued after the LTROs of December 2011 and February 2012, but started before the action by the central bank. The great amount of liquidity supplied by the ECB substituted the impaired interbank market, and contributed to the lowering of yield spreads between northern and southern countries, but it was ultimately largely stored at central bank accounts themselves, not contributing thus in the growth of the money supply.

Thirdly, we compared ECB’s action during the financial crisis to the ones of US Fed and Bank of England. We highlighted that the Eurozone was the area where the money supply grew less, compared to the USA an UK, especially after 2012 when Fed and BoE started two broad asset-purchase programs to fight low inflation and to sustain employment. Adding to this that ECB’s monetary base declined sharply in 2013, thanks to early repayment of LTROs funds from banks, the final conclusion we can obtain is that the ECB lacked action in 2013. After having successfully stabilized the sovereign bonds market in late 2012, with the sole announcement of the OMT program, the ECB arguably made a mistake not easing monetary policy further on, under a quantitative approach, when ECB’s own forecasts were inconsistent with its goal of 2% in the medium term. This is highlighted by the fact that the M3 growth continued to decline from late 2012 to early 2014. And if we point out that the money multiplier gradually recovered, it is trivial to conclude that the lack came from the monetary base.
Finally, we have analysed the package of measures taken by the ECB from June 2014. This intervention came after a prolonged period of declining inflation, well below the ECB’s target, that convinced the Governing Council that the risk of the inflation remaining “too low for too long” was no more sustainable for the sluggish European economy.

As stated before, ECB’s action came arguably late, and the risk of falling into deflation is still high. Having said that, the measures are substantial and seem to move into the right direction. As a matter of fact, we noticed several times during this paper that the main peculiarity of Europe is the predominance of commercial banks in the financial intermediation. European banks, especially the periphery ones, have started since the summer of 2011 a strong deleveraging process, both for structural (new regulation) and contingent (debt crisis) reasons. Consequently, loans and credit to non-financial corporations have been constantly decreasing, thus obstructing the transmission mechanism of the monetary policy into the real economy.

For this reason, TLTROs seem to be a good answer by the ECB to the credit-crunch problem; they are similar to the LTROs in providing liquidity, but they tackle the main drawback of those operations by conditioning the use of this funding to non-financial loans, and not allowing banks to use it to buy government bonds, or to deposit reserves, like the antecedents eventually did.

In addition, the negative interest rates on the deposit facility could tackle, among others, the exchange rate problem, causing the depreciation of Euro by lowering money market and bond yields and then discouraging the capital inflows that sustained the Euro so far. Moreover, negative rates should discourage commercial banks to park liquidity at the deposit facility, and thus incentivize them to lend. Unfortunately, as we highlighted in the last chapter, the little evidence so far available shows that the negative interest rate on the deposit facility had no effect on excess liquidity, therefore not improving the money multiplier and the money supply.

Finally, the option of a broad asset-purchasing program could be the last weapon of the central bank to fight deflationary spirals. Even though we underlined the

33 Draghi, M. (2014): Monetary policy in a prolonged period of low inflation, speech at the ECB Forum on Central Banking, Sintra, 26 May 2014
peculiarities and difficulties that make critical the recourse to a European quantitative easing, an interesting option could be to buy a broad basket of private securities. It could allow to differentiate risk, especially if the main focus would be on Asset Backed Securities and corporate and bank bonds, avoiding thus the political problems of buying government debt, as many commentators pointed out.\textsuperscript{34}

To conclude, as the experience of Japan shows, coming out from deflation is very difficult and can be a decade-long process. Monetary policy in the last decade has dramatically grown in its importance towards the economy, and therefore it should be aware that there is little room for mistakes at this point. The ECB has officially had a very ease stance of monetary policy during the crisis, but effectively the economy, especially the one of southern European countries, did not notice it, as a result of an impaired transmission mechanism. It is therefore a relevant example of how complex monetary policy is, and of how the European Central Bank should act carefully, but courageously, in order to accomplish its important mandate.

\textsuperscript{34} See for example Claeys et al (2014)
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