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# QUANTITATIVE EASING PROGRAMS: TRANSMISSION CHANNELS AND EFFECTIVENESS

Thesis supervisor:

Prof. Pietro Reichlin

Candidate:

Giulia Giordani

ID 188111

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#### **INTRODUCTION**

The present paper aims at offering a perspective on monetary policy measures used by central banks. The focus is on quantitative easing programs that nowadays take on importance because their implementation in western countries as instruments to face the recent crisis. The purpose is to understand when these tools can stimulate the economy and which is their effectiveness.

To place the issue in context, I begin with a brief overview of central banks goals and strategies. Indeed, throughout the years there has been a complex evolution that has led the main central banks to choose inflation targeting in central banks' conduct (or at least some of its objectives).

Indeed, this approach presents lots of advantages, concerning not only the improvement in the performance but also the reduction of the time-inconsistency problem and the increase of the transparency level thanks to a regular communication to the public. Having considered these benefits, many central banks have shifted to this regime after several years of monetary targeting, even though sometimes they follow a flexible approach.

For instance, the Federal Reserve aims to achieve two different objectives: not only the price stability through the inflation target but also the maximum employment. Also, the European Central Bank's strategy cannot be properly called just inflation targeting because it includes other several aspects.

Consequently, after having understood how central banks act, I want to examine the general transmission of monetary policy: which are the means, which the effects. I present not only the traditional Keynesian view about the transmission channel through interest rates but also the credit channel which seems to be an effective mechanism to consider even for unconventional policies measures.

The first one explains how a contractionary or expansive monetary policy leads respectively to a fall or growth in output; this happens because of the interest rate effect which influences investment spending and therefore the aggregate demand. However, this mechanism seems to leave unresolved issues about other real consequences of monetary transmission.

For this reason, it could be useful to analyze the credit channel that arises as a result of agency problems in credit markets, also due to the issue of asymmetric information.

Through the effect on bank lending and firms' balance sheet, this channel could be view as an enhancement mechanism that helps us to better understand the potential of monetary policy measures, in particular if we focus on quantitative easing.

But why and when there is the necessity of unconventional policy measures? In the second chapter I pose my attention on this issue, trying to underline which is the final purpose of unconventional monetary policies like quantitative easing: the economic stabilization after a period of crisis and uncertainty.

Indeed, traditional monetary policy tools are not sufficient anymore when several problems occur: there is a limit to the central banks for lowering interest rates, for instance when the zero lower bound is reached. At that point, central banks need new - or unconventional - operations which could stimulate the economy. However, nowadays we do not perceive these tools as "unconventional" because of their continuous application. We should just think about the policy chosen by two of the main central banks in the world during the recent years.

I'm referring to two quantitative easing programs: the Large-Asset Scale Purchases conducted by the Fed and the ECB's Expanded Asset Purchase Programme. The former has been implemented first, and concluded in 2014; instead, the latter is a current plan of the European Central Bank's policy which closely affects our economy.

However, even though they differ in some features, such as timing and quantities, they intend to reach the same aim: to encourage the economy after the adverse implications coming from the crisis. Quantitative easing programs allow the banks to repurchase securities and this generally happens on favorable terms for them. Through asset purchases there is an incentive for individual banks because they can offer to their customers easier access to the credit: this is made possible thanks to the money which comes from the sale. The general purpose of these operations is to allow companies and citizens to borrow money more easily and to get lower interest rates to pay. Of course, there is the necessity for central banks to implement a package of several programs which stimulate borrowing and spending activity to affect a different kind of assets and markets.

For what concerns the results coming from these measures we should consider several factors. First of all, the immediate effects on yields of the asset purchased. The price of the purchased asset rises, while the yield on them falls. As I will explain in the paper, this will have a significant impact on investment decisions.

Moreover, evidence shows that quantitative easing could affect even other types of debt which are not directly involved in the program.

Secondly, it is necessary to underline the operational effects such as the increase in the central bank's balance sheet. We will see not only how huge is the influence of quantitative easing on that but also which is the relation with the monetary base and the money supply. It is interesting to say that sometimes these implications are different from what we expect from the theory because there are several factors to consider. For example, if we want to analyze the different increase between the monetary base and money supply we should also take into account how banks manage their excess reserves.

Finally, the effectiveness on the real economy and inflation. Indeed, this is actually the aim to reach through these measures: even though the macroeconomic effects are not so easy to estimate, the researchers have found that there are impacts on GDP growth and inflation, helping to avoid deflation process. The effectiveness of these programs is something that we can appreciate if we refer both to the precedent experience in the U.S. and to the recent effects in EU. In particular, we have understood that QE may represent the better solution when policy rates arrive too close to the effective lower bound.

Even though all these advantages (or at least intended consequences) show us the importance and the necessity of these measures, we should also take into account the negative aspects.

For this reason, in the third chapter, I examine better which are the costs caused by quantitative easing. Also, there are limits for this instrument too, such as the long-run problem and the interconnections with other unconventional monetary measures. For what concerns the former, we should consider how some mechanisms work differently from the short run. Regarding the latter, we can see that sometimes a policy can compromise the effect of another one, for example if we think about negative interest rates and asset purchases.

Other critics list potential risks such as the financial stability and other unintended consequences. However, not all of these problems seem to be a real concern in this specific moment, but to be consistent with my analysis I choose to summarize them as well: in particular, through prudential policy it is possible to prevent lots of potential challenges.

Finally, the last topic that I cover on this thesis is about the normalization of monetary policy. Indeed, when central banks decide to conclude their programs they need to adopt exit strategies and also to control inflation expectations.

Referring to this issue, it is interesting to look at the current position of the ECB to understand how it could manage its future tapering which will probably start in the next year.

After a period of uncertainty as we have experience in recent years, central bank's actions should be well monitored: the final purpose is to abandon the asset purchases trying to maintain the results achieved through this program.

The process needs a broad toolkit to organize a complete action. This may actually imply time and additional measures because the tapering should be gradual. There is the necessity of a careful calibration and communication: however, at the moment ECB has not clarified the details of its action yet.

#### **CHAPTER 1**

#### CENTRAL BANKS AND THE CONDUCT OF MONETARY POLICY: MAIN GOALS

Central banks have undergone a substantial transformation throughout the years that it could be useful to analyze. If we look at their beginning, in the XVII century, they were the banks of the king or the government without independence from the executive power. The most relevant example is the Bank of England which was created by the king in 1694. Its role was the management of public deficit which was necessary to finance the colonialist actions. During its history, the Old Lady has always acted in the national interests such as a public institution (even if its nationalization happened further, in 1946). In fact, even when it was owned by privates, its actions follow the decisions of the Government and legislation.

By contrast, the establishment of a single bank like the Bank of England met stiff opposition in the United States. In fact, there was an open hostility to the existence of a centralized authority that led to the failure of two experiments in 1811 and 1836. But in the XIX and early XX centuries nation bank panics became a regular event and there was not a system which could lend money and provide reserves in case of crisis. After the failure of lots of banks in 1907, it was evident the necessity of a central bank.

As a result, we recorded the creation of the Federal Reserve System in 1913 which presents an unusual structure of twelve regional Federal Reserve Banks. Each of these is a quasi-public institution which means that there is a part financed by privates too. Although we could imagine this system decentralized, actually it has a function of a single central bank under the control of the Board of Governors. The Federal Open Market Committee is the organism that sets monetary policy and has as components the Board of Governors' members and the Reserve Banks' presidents.

Moving on with history, the process of transformation of central banks' activities becomes more evident if we look at the end of The Second World War. The mission for central banks has started to be not only the research of funding for the states but the control of the credit market to maintain a balance and the protection of the value of the money.

However, the degree of independence of the main central banks has lots of obstacles coming from political pressures. In 1962, Friedman analyzed this situation in his essay "Should there be an

independent monetary authority,"<sup>1</sup> and he argued that legislating rules for the instruments of the policy were the valid alternative to create a stable monetary system. Central banks need fixed rules with a specific objective that is difficult to modify for government's excuses.

For what concerns the level of independence, it is true that the Federal Reserve has a high autonomy. Indeed, the Congress and the President do not have to approve the policy and operational decisions. Despite this, the Congress can change the laws which influence the Fed and also the central bank has to communicate its policy to Congress regularly. For this reason, a common description used for Fed is "independent within the government."

But the most independent bank in the world is the European Central Bank, created in 1998. However, to understand the framework in which the ECB operates, it is necessary to make a distinction between the European System of Central Banks (ESCB) and the Eurosystem, both established by the Maastricht Treaty. The former includes the ECB and the National Central Banks of the 28 EU members states even if some of them do not use euro. On the other hand, the latter involves the ECB and the National Central Banks of the nineteen states that have euro as their currency.

The ECB takes the decisions with the guidelines, and then the National Central Banks have to implement them with actions. The system is structured in three entities: the Governing Council, the Executive Board, and the General Council. The Executive Board comprises the President, the Vice President, and four members and it is the organism that puts into action the decisions made by the Governing Council. The Governing Council chooses the monetary policy to adopt in the Euro area, and it is composed of the six members of the Executive Board and the governors of the National Central Banks of the Eurozone nations. Instead, in the General Council are also included the governors of National Central Banks of the entire ESBC.

With this brief explanation about the evolution of central banks' mandates and the presentation of the structure of the two main institutions, the Fed and the ECB, we could have a look at their position in the world economy. We know that nowadays central banks play a significant role in financial markets and the overall economy but to understand how we should consider which are their main goals.

First of all, according to Mishkin's list, the most important goal of monetary policy is price stability which means a low and stable inflation. Indeed, without price stability, there is a level of

<sup>&</sup>lt;sup>1</sup> Friedman, M. (1962), from a larger work: "In Search of a Monetary Constitution," Yeager.

uncertainty in the economy that might be an obstacle for economic growth. The most dangerous example of unstable prices is hyperinflation and the countries that have experienced it in the recent years such as Argentina or Brazil, have registered considerable damages to their economy.

For this reason, a successful monetary policy which tries to achieve this first goal uses a nominal anchor that is a variable such as the inflation rate or the money supply. This element ties down inflation expectations and limits the time-inconsistency problem by providing an expected constraint on discretionary policy.

Moreover, another desirable goal is the high employment which does not correspond to an unemployment level of zero<sup>2</sup> but the natural rate of unemployment. This level is consistent with full employment in which the demand for labor equals the supply of labor. There is a strong relationship between high employment and the goal of economic growth, but there are differences in policies. In fact, specific policies encourage firms to invest or people to save to promote the economic growth.

Another concern for central banks is the interest-rate stability, and this depends on the fact that sharp fluctuations could cause uncertainty in the economy both for consumers and for the financial institution. Indeed, one more goal is also the stability in financial markets to avoid financial crises.

Finally, the stability of the foreign exchange markets takes on importance because of the increase in the international trade for the majority of the countries.

Even though these are the main objectives, central banks differ in their mandates. In fact, we can distinguish between banks with hierarchical terms which put the price stability as the primary goal and banks with dual mandates which want to achieve two equal objectives: the price stability and the high employment. In the former group, we find the European Central Bank with the Maastricht Treaty which states that "The primary objective of the European System of Central Banks shall be to maintain price stability," while the Federal Reserve System belongs to the latter group.

Taking all of this into consideration, let's examine which are the strategies selected by central banks to achieve their goals.

<sup>&</sup>lt;sup>2</sup> There could not be a unemployment level of zero because of the frictional unemployment and the structural unemployment. The first one implies the searches conducted by employees and firms to find suitable matches. The second one is due to the impossibility to match job requirements and the abilities of local workers.

#### 1.1 The evolution of central banks strategies

The two basic strategies chosen by central banks are the monetary targeting and the inflation targeting, but if we look at the conduct in the industrialized countries, the trend has been the shift from the former to the latter. In fact, in the 1970s, the majority of the industrialized nations have adopted the monetary targeting.

This strategy implies three elements. First of all, the fact that we need to rely on the information provided by a monetary aggregate. Secondly, it is necessary the fixation and the communication of targets for monetary aggregates. And finally, an accountability mechanism which does not include large and systematic deviations from selected targets.

Mishkin (2000)<sup>3</sup> has examined this experience of monetary targeting for different countries: on the one hand, the U.S., Canada, and the United Kingdom did not reach substantial effects. On the other hand, Germany and Switzerland registered better results.

What is relevant for our analysis is the lesson that we could learn from these events. Mishkin has commented three aspects that show us important implications of this strategy.

The first issue he has considered is the unstable relationship between monetary aggregates and goal variables such as inflation and nominal income that complicates the monetary targeting strategy. This problem appears in several cases, and it represents one of the reasons that led to the abandon of this policy in the United States. Because of the weak relationship between money and nominal income, it is impossible to obtain the expected outcome with a goal variable like inflation. In this framework, monetary targeting could not be the right guide for central banks because the relationship and hence the monetary aggregate are unreliable.

The second feature underlined in the paper is the high engagement in communication aspects which could determine a successful monetary targeting, as it happened in German and Switzerland. At that time, the Bundesbank and the Swiss National Bank used this strategy to announce the objectives of monetary policy, and in this way, they enhanced their level of transparency and accountability. In these cases, the monetary targeting succeeded because of specific characteristics of these countries such as the public attitude against the high inflation and the strong preventive actions conducted by central banks to avoid it.

<sup>&</sup>lt;sup>3</sup> Mishkin, F.S. (2000) "From Monetary Targeting to Inflation Targeting: lessons from the industrialized countries," Columbia University and National Bureau of Economic Research, January.

Finally, even in the countries with favorable results, the monetary targeting has been followed with a flexible approach, without the observance of a rigid rule. If we consider for instance the cases of Germany and Switzerland, their success has also depended on some characteristics that seem close to the ones of inflation targeting, such as flexibility, transparency, and accountability. For this reason, Mishkin considers these examples as hybrid cases of inflation targeting, and this seems reasonable if we look at the evolution of the monetary regime in that countries. In fact, in Switzerland, it appeared natural to move toward inflation targeting, and in the EU the BCE has placed an inflation goal below, but close to, 2% over the medium term as a central pillar of its monetary policy strategy.

Nowadays the inflation targeting represents one of the most important strategies for the conduct of monetary policy. So, let's examine in detail what it implies.

### **1.1.1 Inflation Targeting**

According to the inflation targeting, the central bank has to define a rate inflation target, and the objective is to maintain the effective inflation around it. Usually, the monetary policy authorities announce to the public both the inflationary target and the time horizon within they intend to reach it. The central bank also undertakes actions to inform public on the strategy and the potential changes regularly<sup>4</sup>.

Suppose, for example, that the announcement at time t relates to a time horizon T.

$$i_t - i_{t-1} = y \left( \pi^e_{t+T} - \hat{\pi} \right)$$

The central bank has to constantly monitor the differential between the inflation rate predicted at time t + T and the inflation target ( $\hat{\pi}$ ), and therefore it has to provide corrective actions through the interest rate (*i*).

The choice of inflation targeting is due to the recognition that price stability should be the primary long-run goal of monetary policy (as I mentioned in the first paragraph it is relevant the use of a nominal anchor to reach this aim).

<sup>&</sup>lt;sup>4</sup> Definition from Bankipedia <u>http://www.bankpedia.org/index.php/it/107-italian/i/20594-inflation-targeting-it</u>.

The first country that formally adopts inflation targeting was the New Zealand in 1990, and since 1992 the growth rate has been high, and unemployment has decreased significantly.



Canada and the United Kingdom followed New Zealand in the next two years (1992-1993). As the graphs show, the reduction of the inflation rate is significant, and these countries have achieved their targets over the time.



Source: Mishkin, F.S. (2016) "The Economics of Money, Banking, and Financial Markets" p.444 from other works by Bernanke, B.S., Laubach, T., Mishkin, F.S., and Poson, A.S.(1999) "Inflation Targeting: Lessons from the International Experience" and Federal Reserve Bank of St.Louis, FRED database.

For instance, in U.K after 1995 the inflation remains close to the target except for the period of crisis 2008-2012.



Source: Mishkin, F.S. (2016) "The Economics of Money, Banking, and Financial Markets" p.444 from other works by Bernanke, B.S., Laubach, T., Mishkin, F.S., and Poson, A.S.(1999) "Inflation Targeting: Lessons from the International Experience" and Federal Reserve Bank of St.Louis, FRED database.

Even though lots of other countries have started to adopt inflation targeting during the '90, other central banks have moved slowly toward this regime. For instance, the Fed's strategy has changed over the time. From the 1980s to 2006 it could be called a "just do it" policy, with several actual performances, achieved without using an explicit nominal anchor such as inflation target (but just implicit). This strategy also included a forward-looking behavior that implies accurate control for signs of future inflation.

However, as Mishkin points out, this approach presented some weaknesses such as lack of transparency and accountability that are inconsistent with democratic principles. For these reasons, Ben Bernanke, become chair of the FED in 2006, increased transparency and try to get a consensus within the Federal Open Market Committee (FOMC) to move toward inflation targeting. After some years of changes and also thanks to the support of Janet Yellen (appointed as the chair of the internal subcommittee on communications), the FOMC finally chose the inflation targeting in January 2012. Still, the inflation targeting pursued by the Fed is a flexible form because tries to respect the dual mandate.

Another central bank that follows a weak form of inflation targeting is the ECB. Indeed, its policy has two key pillars. It is necessary to value monetary and credit aggregates for their potential influence on inflation and economic growth. Moreover, there are a lot of other variables from economy to take into account to estimate forecasts. Even though the goal for inflation "below, but close to, 2%" seems to be an inflation target, the ECB has clarified that it is not, but instead, the purposes of the central bank include other several aspects.

After this brief look at the behavior of different central banks approaching to inflation targeting, it could be useful to mention which are finally the advantages of this regime.

Of course, the inflation targeting could reduce the time-inconsistency problem because it helps clarify what a central bank could achieve in the long run. Moreover, as I mentioned before, inflation targeting increases transparency. Central bank communicates regularly with the public also providing the publishment of documents explaining: the goals and the limitation of monetary policy, how the central bank has chosen the numerical values of the inflation targets and the way to achieve it, and finally all the possible changes to the targets.

Other benefits of inflation targeting concern the increase of accountability, the consistency with democratic principles and of course, the improved performances.

By contrast, some critics have also underlined disadvantages. First of all, the outcomes are evident only after a significant lag. So inflation is not so easy to monitor.

Then, another criticism is about the rigidity because there is a rigid rule to follow. But in this case, also Mishkin explains that inflation targeting does not include only mechanical instructions. Indeed, it needs the analysis of several variables to decide the appropriate actions.

As the rigidity, also the concern about the potential weak economic growth seems not to be always a real problem. Even though it is true that in inflation targeting regimes the consequence of a low output appears, generally when the system reaches low inflation levels, then output and employment come back at least to the previous levels.

However, it is clear that if the strategy has the unique focus on inflation, it may cause a monetary policy which is too tight when inflation is above target, and it could produce output fluctuations. For this reason, usually, the choice for the target is an inflation level above zero because a substantial low inflation can have negative consequences on economic activities due to financial instability and economic contraction.

#### 1.2 Measures and transmission of Monetary Policy

The strategy chosen by the central bank needs tools to affect the price stability and in general to control the money supply. During normal times, a central bank uses three instruments of monetary policy: open market operations, discount lending and reserve requirements. We refer to these measures as conventional monetary policy tools to understand how monetary policy usually works. Even though all main central banks use these tools, the following explanation analyzes better how the ECB manages these instruments in its policy.

Regarding the first issue, the aim of the open market operations is to give liquidity to counterparties (that usually are banks of the Eurozone) through reverse transaction: it means financial instruments against the monetary base. There are four open market operations which differ in purpose, regularity, and procedures:

- 1. Main refinancing operations (MRO): they are the most important form of open market operation. They consist of weekly reverse transactions<sup>5</sup>. The banks which receive liquidity by ECB have to pay an interest rate and give appropriate financial activities as collateral until maturity. These operations are similar to Fed's repo transaction, but the ECB decentralizes them through the national central banks.
- 2. Longer-term refinancing operations (LTRO): they are liquidity-providing reverse transactions carried out monthly. They have three months maturity. In this way, the banking system has a more stable liquidity base.
- 3. Fine-tuning operations (FTO): can be executed on an ad hoc basis to manage the liquidity situation in the market and to steer interest rates. They may take different forms, not necessarily reverse transactions but also other, like foreign exchange swaps. These are extraordinary operations: in fact, there is a flexible way to manage it, and the execution is much faster.
- 4. Structural operations: they can imply reverse transactions, outright transactions, and the issuance of debt certificates. The aim of these operations is to change the long-term position of the Eurosystem, compared with the amount of liquidity in circulation.

The second instrument is the discount lending. The Eurosystem offers to the banking institutions other two opportunities, the so-called "standing facilities", activated by the initiative of the counterparty.

The first one is the marginal lending facility. The counterparties that suffer a deficit of liquidity reserves can always ask for overnight liquidity from the ECB if they present appropriate collaterals. The interest rate is higher than the one of the regular operations.

<sup>&</sup>lt;sup>5</sup> Reverse transactions: they imply purchases or sales of eligible assets under repurchase or credit operations against eligible assets as collateral.

The second one is the deposit facility which represents the possibility for a bank to make overnight deposits with the national central banks. The interest rate here is lower than the one of refinancing operations because of the certainty of getting back these reserves and also without costs.

In this way, the ECB fixes an upper limit and a lower limit to the interest rates on the interbank market (exchanges between banks in surplus and banks in deficit). The interest rate applied to these interbank transactions is EONIA (Euro Overnight Index Average) and, as the graph below shows, it cannot exceed the rate on marginal lending, nor fall below that on the deposit at ECB.



In March 2016, the ECB Governing Council has chosen to adopt an articulated package of expanding measures. In fact, in the chart, it is evident the reduction of the two rates: the one on the main refinancing operations and the one on the marginal lending. Both of them have decreased by five basis points (at 0.0 and 0.25% respectively). Also, the deposit facility rate, already on negative values, has been reduced by ten basis points to -0.40%.

Finally, for what concerns central bank tools, the third instrument is the reserve requirements. The aim is to stabilize money market interest rates and create a structural liquidity shortage.

The definition of this requirement depends on the average daily reserve that an institution holds over a maintenance period. The latter takes into account the elements of the balance sheet and then

the application of different coefficient. All institutions with the reserve requirements have access to the standing lending facilities and participate in open market operations.

Having considered the primary tools used by ECB and in general by central banks, I would like to analyze the debate, the so-called "Symposium" in the Journal of Economic Perspectives (1995), on the transmission mechanism of monetary policy. In particular, let's examine first the traditional Keynesian view and then the opinions about the credit channel.

#### **1.2.1** The traditional Keynesian view

It is crucial to understand how monetary transmission mechanisms work to choose the correct policy. For over 50 years the key monetary transmission mechanism has been the interest rate channel, in particular in the Keynesian model. Indeed, the latter explains through a schematic diagram which is the effect of a monetary tightening on the real economy:

$$M \downarrow \Rightarrow i \uparrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$$

A contractionary monetary policy (M) leads to an increase in the real interest rate (i). This increase causes a rise in the cost of capital that determines a reduction in investment spending (I) and subsequently a decline in aggregate demand which finally means a fall in output (Y).

At first, Keynes considered in this effect through businesses' decisions (that determine investment spending). Successively, other researchers have started to include also consumers' decisions about housing and durable expenditure in the investment spending.

According to Taylor, that has implemented this model, there is a strong correlation between the rise in the short-term nominal interest rate and the long-term interest rate which rises as well because of sticky prices and rational expectations. Then, as in the model before, it causes a decline in investment. By contrast, Ben Bernanke and Mark Gertler believe that this position is controversial and they argue the importance of another mechanism, the credit channel that I will explain afterward.

However, the transmissions mechanisms include also the exchange rate channel due to the importance of the growing internationalization of western economies. For this reason, the shift in the interest rate becomes relevant because when national real interest rates increase (i), domestic deposits attract more investors than deposits in foreign currencies. It means an appreciation of the

national currency (*E*) which causes a decline in net exports (*NX*) and consequently in aggregate output (*Y*). To sum up with a schematic:

$$M \downarrow \Rightarrow i \uparrow \Rightarrow E \uparrow \Rightarrow NX \downarrow \Rightarrow Y \downarrow$$

Furthermore, there still are other variables to consider in the transmission mechanism because only one, the interest rate, but even two interest rates and the exchange rate are not sufficient. Indeed, monetarists agree in taking into account also the relative asset prices and real wealth. They emphasize two theses: Tobin's q theory of investment and wealth effects on consumption.

According to the first one, the key point is the effect on the valuation of equities. The factor q is the market value of firms divided by the replacement cost of capital. When it is high, it means that the market price of companies is high considering the replacement cost of capital. Hence new factory and equipment capital are affordable concerning the market value of business firms. If a company issues equity, it gets a higher price. Moreover, with this small issue of equity, the company can purchase a lot of new investment goods. Conversely, if a company desires to acquire capital when q is small, it can economically buy another firm and obtain old capital. In this second case, investment spending (I) will be flat.

So, which is the effect of monetary policy on equity prices  $(P_e)$ ? The fall of the money supply determines a reaction of the public because it believes that it has less money than it wants. For this reason, it decreases its spending: in particular, it can decrease its expenses in the stock market, causing a fall of equities' demand with the following reduction in assets' prices. Connecting this view with Tobin's q theory the mechanism is:

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow q \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$$

For what concerns the second thesis, wealth effects on consumption is another monetary transmission channel through equity prices. In particular, as the Modigliani lyfe-cycle model explains human capital, real capital and financial wealth (in the last one common stocks have a huge weight) are the components of the consumer spending. When stock prices drop, financial wealth declines and then the resources of consumers are less. Consequently, the reduction in consumption determines a decrease in output:

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow wealth \downarrow \Rightarrow consumption \downarrow \Rightarrow Y \downarrow$$

Additionally, it is important to underline that these two theories consider equity as a general concept so they can also work for the housing market in which housing is equity.

### 1.2.2 An enhancement mechanism: the Credit Channel

The interest rate and the other asset prices channels seem to leave unresolved issues about other real consequences of monetary transmission. The credit view tries to give a new explanation even though it cannot be considered as a truly independent or parallel channel. As Bernanke and Gentler wrote in their paper "Inside the Black Box" (1995), the credit channel amplifies and propagates conventional interest rate effect and therefore, they want to underline which is its role inside the so called "black box" that is the monetary transmission mechanism itself.

First, they have conducted an analysis using a vector autoregression<sup>6</sup> that shows which are the responses to monetary policy shocks and their focus is about four aspects:

1. a tightening in monetary policy has only transitory effects on interest rates, but then there are persistent declines in real Gross Domestic Product and the price level. In detail, GDP decline starts about for months later; instead, the price level reduction begins after one year. Finally, after a brief period of rising, the funds rate precipitously falls as represented in the following chart.



<sup>&</sup>lt;sup>6</sup> The sample period they have used for their analysis is January 1965 through December 1993.

2. the impact of a monetary tightening affects final demand that falls quickly (with a reduction of the GDP too). Conversely, inventories begin their decline after several months.



3. the final demand drop depends on the decrease in residential investment and durable expenditures (as shown in the graph below). This funding is confusing because typically short term rates (most influenced by central banks) have a huge effect on assets with shorter lives, instead of the residential investment are more sensitive to long term real interest rates.

4. Fixed business investment also go down but with a lag and not so much compared with housing and durables even if they are also long-lived investments.



Source: Bernanke, B.S. and Gertler, M.(1995) "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," Journal of Economics Perspectives volume 9 number 4 (Fall) p 33.

With these facts, it appears evident that we cannot reach a complete explanation about the magnitude, timing, and composition of the economy's effects after a monetary policy shock exclusively referring to interest rate effects.

The so called credit view helps to fill in the gaps in the traditional approach.

The key point is to analyze the problem of asymmetric information that causes financial frictions in the financial market.

Bernanke and Gertler refer to the so called external finance premium which presents the sunk costs associated with the principal-agent problem that it is usually existent between lenders and borrowers. Among the several factors included in the external finance premium we can distinguish:

- the lender's expected costs that come from evaluation, control, and collection
- the "lemons" premium depending on the obvious starting condition in which the borrower has better information about its chances than the lender
- the costs of distortions because of the borrower's behavior, such as moral hazard

There are two channels to examine that arise as a result of these agency problems in credit markets. These are the bank lending channel and the balance sheet channel. Let's see how they work.

The first one starts from the fundamental view that banks have a particular position in the financial system. In fact, they have all the instruments to deal with some types of borrowers, for instance, small firms, where the problems of asymmetric information are more evident.

Instead, a larger company could operate in the credit market without the brokering. Hence, for the first kind of borrowers a contractionary monetary policy which causes a decline in bank reserves and bank deposits have a negative impact.

$$M \downarrow \Rightarrow bank \ deposit \downarrow \Rightarrow bank \ loans \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$$

The second one works through the net worth of business firms. Lower net worth implies several losses from adverse selection because lenders in effect have less collateral for their loans. This situation leads to a decreased lending to finance investment spending.

The net worth of business firms also increases the moral hazard problem because it means that owners have investment projects. Hence, a decrease in business firms' provoke a fall in lending and then in investment spending:

# $M \downarrow \Rightarrow P_e \downarrow \Rightarrow adverse selection \& moral hazard \uparrow \Rightarrow lending \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$

Another consequence of a contractionary monetary policy that raises interest rates is the reduction of cash flow, so the new schematic is:

#### $M \downarrow \Rightarrow i \uparrow \Rightarrow cash flow \downarrow \Rightarrow adverse selection \& moral hazard \uparrow \Rightarrow lending \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$

An interesting contribution is the suggestion of Bernanke and Gertler to use the credit channel as well to consumer spending. With less bank lending customers reduce durables and housing purchases if they do not have other sources of credit. Analogously, with an increase in interest rates the household balance sheet worsens because of the adverse effect on cash flow.

Moreover, another factor to consider about consumers is the liquidity effect on their expenditures on goods and housing (as Mishkin noticed referring to the Great Depression). Indeed, if consumers understand that they could be in financial distress, they prefer to hold a greater amount of liquid financial assets. Therefore, if stock prices fall with a reduction of the values, also expenditures on housing or durables fall because the consumer has a less secure financial position:

# $M \downarrow \Rightarrow P_e \downarrow \Rightarrow$ financial assets $\downarrow \Rightarrow$ likelihood of financial distress $\uparrow$

## $\Rightarrow$ consumer durable and housing expenditure $\downarrow \Rightarrow Y \downarrow$

Additionally, having understood how these mechanisms operate we should consider that even though the credit channel implies several effects on the economy, there still are limits and critical opinions.

First of all, for what concerns the bank lending channel, we must say that after lots of financial innovations of last decades, banks play a less important role in credit markets.

By contrast, even for banks, the balance sheet channel has increased its relevance over the time. For instance, when there is a rise in interest rates the value of securities decline, impairing banks' capital, and successively there could also be a reduction in the ability of the bank to attract funds and to make loans.

Moreover, there is another aspect to underline. Credit is not the first driving force; in fact, credit conditions are an endogenous factor that determines with other several factors dynamic responses of the economy. For this reason, the credit theory has no consequences for what concerns the forecasting power of credit aggregates.

Finally, the last specification is about the borrowing reduction after a monetary tightening. Indeed, the credit channel does not necessarily predict that firms and households decrease their borrowing, it just states that they will borrow and spend less than they would with perfect conditions in the credit market.

#### **CHAPTER 2**

# WHY CENTRAL BANKS NEED UNCONVENTIONAL MONETARY POLICY TOOLS?

The traditional monetary policy tools could not always be sufficient to stabilize the economy. In particular, when there is a period of extreme crisis central banks need other instruments to achieve their goal, known as "unconventional monetary policy tools". Actually, this definition does not seem to be appropriate since in recent years several central banks needed to adopt these measures combined with the previous ones and this continuous application makes harder to consider them as properly "unconventional." However, this distinction is still useful to identify these operations that try to support economic growth and to spur demand in different ways.

When periods of deep recession or crisis occur, lots of problems make conventional monetary tools limited. First, because the financial system freezes and it becomes unable to allocate capital to productive uses; for this reason investment spending and economy decline. Second, because of the zero lower bound problem, that does not allow central banks to lower short-term interest rates further. In this situation another risk for the economy is the liquidity trap: there are no incentives for people to invest and they prefer to accumulate money to prevent a recovery from taking place.

For these reasons, central banks need non-interest rate tools that take three forms: liquidity provision, asset purchases, and forward guidance.

#### 2.1 Definition of unconventional monetary measures and objectives

Central banks choose these unconventional monetary policy tools to stimulate the economy. The final objective is to reach an economic expansion trying to avoid the downward spirals in output and inflation.

To understand how these measures work, we have to consider that the real interest rate for investments  $(r_i)$  includes not only the short-term interest rate (r) set by the central bank but also financial frictions  $(\bar{f})$ :

$$r_i = r + \bar{f}$$

Using the aggregate demand/aggregate supply model (AD/AS) as Mishkin explains, we could see how nonconventional measures stimulate the rise in aggregate output and inflation lowering financial frictions.

Before presenting the model, we should make some specifications. Indeed, we want to examine the response to nonconventional policies when the zero lower bound (ZLB) problem occurs. This situation does not allow central banks to lower the policy rate and for this reason any conventional expansionary policy cannot work. The ZLB problem became a relevant issue both during the Japan's experience in 90's and recently during the subprime crisis in 2008.

Referring to the latter event, Paul Krugman has said that the monetary policy will not be able to solve this situation: as a solution, unconventional methods will be necessary to tackle it. Another contribution on the topic comes from Michael Woodford who highlighted that in a zero lower bound case, a central bank has to cover the output gap by spending liberally on stimulating effects.

Now let's consider which are the implications of this ZLB problem for the aggregate demand curve. As the example in the chart shows, the MP curve has not the usual upward slope from the point 1 to 2: this is due to the fact that when inflation continues to fall, the monetary authorities cannot lower the real interest rate through the policy rate which has risen instead.

If we look at the aggregate demand (AD), the fall of both inflation and expected inflation causes an increase in the real interest rate. Consequently, AD assumes an upward slope rather than downward.



As we can see, the zero lower bound problem is reflected in the kink<sup>7</sup> in the aggregate demand curve. From a technical point of view, to understand this kink, we can derive the aggregate demand from the IS curve (investment-saving) that describes the relationship between real interest rates and aggregate output when the goods market is in equilibrium:

$$y = a - b (i - \pi)$$

According to the Taylor Rule where: -i is the interest rate set by the central bank

-  $\pi^*$  is the inflation target rate

-  $y^*$  the full employment output

-  $\alpha$  and  $\beta$  are the coefficients that represents the sensitivity of monetary policy respectively to inflation rate and employment output,

we can now derive the aggregate demand assuming that i cannot go below zero, as our case requires:

Taylor Rule 
$$\rightarrow i = \alpha(\pi - \pi^*) + \beta(y - y^*)$$
  
with assumption  $\rightarrow i = \alpha(\pi - \pi^*) + \beta(y - y^*) \ge 0$ 

The AD can be explained with the following equation as a function of inflation:

$$y = \frac{a + b(\alpha \pi^* + \beta y^*) - b(\alpha - 1)\pi}{1 + b\beta} = f(\pi)$$

We assume  $\alpha > 1$ . The AD equation is consistent with our assumption  $i \ge 0$  if we have:

$$\alpha(\pi-\pi^*)-\beta y^*+\beta\left(\frac{a+b(a\pi^*+\beta y^*)-b(\alpha-1)\pi}{1+b\beta}\right)\geq 0,$$

that means:  $\pi \ge \frac{(\alpha \pi^* + \beta y^*) - \beta a}{\alpha + \beta b} \equiv \overline{\pi}$ 

Then the curve is:  $y = \begin{cases} f(\pi) & \text{if } \pi \ge \overline{\pi} \\ a + b\pi & \text{if } \pi \le \overline{\pi} \end{cases}$ 

This is why we have a kink in the aggregate demand curve: as we have just examined, in the zero lower bound case we should consider specific characteristics of the Taylor Rule.

<sup>&</sup>lt;sup>7</sup> The kink in the demand curve has been adopted first in economic theories concerning oligopoly and monopolistic competition. The formulation come from two contributions in 1939: Paul Sweezy (from Harvard College) with its publication "Demand Under Conditions of Oligopoly" and Robert Lowe Hall and Charles J. Hitch with their paper "Price Theory and Business Behavior."

In the long-run, the kinked demand curve could create two equilibria. One is a stable situation in which nominal interest rates are positive and inflation is equal to the central bank's target rate of inflation; the other is unstable because the nominal interest rate is zero and any shock, even the smallest one, can trigger a deflationary process.

Having considered this peculiarity, we can now examine how nonconventional monetary policies act in the AD/AS model. As the following the graph shows<sup>8</sup>, they reduce financial frictions and shift the short-run aggregate demand to the right. This change increases output and inflation (point 2).



This mechanism works for each tool: let's explain better how.

- Liquidity provision occurs when a central bank implements extraordinary increases in its lending facilities. The aim is to provide liquidity to the financial markets. In fact, a shortage of liquidity causes a sharp rise in financial frictions. Instead, thanks to liquidity provision the impaired markets can return to their normal functions.
- Asset purchases is another tool that consists of an expansion of types of assets bought by central banks: not only government securities (as it happens in the open market operations) but also private assets. These purchases increase the price of that securities and therefore they cause a reduction in their interest rate. In this way, the credit spread and the financial

<sup>&</sup>lt;sup>8</sup> AD: aggregate demand AS: aggregate supply LRAS: long-run aggregate supply Y:output.

frictions fall. It is important to underline that the  $\overline{f}$  term could also reflect the spread between long-term and short-term rates. This implies that asset purchases of long-term government securities also determine a reduction in the real interest rate for investments.

• Forward guidance that could also be called as management of expectations is another solution in which the central bank's commitment is to keep the policy rate low for a long period. In this way, the market expectations of future short-term interest rates are low and determine a reduction in the long-term interest rates. However, another form of management of expectation concerns the implications depending on the inflation expectations. I will explain these consequences further in the third chapter.

When a central bank operates liquidity provision and asset purchases, it will expand its balance sheet. This expansion is referred to as "quantitative easing" (QE) because it causes a substantial increase in liquidity that helps to stimulate the economy. Let's see in detail what it implies and why central banks such as ECB and Fed have adopted this kind of programmes.

#### 2.2 Quantitative Easing

Central bank's policies reflect their necessity to achieve the first goal, the price stability. In fact, in normal times monetary policy operates by steering short-term interest rate. Central banks can fully determine the cost that the banking system pays to obtain reserves. When expected inflation falls below the target, the central bank may lower the official interest rates: as I mentioned before, we should consider the interest rates corridor between the marginal lending rate and the deposit facility rate.

The impact is relevant for investment and consumption choices by households and firms: prices go up, and also inflation rises to a level consistent with the definition of price stability.

However, there is a limit to the central banks for lowering interest rates. The zero nominal yield of holding cash prevents the nominal yield on any financial asset from going significantly negative, so if the zero lower bound is reached, the central bank is no longer able to counter the decline of inflation below the objective by lowering official interest rates because of the risk of the deflationary spiral.

Deflation is very risky because it triggers a vicious circle that is damaging to the economy: consumers and companies postpone their unnecessary purchases because they see prices falling and expect more losses. As a result, demand remains weak, and manufacturers of goods and services further reduce prices. Companies consequently record fewer revenues and try to cut costs from those that most affect their budgets, which are usually employees. They also stop lending to banks because they do not want to make other investments with following interests to pay.

One of the most effective solutions to getting out of deflation is precisely the use of quantitative easing.

Through this mechanism, central banks could create the currency which means making more money available to get loans from banks and invest easier.

In practice, quantitative easing proposes banks to repurchase securities, usually on favorable terms. In this way, there is an incentive for individual banks because they can make the access to the credit easier for their customers, thanks to the money obtained from the sale. The aim is to allow companies and citizens to borrow money more easily and to pay lower interest rates.

Quantitative easing has several consequences. One of the most common is the impact on the cost of living and the purchasing power. To sum up, putting more money in circulation with operations like the QE reduces the value of the currency and as a result, prices increase because the money is worth less. This means that to buy imported goods you need more money than before: this mechanism is reflected and in the costs of the companies, and that's why inflation rises. Also, we must notice that there is an expansive effect on the output: the foreign currency is stronger, so foreigners import more goods at the same expense.

The QE road has long been followed by the Bank of Japan, which since the end of the 90s has launched an asset purchases campaign to counter deflation. Then, other central banks have adopted similar programmes throughout the years. In particular, I would like to examine better the Fed program, used to face the crisis after 2008, which according to several observers have contributed to the recovery of the economy. Then, I will present the current Expanded Asset Purchase Programme operated by the ECB to stimulate the European economy.

### 2.2.1 FED Large-Scale Asset Purchases

To understand FED's response to the global financial crisis, Williamson (2015) distinguished two different periods. First, the one from the end of 2007 to the second quarter of 2009 in which Fed's policies consist of non-specific lending programs, tailored lending to specific financial institution and asset purchase programs. In this period we had the so called "stigma problem": the Fed wished to lend, but there was a reluctance of banks to borrow at the Fed's discount window because it could be perceived by financial market participants as a signal of potential insolvency.

To solve the stigma problem, the Fed operated the Term Auction Facility in December 2007. TAF worked similar to the discount window lending, with the same collateral requirement but the Fed sells at an auction a preset quantity of loans, so the competitive auction determines the interest rates. The TAF was just one of the actions operated during the crisis, successively the Fed conduct others to help restore liquidity to different parts of the financial system, for instance, Term Securities Lending Facility (TSLF) and Money Market Investor Funding Facility (MMIFF)<sup>9</sup>.

Instead, the second period concerns the Post-Great Recession, beginning in the third quarter of 2009 and it involves three elements:

- 1. the zero interest rate policy
- 2. large-scale asset purchases, known as QE
- 3. forward guidance

In particular, the second one comprehends new purchases programs, different from the usual open market operations. Indeed, the aim was to reduce interest rates for certain kinds of credit.

Fed's quantitative easing started in November 2008 with the Government Sponsored Entities Purchase program. This lead to a purchase of \$ 1.25 trillion of mortgage-backed securities (MBS)<sup>10</sup> which had the guarantee of two government sponsored enterprises, Fannie Mae and Freddie Mac.

- Loans to J.P. Morgan to buy Bear Stearns
- Primary Dealer Credit Facility (PDCF)
- Loans to AIG
- Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF)
- Commercial Paper Funding Facility (CPFF)
- Term Asset-Backed Securities Loan Facility (TALF)

<sup>&</sup>lt;sup>9</sup> Other lending facilities during 2008:

Swap lines

<sup>&</sup>lt;sup>10</sup> A mortgage-backed security (MBS) is an asset-backed security: it is guaranteed by a mortgage or collection of mortgages with a process of securitization. The financial content of MBS depends on the flow of payments resulting from mortgage lending and early reimbursement risk. An authorized financial institution originates the mortgage.

The purpose was to encourage the economy in the housing market with the reduction of interest rate on residential mortgages.

Then two years later, we recorded the QE2 which was a purchase program of \$ 600billion of longterm Treasury securities at a pace of purchase of about \$ 75 billion per month. In fact, during the crisis, there was a situation in which short-term interest rates on Treasury securities were almost at zero, instead long-term interest rates were not.The point is the long-term interest rates are most relevant for what concern investment decisions, so the Fed undertook this action to stimulate investment spending.

Finally, we had in September 2012 a third large-scale quantitative easing which was a combination of the previous two. Indeed, the program comprised purchases of both mortgage-backed securities (\$ 40 billion) and long-term Treasuries (\$ 45 billion).

In this case there was not a fixed dollar amount to be reached, instead was open-ended until substantial improvements were achieved. This last QE has been the largest one: to understand better the size of these three different programs the pie chart below gives us information about the changes in asset holdings on the Fed's balance.



Changes in Asset Holdings on the Fed's Balance Sheet. In billion: QE1: +\$451 – QE2: +\$578 – QE3: +\$1,663 Total Changes: +\$2,587. (The total also considers other items.) *Data from: Labonte, M. (2015) "Monetary policy and the Federal Reserve: Current Policy and Issues for Congress," Congressional Research Service, 18 June, p 13-14.* 

But what has come from these quantitative easing programs? By June 2014, the Fed's balance sheet has been quintupling and also the monetary base has increased by 377%. Considering the implication for the money supply is interesting.

As a matter of fact, a large expansion of the monetary base like this could potentially cause an enlargement in the money supply too. But, as we can see in the following graph, the money supply has a little increase if we compare with the monetary base's one.



**Money supply and monetary base**. Source: Mishkin, F.S. (2016) "The Economics of Money, Banking, and Financial Markets," 11<sup>th</sup> edition, Pearson, p 406. From Federal Reserve bank of St. Louis, FRED database.

Why do we find these results? If we refer to the money multiplier (m), which says how much the money supply has a variation after a given change in the monetary base, we know this relation:

$$m = \frac{1+c}{rr+e+c}$$

This means that the money multiplier depends on the currency ratio (c) which is set by depositors, the excess reserves ratio (e) determined by banks and the required reserve ratio (rr) set by the Fed. A possible explanation for this different increase between the monetary base and money supply comes from the excess reserve ratio. In fact, data show us that this ratio rose by a factor of over 1,000.



This happened because, after Fed's operations, banks needed more reserves to respect their requirements. As a result, they preferred to hold the reserves because the interest rate (paid by Fed ) on these was often higher than the rate at which the banks could lend them out in the federal funds market.

Now, looking at the previous equation, there is a negative relation between e and m, so the money supply did not have a big expansion because the increase in e has contained the rise of the money multiplier.

By contrast, if we observe the enlargement of the Fed's balance sheet, we recorded an unprecedented increase: asset shifted from about \$ 800 billion in 2007 to over \$ 4 trillion in 2014.



**Fed's Balance Sheet.** Source: Board of Governors of the Federal Reserve System website (2017) "Credit and Liquidity Programs and the Balance Sheet," July. <u>https://www.federalreserve.gov/monetarypolicy/bst\_recenttrends.htm</u>

In particular, the large part of this expansion comprises the Fed agency debt and mortgage-backed securities purchases and the long-term treasury purchases.

However, as I showed before, the different level of increase in the money supply led us to think that quantitative easing has not been as dominant as we could imagine. The crucial issue is the fact that banks have added to their holdings of excess reserves instead of making loans, missing the objective of make stimulus to the economy.

Even though this is true, as Bernanke argued, we cannot say that quantitative easing in U.S. has not been effective.

Indeed, the Fed's actions have no the aim to expand the balance sheet; rather their purpose was to alter its composition. Why? Because in this way there could be an improvement in the functioning of particular segments of the credit markets because Fed policies provided them liquidity.

Moreover, it is important to underline that even though there was no possible to lower short-term interest rates to stimulate the economy, asset purchases programs allow the reduction of interest rates for borrowers, as the residential mortgage ones, and encourage the investment spending.

Indeed, Bernanke's arguments (2012) about QE support this thesis. The fundamental idea is that financial markets present a segmentation by asset maturity. This means that QE could work similar to conventional monetary policy but with one significant difference. The monetary accommodation concerns the reduction in long-term bond yields, instead than short-term ones. On the contrary, not all the economists have agreed on the definite result of quantitative easing. For instance, Williamson (2015) not only underlines the problem of excess reserves that I mentioned before, but also he argues that there is no a theoretical link between QE and the final increase in inflation.

Instead, he believes that QE could cause lower inflation. With government debt in short supply as collateral, there is a liquidity premium to safe assets (with low interest rates). So when Fed conducts a swap of short-maturity debt for long-maturity ones, as it happened with Operation Twist<sup>11</sup>, the effective stock of collateral rises. The consequence could be a reduction of liquidity premium and an increase in real interest rate which lead a decrease in the inflation rate.

He also referred to some empirical evidence: first, the fact that Switzerland and Japan with their larger balance sheet (as QE implies) have experienced periods of very low inflation. Second, about U.S., the Fed has missed its inflation target since 2012. In fact, if we see the following chart, only in the recent two years the inflation rate is close enough to the target.



http://www.usinflationcalculator.com/inflation/current-inflation-rates/, from the U.S. Labor Department.

<sup>&</sup>lt;sup>11</sup> An operation twist is a monetary policy operation that includes the purchase and sale of bonds. In this process, the Fed purchases and sells short-term and long-term bonds (actions depend on the objectives). For instance, in September 2011, the Operation Twist conducted by the Fed tries to reduce long-term interest rates, selling short-term Treasury bonds and then purchase the long-term ones. In this way, there was a downward pressure on the long-term bond yields. (definition from Investopedia, <u>http://www.investopedia.com/terms/o/operation-twist.asp</u>)

Even though this opinion is useful to take into account the possible disadvantages of QE programs, we have to say that U.S. economy is going well also thanks to these actions. Of course, there are not only benefits as some theories sustain, and for this reason, we should also consider unintended consequences as we will see in the next chapter.

However, after Fed results through the quantitative easing programs, also ECB has undertaken asset purchases as a response to the global crisis even with some differences.

#### 2.2.2 ECB Expanded Asset Purchase Programme

After the crisis, all parts of the economy experienced a period of contraction. Despite the actions undertaken by the ECB in the first years, in 2014 the euro area inflation was much below the objective. As we can see in the following graph, there was the necessity of an intervention.



First of all the ECB lowered twice the official interest rate: first, the deposit facility rate at -0.20 and the marginal lending facility rate at 0.3 on December 2015, then from March 2016 they were respectively brought at -0.40 and 0.25.

Second, on the 5th July of the same year, the ECB launched the first target long term refinancing operation (TLTRO I). This is an operation which gives financing to credit institutions for a term until four years. The objective is to provide attractive conditions to banks for long-term funding. In this way the private sector receives help, and there is an incentive in bank lending to the real economy.

Third, in this package of measures ECB includes the Asset Purchase Programme (APP), that is also known as Expanded Asset Purchase Programme because of successive enlargements. It currently comprises:

- the Third Covered Bond Purchase Programme Program, CBPP3 which has begun in October 2014;
- from November 2014, the program for the purchase of securities issued after the securitization of loans, the so called Asset-Backed Securities Purchase Programme (ABSPP);
- 3. the Public Sector Purchase Programme (PSPP) that is a program for the purchase of government bonds issued by the governments of the euro area and by international or supranational agencies and institutions located in the euro area (from March 2015).
- 4. from June 2016, purchases are extended to non-financial companies' bond, with the Corporate Sector Purchase Programme (CSPP).

The overall program counts monthly net purchases of public and private sector securities of about  $\epsilon$ 60 billion on average: in particular 60 billion between March 2015 and March 2016, 80 billion from April 2016 and March 2017, then again 60 billion till now.

Now, let's consider that the PSPP is properly a quantitative easing program: the action is to inject liquidity into the system and pull down interest rates. In this way, as we learned, there will be an increase in the dimension of the Eurosystem balance sheet.

The other three programs (CBPP3, ABSPP, CSPP) could be better defined as credit easing operation which restores the proper functioning of the transmission mechanism and stimulates the credit provision to the real economy. The consequence is a change in the composition of the Eurosystem's balance sheet.

However, the general objective of these actions is to stimulate borrowing and spending activity. These help to pursue the principal aim of the inflation rate below but close to 2 per cent over the medium term. And in general, through these mechanisms, ECB promotes economic growth.

The Expanded Asset Purchase Program (and in particular the Public Purchase Program) has direct consequences on public and private bond yields. It favors a downward shift of market returns, which have an inverse relation with prices. In fact, it improves credit supply conditions and stimulates investment spending.

The reduction in interest rates also favors depreciation of the exchange rate that contributes to raising inflation, providing further stimulus to economic activities. Additional liquidity encourages investors to balance their portfolio with financial assets more profitable, not directly affected by central bank interventions. In this way, the process sends the monetary impulse to the various private sector financing instruments.

The direct effects of the purchase program have arisen in the financial markets especially in the early stages. During the period between the announcement of the PSPP (January 2015) and the launch of the program (March 2015), yields of Italian government bond at 10 years have declined from 2.00% to 1.40%, as the figure below shows. And a similar shift also occurred for Germany's bond.



10 years Government Bond Yields (Germany and Italy). Data from Bloomberg and Banca d'Italia.

According to Banca d'Italia data, the nominal exchange rate of the euro against the US dollar depreciated by about 3.9%; the cost of loans granted to Italian households and businesses has been placed on very low levels.

At the end of 2015, other external factors, such as the re-emergence of some risks associated with the Emerging economies' slowdown, affected some of these previous results. For example, yields on 10-year securities have returned to the levels recorded at the beginning of the program. Then,

with the successive extensions of the EAPP in January 2016 and in January 2017, we recorded other decreases.

Now, let's see in detail which are the rules defined by the Eurosystem for the EAPP. Which securities can be bought? All the securities eligible for monetary policy operations (BCE/2014/60) with a return higher than the deposit facility rate(-0,40%). The minimum rating required is first-best rating of BBB- or equivalent (ABSPP requires a minimum second-best rating of BBB).

There are two kinds of counterparties that can buy these securities:

- domestic ones who participate in Eurosystem monetary policy operations
- all the other counterparties that central banks of the Eurosystem use for the investment of their euro-denominated investment portfolios

The ECB coordinates the EAPP through the control over the national central banks' purchases. Indeed, there is a decentralized process where are the national central banks the ones who conduct the purchases. In their activity, they try to follow two main principles: the best execution and market neutrality. That is because Eurosystem wants to act as a regular investor without generating any distortion in the market and altering the smooth functioning.

Just to give us an idea of the size of this program, since the launch of the APP and until 31 December 2016, Banca d'Italia has carried out further 13,900 transactions; 8,800 of them only to buy Italian public securities on the market. During this period 209 billion at face value were purchased by Banca d'Italia and ECB; at the end of July 2017 this value amounted at 283.7 billion.

The implementation of the PSPP follows a specialization principle by country: the national central banks can buy on the secondary market securities issued by their governments with a maturity between 2 and 30 years.

The principle of sharing revenues and losses is worth for 20 percent of purchases (according to the participation of national central banks to the ECB's capital); the remaining 80 percent of the proceeds remains on the balance sheet of the central bank that made the purchases. The risks associated with any losses on securities are mitigated by highly detailed eligibility criteria. In fact, there is an issue share limit of 33% (or 25% when there are some specific circumstances). In this program there are no primary market purchases.

The PSPP is implemented to grant flexibility: the purpose is to limit bond purchases' influence with the mechanism of market's price formation and also to maintain market liquidity. During the daily implementation, bond purchases react quickly to signs of the scarcity of individual bonds. For what is possible, the Eurosystem tries not to purchase bonds that are cheapest to deliver under futures contracts, or even the ones with special features in the repo market (or if they display relatively limited liquidity for some other reasons).

The PSPP has contributed to the extraordinary reduction of government bond yields through the lower term premia and the increase in excess liquidity: in this way, it anchors money market rates and their expectations close to the rate on the deposit facility. Also, through PSPP, the ECB has supported the reduction of cross-country fragmentation leading to lower spreads between higher-rated and lower-rated countries. Moreover, even the yields on other financial assets recorded a decrease, whereas bank lending conditions have got better.

For what concerns the Covered Bond Purchase Program, the NCBs purchase a daily quantity of securities defined by the ECB according to a subdivision by jurisdiction. For instance, Banca d'Italia operates in the markets of Italy, Spain, Belgium and the Netherlands. The principle of sharing revenues and losses is worth for all securities purchased under CBPP3, according to the participation of national central banks to the ECB's capital.

Through the CBPP, the ECB intends to enhance the functioning of the monetary policy transmission mechanism: indeed, this program can help to support financing conditions in the euro area. It also facilitates credit provision to the real economy and causes positive spillovers to other markets, which means that it induces portfolio rebalancing.

For the Asset-Backed Securities Purchase Program, ABSPP), the NCBs are involved in all the stages of the securities valuation process and take part in the management of the program. In the first phase, there were two internal asset managers (Banque de France and Banque Nationale de Belgique/De Nationale Bank van België) and two external asset managers (Amundi and NN Investment Partners) which conducted the purchases because of the special features of ABS market. Instead, from April 2017 the purchases are conducted exclusively through six NCBs (Belgium, France, Italy, Germany, Spain, and Holland).

Through ABSPP, banks can receive support to diversify funding sources and to encourage the issuance of new securities. Thanks to this program, the banks can execute better their primary role that is the credit provision to the real economy. For example, when a bank securitizes loans and sells them, it has the necessary funds to provide new lending to the real economy.

Finally, even the Corporate Sector Purchase Programme operates through the specialization approach: each NCB buys the bond issued by its own jurisdiction. Here the purchases are conducted in both primary and secondary markets.

The aim of the CSPP's introduction is to strengthen the pass-through of the asset purchases in the Eurosystem to the financing conditions of the real economy. For what concerns the distribution of purchases, there is a good diversification across corporations in lots of economic sectors and across the euro area countries where bonds are outstanding according to a market capitalization based benchmark.

But which is the weight of the different programs in the EAPP? The pie chart below shows the Eurosystem holdings at the end of July 2017. As we can see, the PSPP is by far the largest component of the asset purchase programme (APP).



All these purchases increase the Eurosystem holdings to inject liquidity into the banking system. So, as we saw for Fed's balance sheet, also ECB's one reflects the changes due to the quantitative easing. If we look at the graph of the ECB balance sheet, it is evident how much of its expansion depends on the quantitative easing program (red part in the next figure).

Now that we have underlined the most important features and intent of quantitative easing referring to the Fed and ECB's actions, I would like to consider facts and opinions about its implications.



#### 2.3 Transmission channels and effectiveness

The international experience of unconventional measures such as quantitative easing has been different in nature, size, and vigor, taking into consideration the features of the country.

In fact, on the one hand in United States quantitative easing has finished with Fed that has raised the policy rate in 2015 and Bank of England continues to prepare market participants for an eventual increase too.

Even so, in both cases, they kept the same level of holdings (as we have seen for Fed balance sheet). On the other hand, not only ECB as we have mentioned but also the Bank of Japan and other central banks, such as the Swedish Riksbank, have not stopped their asset purchases programs. Furthermore, several central banks have reduced policy rates to negative levels. As shown in the chart, we recorded that the Euro area and the Denmark deposit rates are below zero, as also other policy rates in Japan, Sweden, and Switzerland.



**Monetary policy rates**, last observation May 2016. Euro area: DRF – Denmark: certificate of deposit rate – Sweden: repo rate/rate of interest on Riksbank certificates – Switzerland: midpoint of target range for three-month London Interbank Offered Rate – Japan: rate on outstanding balance of financial institution's current account. *Sources: Santor*, *E. and Suchanek, L. (2016) "A new Era of Central Banking: Unconventional Monetary Policies," Bank of Canada Review (Spring), from Danmarks Nationalbank, Sveriges Riksbank, Swiss National Bank, Bank of Japan, ECB.* 

There are multiple channels through which quantitative easing is expected to improve economic conditions. It increases the price of the purchased assets and reduces the yield on them. In this way, it flattens the yield curve of the purchased assets (chart in the next page).

One effect of lower interest rates is that the financing costs of firms and households are reduced, so there are incentives to increase borrowing. Moreover, there is an encouragement for investors to prefer riskier assets to government bonds. In fact, higher asset prices can also generate a positive effect that induces confidence and hence, the growth in spending.

Another consequence of QE is on the exchange rate because QE causes a downward effect, which means a stimulus to aggregate demand because the domestic production becomes more competitive than in the precedent situation.

The international experience has repeatedly shown that QE has achieved its goal: to provide significant monetary and financial easing. It is interesting to underline that some studies have observed how the impact of quantitative easing is not only on purchased assets: in some case, it also reduces other types of debt.



Even though the macroeconomic effects are harder to estimate, using a variety of models and methods, researchers have found that there are impacts on GDP growth and inflation. Indeed, QE may be the better solution when policy rates arrive too close to the effective lower bound.

Instead, if we want to focus on negative interest rates, we could refer to the transmission channels of conventional easing because there is a similar effect: the shift downward of the yield curve at all maturities which is different for QE, that regards the longer maturities. We can see this effect on the yield curve in the next graph.

However, the experience is much more limited than with QE, and we are not able to say if negative rates could help economic growth and support inflation.



#### **CHAPTER 3**

#### COSTS, CONSEQUENCES, AND EXIT STRATEGIES

Quantitative easing could be a powerful source to stimulate the economy, but central banks need to evaluate costs when they choose to operate this kind of program. A key factor is the time management: indeed, a prolonged process should be monitored differently from a shorter one because costs and also effects differ in their impact.

Additionally, it is important to examine which is the relation between monetary policy measures such as quantitative easing and financial stability. For instance, the implementation of some prudential policies could help to maintain the financial stability, and hence make monetary policy more efficient.

Moreover, sometimes there are unintended consequences which could slow down the process, and for this reason, it could be useful to take them into consideration. There could be some factors that alter the effectiveness of the program: often it depends on the economic context in which central banks conduct quantitative easing.

Finally, it is important to underline the fact that when these programs come at the end, central banks should manage the situation through exit strategies. The aim is to prepare the market for changes and to preserve the results reached with quantitative easing.

#### 3.1 Financial stability and Prudential policy

Prudential, fiscal and monetary policies should be three separated actions. In particular, this is the general view before the crisis. However, because of correlations between these policies, some economists start to think differently and suggest a coordination in the conduct of them. In this debate, Cecchetti (2015) first lists the connections between these regulations and then, after some researches, concludes that the pre-crisis consensus remains intact. Let's see why.

First of all, we should take into account that monetary policy influences prudential policy because of its impact on bank, household and firm's balance sheet as we have seen in the first chapter with transmission channels. Moreover, prudential policy can affect the cost of lending, hence the reactions of intermediaries to changes in interest rates. Instead, the influence on the fiscal policy is due to the treatment of sovereign debt.

Finally, monetary policy measures affect the stabilization effect of fiscal policy when the zero lower bound problem occurs.

The relevant issue is to understand how much strong are these interconnections. If we consider a simple framework with its impulses (which can be real, nominal or financial<sup>12</sup>), we know that the propagation mechanism operates on sectoral structure, investment opportunities and balance sheets of households, firms, and banks.

The outcome of macroeconomic stability and financial stability depends on that. The first one is granted with a high and stable growth and when the inflation is stable, and its level is not high. The second one occurs when the probability of crisis or the severity of its effects are low. In particular, there could be three sources of instability:

- 1. A shock that destabilizes the system if it is not stopped. In this case, through monetary policy, central banks could stabilize the situation trying to neutralize shocks.
- 2. The possibility of increases in the amplification of a shock through the propagation mechanism. This issue could be solved with prudential policy. Indeed, its aim is to ensure institutional and systemic resilience, which means to reduce the sensitivity of the financial system when shocks happen.
- 3. Variations in the distribution of shocks. These depend on the systemic risk. So, the debate question is: how much does monetary policy influence the systemic risk? If the impact is small, as Cecchetti explains, then the objective of financial stability should be conducted by actions in prudential policy.

Let's consider the third issue during easing programs. We can count three disadvantages of this kind of policies. First, with the reduction in borrowing costs, everyone is encouraged to take on more debt. Second, also investors take on additional risk because nominal and real returns are lower than usual. Third, the reduction in interest rates causes currency depreciation which increases the foreign currency debt.

<sup>&</sup>lt;sup>12</sup> Impulses:

<sup>•</sup> Real: productivity and terms of trade

<sup>•</sup> Nominal: interest rate, exchange rate, equity or property prices

<sup>•</sup> Financial: Information and risk attitudes

However, referring to an IMF study of 2015<sup>13</sup>, Cecchetti underlines that policy easing's impact on output is approximately the same with the financial system under stress or not.

Furthermore, monetary policy can help to lower financial stress in the short-term. For what concerns the long-term implications, effects are different, but I will return later on that.

The conclusion is that the resilience of the system is an objective of prudential policy. Indeed, it can ensure financial stability or at least minimize its risks in several manners. A good solution could be the combination of high capital requirements and stress tests.

Basel III offers a good example in this sense. As a matter of fact, through capital requirements, it is possible to reduce the probability of crisis in the larger part of institutions. Also, the social costs for this measure are almost small.

Moreover, with stress tests, we can examine if a bank is sufficiently ready for adverse situations: if it has enough capital and liquidity to ensure minimum requirements without raising equity in other ways. Additionally, according to Cecchetti's suggestion, these tests are a flexible and fast solution.

# 3.2 Limits in using unconventional policies during the long-term and other unintended consequences

Monetary policy measures and hence quantitative easing programs could have a stabilization effect both for real economy and for the financial system in the short run. This is what we have learnt from theories and researches.

Instead, for what concerns the long run we don't have so much experience. According to Labonte (2015), the issue is that over the long term, the rapid rate of growth of money and credit is lost through a rapid rate of inflation and the effects on real GDP and employment are so much restrained, or they even do not exist.

Economic explanations refer to two situations. First, the difference is that in the short run there is an elaborate system of contracts (implicit or explicit) in many economies. This system implies a slow adjustment in wages and prices with a more rapid growth of money and credit, instead.

<sup>&</sup>lt;sup>13</sup> IMF study uses a Bayesian Threshold-VAR considering monthly data on industrial production, inflation, the slope of the U.S. Treasury term structure. Financial stability is measured considering the average distance to default for insurance companies and the largest banks for trading during a period from 1984 to 2014. This test is based on another research in 1974 conducted by Merton.

The second reason depends on the fact that this slow change also causes rigidities both to wages and prices. The consequence is a large initial effect on output and employment because of the variations in the growth of money and credit (which alter the aggregate demand), even if with a policy lag. But when in the long run there is a renegotiation of contracts, with expectations adjusted, wages and prices increase because of the change in the aggregate demand. So, a larger part of the variation in output and employment is wasted.

Moreover, for what concerns the long run, also the use of unconventional policies has to be monitored: in particular, if the dangers from a period of crisis begun worse than in a typical recession, extended monetary policy easing creates financial instability. The economist Blanchard (2014) refers to these periods as a "dark corners" in which the economic rules do not work as always, and hence problems occur.

However, we should understand when this trade-off between the necessity of intervention and the financial stability problem shifts.

Indeed, if the period of policy easing lasts too much, bank leverage rises. Cecchetti (2015) suggests one solution to this problem. He sustains a financial regulatory system in which the rules are rigid enough to avoid that banks reach a very low-level position.

However, important issues remain. Specifically, we should consider many potential costs: some associated with prolonged monetary easing measures in general, others which are related in particular to unconventional ones and hence quantitative easing.

As we have just mentioned, most critics concern the increased risk in the financial system. If we focus in the case of QE, other market functions may be affected. The first reason is that with quantitative easing safe assets which are useful to several services are less available, as for the case of collateral. For instance, lots of investors need long-term government bonds to comply with regulatory requirements and also because they can use them as collateral during financial transactions; hence these assets have an important role for liquidity in the system.

The second reason depends on the fact that central bank's asset holdings increase substantially: these changes affect price discovery and liquidity premium. Malfunctions like this could be an obstacle for real economic activity, and they slow the process of recovery.

A similar concern about financial market functioning regards the impact of negative interest rates if we consider for instance that financial assets with payoffs that go below zero.

But more than this, it is important to underline the risk which follows the reduction of long-term yields: we have understood that quantitative easing and negative interest rates work because they stimulate investors. Hence, they also encourage risky exposures in investments. In prolonged periods, risk taking actions could cause financial distortions as asset price over-valuation or the reduction of credit standards.

However, the effectiveness of unconventional monetary policies does not depend only on the time component. There are other several factors which affect the results. Santor and Suchanek (2016) describe the success of these actions "state-dependent." This definition is appropriate if we realize how much the economic context matters in this process.

In fact, during the crisis, these measures affected the bond yields, but when liquidity has increased, this kind of effects had a reduction. Moreover, small open economies could experience less efficacy because there is a weak correlation between government bond yields and international ones.

Additionally, there are potential costs of unconventional measures such as quantitative easing that represent another limit. There could be a point in which advantages coming from these policies do not outweigh costs.

If we consider the operational implications we must notice that there are other important limits too. For instance, during large-scale asset purchases programs, a huge amount of purchase could damage market functioning because of the deterioration of liquidity.

We know that the central banks' holdings of government debt are a relevant share of the total amount: for instance, at the end of 2015, they represent the 46% in U.S., 36% in Japan, 32% in U.K., 17% in Sweden and 21% in Euro Area<sup>14</sup>. Also, for the latter we must remember that ECB has implemented its QE and the level of total outstanding, as recorded in the second chapter. However, according to policymakers, it does not seem that these measures have reached the limit, the so called effective quantitative bound which means that asset purchased has finished its beneficial effects.

Furthermore, we should list some more general potential costs. Although none of the central banks I mentioned are currently involved in this issue, some argue that quantitative easing affects central bank independence and credibility if there is a perception that their purpose is to monetize deficits through inflation.

<sup>&</sup>lt;sup>14</sup> Source: Santor, E. and Suchanek, L. (2016) "A new Era of Central Banking: Unconventional Monetary Policies," Bank of Canada Review (Spring), p. 36. Data taken from International Monetary Fund, US Treasury, UK Debt Management Office, Bank of England, Ministry of Finance Japan, ECB and Sveriges Riksbank.

Instead, others focus their concerns considering the effect of advanced economies' quantitative easing on the emerging ones that are capital flows but also an upward pressure on asset prices and exchange rates. But the overall impact has been positive in the larger cases.

#### 3.2.1 The interaction of different unconventional measures

Another unintended consequence of quantitative easing could depend on the interaction with other unconventional measures. We have not considered this case yet. Sometimes these policies used in combination reinforce positive effects on the economy.

For example, in the United State QE worked efficiently also because it has increased the credibility of forward guidance: in fact, there was a clear communication to financial market participants about the program's decisions of the Federal Open Market Committee. Similarly, quantitative easing conducted by ECB has helped the implementation of forward guidance. In this way, it has intensified the credibility of the announce about low future rates. This happens because when policy rate increases early, there could be capital losses, hence market participants think that the central bank would try to avoid these losses.

In some situations, it is even necessary the simultaneous use of unconventional policies. For instance, when ECB chose to expand the quantitative easing program in 2015, it also lowered the deposit facility rate to -0.3%. Indeed, there was an eligible criterion for which bonds with yields lower than the DRF should not be considered in QE; so this decision was undertaken to cut out that bonds.

Another consistent correlation exists between credit easing and lower interest rate. The former could improve the transmission of the latter, as it happened in the United States. In particular, the large scale of MBS purchases also caused a transfer of lower policy rates to other assets classes. We could record the reduction in corporate rates and also the rise of stocks' value.

We had experienced a similar situation in the Euro area when in June 2014 through ECB measures there was an easing of banks' funding conditions and also a small transmission to the borrowing costs of households and companies. Successively, with the expansion of the asset purchase program to involve corporate sector bonds, the purpose was to reinforce the pass-through of the program to the financing conditions of the real economy.

By contrast, in other situations, the effects of the combination of unconventional measures are not cumulative, and they also represent challenges. For instance, it is better not to combine regularly negative deposit rates and asset purchases. In fact, the stimulus for banks to grant loans and buy assets instead of holding excess reserves generates extra liquidity in the system that finally is deposited in the bank. And with negative interests, banks' margins decrease but if banks start to cut loans or change credit conditions, they compromise the positive effects of monetary policy.

Moreover, the simultaneous use of negative rates with forward guidance could affect the results of these actions. Indeed, if market participants generally perceive negative interest rates as a temporary tool and they do not change the usual behavior, when this policy is implemented with forward guidance their reactions are different. They try to find other solutions to minimize their costs: for instance, because they do not want to pay interests on deposits, they could invest in safe storage of cash. In this way, the effective lower bound problem increases and at the end it limits the effects of the negative interest rates policy.

Finally, for what concerns the general implementation of unconventional monetary policy, some believe that the main issue regards the successive choice of central banks to raise rates at the end of these measures. But if we look at the Fed experience we are optimistic about this concern: having said that, exit strategies, in general, should be monitored because are an important final step of these programs. Let's examine them better.

#### **3.3** The normalization of monetary policy: inflation expectations

Central banks should specify their exit strategies from unconventional policy measures: in this way, they can keep inflation expectation well anchored. Through the management of expectations policymakers could monitor the inflation: in fact, the process operates through shifts in the short-run aggregate supply curve<sup>15</sup> because of the rise of inflation expectations. In this way, as the following figure shows, the economy reaches the point 2 in which output and inflation are higher than before.

<sup>&</sup>lt;sup>15</sup> AS: aggregate supply LRAS: long-run aggregate supply Y: output AD: aggregate demand. The kink in the aggregate demand curve reflects the zero lower bound problem, explanation in the 2.1 paragraph.



This happens because the increase in expected inflation causes a reduction in the real interest rate. The effect is a stimulus to investment spending and output. However, the problem of this strategy is the public's belief: it is necessary that market participants strongly think that inflation will rise in the future for real. Otherwise, this mechanism does not work if the central bank does not commit to credibly raising the inflation.

Moreover, when central banks decide to undertake exit strategies, there are several factors to consider. First of all, exit strategies are country-specific: indeed, they reflect the particular circumstances that occur in that given country. Secondly, they, of course, include all the potential decisions about the limitation in the use of unconventional policy with the further aim to abandon them definitively.

Referring to quantitative easing programs, central banks should wait that the purchased assets reach the maturity. Over several years, the size of central banks' balance sheet come back to fewer quantities with a gradual normalization. It is important to underline that the ability of central banks to pay interest on reserves is an instrument through which they increase the policy rates and avoid to main6tain large balance sheets. This is a flexible action that could be used in exit strategies.

Even in the case of negative interest rates policy, the exit process should be similar. Indeed, central banks could use the changes to the corridor.

However, there are several challenges to consider when central banks operate exit strategies from unconventional monetary policy such as quantitative easing. Indeed, there could be an alteration in the transmission mechanism because of central banks raise policy rates and drain reserves simultaneously. With too much liquidity than usual, an increase in policy rate could have less contractionary effects.

Moreover, when for a central bank becomes necessary to sell assets, it could have losses. So, to defend policy credibility and then reach the effectiveness of its policy, it should state accountability. An example from a previous experience could be the case of the Bank of England: there were indemnities, provided by the government, to cover losses from the asset purchase facility.

It could also be useful to analyze the normalization process operated by the Fed after quantitative easing and zero interest rates. The Fed communicated that at the end of October 2014 it would stop the large scale asset purchases. Its plan was to continue the implementation of monetary policy through the federal funds rate target.

Before the crisis, the Fed had altered the federal funds rate through the reserve levels. However, during the exit process it could not do the same because the QE has caused excess bank reserves of more than \$2 trillion, so the market clearing federal funds rate has reached almost zero.

The removal of those reserves by reducing the balance sheet with asset sales would be a good solution to this problem. However, in the Fed's normalization statement, the central bank excluded MBS sales and it also saw that it does not want to sell Treasury securities. Its plans consisted of a gradual reduction of securities when they have reached their maturities, with a consequent rise in the funds rate. This process implies several years: indeed, Janet Yellen has said that the Fed wants to reduce its balance sheet until it has no just the securities necessary to conduct monetary policy successfully. Then, it will hold primarily Treasury securities.

Indeed, the choice to sell asset rapidly would have generated volatility in those markets. Instead a gradual process could prevent from this risk. The Fed's objective is to increase market interest rates through two means: the rise in the bank reserves rate and the alteration of repo rates through large scale reverse repos. With these actions, the Fed can monitor the federal funds rate: in particular, as Labonte underlines, the Fed can lock up the liquidity in excess to not be affected by inflationary effects because the banks could not use the reserves at the Fed to finance activity in the economy.

Furthermore, the effect of reverse repos is to drain liquidity from the system and also to alter shortterm market rates. In fact, interest rates in the repo markets which represent one of the main shortterm lending markets, increase. However, because since 2013 the Fed is involved in a too much large volume of the reserve with lots of nonbank counterparties that it does not regulate, there started to be some concerns about this situation. For this reason, the Fed normalization statement specifies that the dominant measure to influence interest rates is the interest on reserves; instead, reverse repos represent a limited size of the program.

While policy normalization has started in United Stated, the Expanded Asset Purchase Program in the Euro Area is not concluded yet. So, it becomes interesting to consider the current plan of the ECB and to examine the potential implications for the future if it will undertake exit strategies in the next months or years, as some expect.

#### 3.3.1 The current position of the ECB

Markets have started to believe that ECB is going to operate an exit strategy from its exceptional monetary policy. Even though ECB moves slowly to policy normalization and asset purchases continue, it probably will begin a careful recalibration of its instruments to maintain stimulating actions almost unchanged: this does not actually mean that a policy tightening will start in the next years.

In particular, it is true that the Governing Council intends to gradually shrink asset purchases to zero from the beginning of 2018: this operation is commonly known as tapering. However, rate hikes will follow later on, also to be coherent with the ECB's forward guidance. Indeed, the aim is to prevent from other risks: with underlying inflation pressures weak, monetary policy measures are going to remain loose for a longer time.

During the ECB Forum in Sintra, President Mario Draghi underlined that low inflation, even if it is persistent, does not represent a hindrance to policy calibration: he insisted that stimulus for economy must remain broadly unchanged to allow a full recovery.

However, the ECB is preparing the market for future adjustments. The tapering is expected for 2018: a reduction of the monthly asset purchases.

Indeed, if we want to see the QE progress, we can say that more than 85% of the ECB extended 2.28 trillion quantitative easing is accomplished (see the bar chart below).



Even though we should not consider Draghi's speech should as a signal towards a policy normalization, in the market this possibility for the next years has caused euro area bond yields to jump since September 2016 (as the following graph shows.)



**Bund yields**. Source: Petersen, A. (2017), "QE Monitor. The ECB's exit: Take it easy (for now)," Allianz Global Investors, 14 July, p.4. From Thomson Reuters Datastream, AllianzGI Global Capital Markets & Thematic Research

Since the market has started to react, and also economists and policymakers have expressed their concerns about the future ECB exit strategy, it could be useful to summarize which could be the

main steps. The key for policy normalization is a careful calibration and communication: the process needs a broad toolkit to organize a complete action. In particular, ECB has to manage:

- Conventional interest rate policy: ECB decisions regard timing of rate hikes but also the speed of this measure. Moreover, for what concerns the interest rate corridor, it has to adjust the structure and the dimension. As we have seen before, it involves the main refinancing rate, the marginal lending rate, and the deposit facility rate.
- 2. Unconventional liquidity and funding measures: these decisions include the tender procedure, the collateral pool and also the term funding.
- 3. Unconventional balance sheet policy (QE): this is properly the tapering. ECB need to choose between a consistent pace of reduction and a more flexible process. Also, it has to determine if the reduction of all the four programs of the EAPP is proportional and if it is conducted at the same time. Other actions regard the reinvestment policy and the balance sheet normalization: ECB will select its strategy. It could be a passive procedure through asset holdings' maturity or an active retirement through sales of holdings in secondary markets.
- 4. Forward guidance: the implementation of this measure concerns the future path of shortterm interest rates and net asset purchases. In particular, ECB will organize the sequencing mix between rate hikes and tapering.

If we refer to Draghi's speech at "The ECB and Its Watchers XVIII Conference" on 6 April 2017, it seems to be clear the approach to the sequencing mix that the ECB will adopt. Indeed, Draghi confirmed that the central bank would continue with its current forward guidance.

This choice implies that tapering and so the quantitative easing exit will be operated first. Then the rate hikes will follow this process. Otherwise, the impact of purchases achieved through quantitative easing would be partly neutralized because of the pressure coming from the precipitous path of expected short-term rates.

In the following graph, we can see the exit strategy according to the current forward. The first step is the tapering (red line): a gradual reduction of asset purchases until QE exit is reached (intersection point between red and green line). The second step concerns the rise in interest rates: it also includes the reinvestment of maturing bonds which has started in the first phase. Finally, the third step is implemented to work down the balance sheet: it could be undertaken with or without further rate hikes (respectively 3a and 3b.)



Instead, the next chart presents a different schema with the exit strategy that diverges from the current forward guidance. Here, the second step (green line) that is the rise in interest rates occurs before tapering has finished. Indeed, the QE exit which is represented by the black line follows the second step.



In both cases, it is important to underline the reinvestment scheme. Actually, the ECB has already begun it in March 2017. These reinvestment flows will reach  $\in$ 120 billion next year. In this way, there will be a ceiling on bond yield. Also, low borrowing costs will continue to support the economy, in particular equities and other types of debt with high risk. Some believe that this mechanism is the silent stimulus for Eurozone markets.

As we have seen before, also U.S. has implemented a scheme like this, even though there are some differences on just how the recycling of maturing bonds will work.

Indeed, ECB has not clarified the details: it just said that there would be a flexible reinvestment, which means that maturing bonds will be redeemed and reinvested at the maturity month or in the following ones when it is necessary.

However, during the tapering this scheme could be a strong accompanying instrument for the exit, making the participation of the NCBs and the ECB more prolonged in the program. For instance, if a tapering of 10 billion a month started from January 2018, purchases would end in May 2018, but the reinvestment of the maturing securities could even continue further.

Moreover, referring to the current situation, there are lots of monetary indicators, for instance bank lending, that show that ECB is confident in its policy effectiveness.

We can see the recovery in the economy since mid-2014 with a quarterly GDP growth repeatedly between 0.3% and 0.8% and with the employment that has increased by more than 4.5 million of people.

As Draghi pointed out, we can explain the resilience of such recovery through two factors: the collapse in oil prices in 2014-15 and the ECB's monetary policy. There are internal model-based estimates, which have confirmed that economic has been highly correlated with these two forces. In particular, he said that half of the extra GDP growth of current recovery has depended on ECB policy, with also a contribution from oil prices.

Taking all of this into consideration, Draghi insisted in saying that for now there is not sufficient evidence to alter ECB's assessment of the inflation outlook: this is still conditioned by a substantial degree of monetary accommodation. For this reason, ECB does not conduct a reassessment of the current monetary policy at this time.

This choice depends on several circumstances: in particular, ECB is trying to create sufficient confidence that inflation will reach its target over the medium-long term and also it will last even in different conditions in which monetary policy provides less support than now. At that point, ECB will make some alteration to the components that we have described before, as interest rates, asset purchases, and forward guidance.

#### CONCLUSION

Central banks' conduct has a significant weight in the economic framework: as we have seen in this short thesis, every choice is determined to meet a specific goal. This is generally the achievement of the inflation target which allows stimulating the economic system and tries to keep distant the possibility of a deflation process.

In some situations in which the general policy tools do not work as usual and the system suffers because of a crisis, the use of different measures such as quantitative easing is the right action to sustain a recovery.

Having examined the Fed case with its large scale asset purchases, we have to recognize that quantitative easing is a powerful source. It causes not only the immediate effects on yields of the asset purchased and on the central bank's balance sheet, but it also represents a stimulus to the real economy through several transmission channels. In the end, the final purpose to increase the inflation rate after a period of recession could be reached.

However, it is important to clarify that even this measure has limits, especially if we think that its benefits could be lost during a too much prolonged term or even because of the influence of other factors, such as other non-conventional measures or environmental determiners.

Nevertheless, quantitative easing is still necessary for the Eurozone in which the recovery is not concluded yet or at least some problems endure.

During the last meeting on the 7<sup>th</sup> September, the Governing Council have just confirmed that purchases will continue at least until the end of December 2017, but it could last even in the following months if the situation requests this measure. Having decided this policy, the ECB needs to control the anxiety of speculators that with the euro appreciation is blocking the path towards policy normalization. Indeed, the end of quantitative easing will be a complex and gradual procedure, and for this reason each step should be evaluated carefully not to frustrate the effects reached after the period of uncertainty caused by the crisis.

In conclusion, the aim of this thesis has been first of all to present the effectiveness of quantitative easing referring to the Fed and the ECB programs, analyzing the main channels involved in these operations. In the end, it is important to highlight that the process of normalization after the QE requires time managing and control over several factors such as inflation expectations.

## REFERENCES

- Alvarez, I. et al. (2017) "The use of the Eurosystem's monetary policy instruments and operational framework since 2012," European Central Bank, Occasional Paper Series No. 188, May, p 45-62.
  <u>https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op188.en.pdf?1ed71ae150b45e8633669345</u> e1d1d57b
- Banca d'Italia (2017) "Relazione annuale 2016," 31 May, p 42-51.
- Banca d'Italia (2016) "Relazione sulla gestione e sulle attività della Banca d'Italia 2015," 31 May, p 47-57.
- Bank of England (2017) "History of the Bank of England." http://www.bankofengland.co.uk/about/Pages/history/default.aspx
- Bernanke, B.S. and Gertler, M. (1995) "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," Journal of Economics Perspectives volume 9 number 4 (Fall) p 27-48.
- Bernanke, B.S. (2012) "Monetary Policy since the Onset of the Crisis," 31 August. http://www.federalreserve.gov/newsevents/speech/bernanke20120831a.pdf
- Blanchard, O.J. (2014) "Where danger lurks," Finance and Development, volume 51, number 3, September, p 27-30.
- Buttet, S. and Roy, U. (2013) "A Simple Treatment of the Liquidity Trap for Intermediate Macroeconomics Courses," CUNY Guttman Community College, 9 November. <u>http://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1001&context=nc\_pubs</u>
- Cecchetti, S.G. (2015) "On the separation of monetary and prudential policy: how much of the precrisis consensus remains?," CEPR No.10949, 13 November.
- Draghi, M. (2017) "Accompanying the economic recovery," Introductory speech at the ECB Forum on Central Banking, Sintra, 27 June. <u>https://www.ecb.europa.eu/press/key/date/2017/html/ecb.sp170627.en.html</u>

- Draghi, M. (2017) "Monetary policy and the economic recovery in the euro area," Speech at The ECB and Its Watchers XVIII Conference, Frankfurt am Main, 6 April. https://www.ecb.europa.eu/press/key/date/2017/html/sp170406.en.html
- European Central Bank (2017) "The Eurosystem's instruments." https://www.ecb.europa.eu/mopo/implement/html/index.en.html
- European Central Bank (2017) "Asset purchase programmes." https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html
- European Central Bank (2017) "Monetary policy decisions," 7 September. https://www.ecb.europa.eu/press/pr/date/2017/html/ecb.mp170907.en.html
- Federal Reserve Bank of San Francisco (2017), "What is the Fed: Structure." http://www.frbsf.org/education/teacher-resources/what-is-the-fed/structure/
- Friedman, M. (1962), "Should there be an independent monetary authority," from a larger work: "In Search of a Monetary Constitution," Yeager, p 219-243.
- Khan, M. (2017) "ECB reinvestment flows are 'silent stimulus' for the eurozone", Financial Times, 3 August. <u>https://www.ft.com/content/b3d34ee2-7813-11e7-a3e8-60495fe6ca71</u>
- Labonte, M. (2015) "Monetary policy and the Federal Reserve: Current Policy and Issues for Congress," Congressional Research Service, 18 June.
- Mastrobuoni, T. (2017) "La Bce conferma i tassi ai minimi e il Qe. Draghi: "Incertezza da euro forte," La Repubblica, 7 September.
  <u>http://www.repubblica.it/economia/2017/09/07/news/bce\_tassi\_quantitative\_easing-174821669/</u>
- Menietti, E. (2015) "Cos'è il "Quantitative Easing," Il Post, 19 January. http://www.ilpost.it/2015/01/19/quantitative-easing/
- Mishkin, F.S. (2000) "From Monetary Targeting to Inflation Targeting: lessons from the industrialized countries," Columbia University and National Bureau of Economic Research, January.

https://pdfs.semanticscholar.org/76b0/ac1b30059bba1eeb2ac304f40d2824e85e7c.pdf

- Mishkin, F.S. (1995) "Symposium on the Monetary Transmission Mechanism," Journal of Economics Perspectives volume 9 number 4 (Fall) p 3-10.
- Mishkin, F.S. (2016) "The Economics of Money, Banking, and Financial Markets," 11<sup>th</sup> edition, Pearson, p 400-468, 639-646, 672-685.
- Petersen, A. (2017), "QE Monitor.The ECB's exit: Take it easy (for now)", Allianz Global Investors, 14 July.
- Santor, E. and Suchanek, L. (2016) "A new Era of Central Banking: Unconventional Monetary Policies," Bank of Canada Review (Spring).
- Saunders, A., Cornett, M.M., Anolli, M., Alemanni, B. (2015) "Economia degli intermediari finanziari," 4<sup>th</sup> edition, McGraw-Hill Education, p 95-127.
- Skolimowski, P. and Tartar, A. (2017) "Draghi Seen Keeping Cool on Stimulus Drive Amid Inflation Surge", Bloomberg news, 5 March. <u>https://www.bloomberg.com/news/articles/2017-03-05/draghi-seen-keeping-cool-on-stimulus-drive-amid-inflation-surge</u>
- Tobias, A. and Liang, N. (2016) "Monetary Policy, Financial Conditions and Financial Stability," CEPR No.11394, 16 July.
- Williamson S.D. (2015) "Current Federal Reserve Policy Under the Lens of Economic History: A Review Essay," Federal Reserve Bank of St. Louis Working Paper 2015-015A, July.