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**ECB POLICIES ADOPTED DURING THE FINANCIAL
CRISIS OF 2008 THROUGH THE LENS OF THE
THREE-EQUATION NEW KEYNESIAN MODEL**

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Introduction

The recent financial crisis has been one of the most important ones of the last decades, especially, considering that it started in the USA but it also affected many economies worldwide. An element that has been put in evidence is the interconnection that nowadays characterizes the financial and banking system and generally, the economy itself. Undoubtedly, this has several advantages for each country, consumers, enterprises and so on, for example, the range of products that can be bought is larger than decades ago and it can be beneficial also for companies, since the competition increases and can lead to innovation but it has also disadvantages, since it implies that economic turmoil can easily widespread to other economies.

In the context of a financial crisis, measures must be taken at different levels, such as national and supranational, in the case of the European Union. In other words, the main instruments utilized are the fiscal and monetary policies, and within the Community, only the first one is an exclusive competence of the government. On the other hand, the second typology has been attributed to the Union by Member States and consequently, their sovereignty in this field is limited. In this regard, the institution charged is the European Central Bank (ECB), an independent body that can operate also in the international environment through the sign of agreements related to its competences, and by providing its contribution to the work of important organizations or agencies, such as the International Monetary Fund or the Organization for Economic Cooperation and Development (OECD). The comprehension of ECB functioning and its tasks is important to analyze its role during the financial crisis of 2008, underlying the measures adopted, and their efficacy with regard to the objective that it wanted to achieve. Moreover, it underlines that also the competence in the field of monetary policy is limited and consequently, sometimes it has to implement unconventional instruments, such as in the case of the crisis.

This thesis aims to make evaluations of the policies put in place at the European level, in the context of a macroeconomic model, more specifically, the Three-equation New Keynesian Model proposed by Wendy Carlin and David Soskice. In more detail, the objective of their work is to bridge the gap between the simple models explained in intermediate macroeconomic volumes and the ones that are the object of debate in academic and central bank environments. Through the model this thesis

aims to analyze ECB policies put in place during the years of the crisis and especially, taking into account interest rate variations which represent the main channel of monetary policy. Nevertheless, the decision of the model necessitates a brief consideration, since many scholars have proposed theirs for studying specific economic situations. The Three-equation New Keynesian Model is composed of three elements, as can be deduced by the title itself, and they are the IS and the Philips curves, and a monetary policy rule equation. For the analysis at which the thesis aims, a monetary rule must be taken into consideration, since variations of the interest rate have effects on the whole economy, and they are the main object studied in Chapter 3. The relation mainly observed is the one concerning the cost of money and inflation and it is also studied in the Model, especially, between the years 2007 and 2009, when the Central Bank adopted some measures to face a rise in the level of prices and the bursting of the financial crisis in 2008 made a shift in the priorities in the monetary policy at European level.

In order to allow a better understanding of the reasoning put in place, it seemed essential to present in Chapter 1 ECB functioning, especially for two reasons. Firstly, in the Treaties it is stated that the main objective of the Bank is price stability, and the target considered optimal is a 2% inflation. Secondly, having such an explanation is necessary to comprehend the motivations according to which it acted in a way and not in others, for example, why some measures were utilized and if they were efficient. Moreover, Chapter 2 provides a detailed overview of how the financial crisis burst and the different phases that affected Europe during those years, especially the stages of the sovereign debt crisis which characterized only this continent, while the USA was already in economic recovery.

Finally, at the beginning of Chapter 3, the principal elements of the New Keynesian thought are outlined, with the aim of providing a clearer understanding of the development of the Model by authors W. Carlin and D. Soskice and the interpretation of the IS and Philips curves taken into consideration. In more detail, it is analyzed the relation between the interest rate and inflation from 2007 to 2009, and the measures adopted by the ECB to tackle that situation, worsened by the burst of the financial crisis that, as already said, implied a shift in the priorities of the monetary policy.

Chapter 1 - ECB: role and functions

1.1 European Monetary Union

The creation of the Economic and Monetary Union was established by the European Council in June 1988, assigning to a committee, composed of the central banks' governors of the Community member states of that time and other professionals, the task of suggesting the path to follow to achieve the realization of the project (ECB, 2023b).

The first step consisted in the removal of restrictions on the movement of capital and the attribution of new functions to the Committee of Governors¹, such as encouraging collaboration in the field of monetary policy between Member States in order to reach price stability. A revision of the Treaty of Rome was necessary to build the Economic and Monetary Union and for this aim, the Treaty of Maastricht was signed in February 1992. It laid the foundations for the creation of the European Central Bank and, generally, of the European System of Central Banks (ESCB), which is composed by the ECB and the national banks of each Member State, whether they adopted the euro or not.

Afterwards, it was set up the European Monetary Institution which replaced the Committee of Governors. It was charged of enhancing coordination between Member States in the field of banking policy and, especially, of putting the basis for the establishment of the ESCB. Moreover, two regulations which formed the Stability and Growth Pact have been approved by the European Council, with the objective of integrating the provisions of the Maastricht Treaty and ensuring a rigorous respect by the Member States.

In 1998, eleven countries² satisfied the requirements to participate in the following phase of the European Monetary Union creation and the subsequent adoption of the euro as the common currency. These states nominated the main figures of the European Central Bank, in other words, they appointed the President, Vice-President and the other four members of the Executive Board, contributing to the establishment of the institution. As the latter was created, the European Monetary Institute was dismissed because its tasks were completed.

¹ The Committee of Governors is composed by the central banks of the European Economic Community (EEC) Member States.

² Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, the Netherlands, Portugal and Spain.

In 1999, the eleven currencies' exchange rates were fixed and a common monetary policy started to be conducted by the ECB and from this moment, the number of adherents only grew. Several EU Member States joined the monetary Union: Greece (in 2001), Slovenia (2007), Cyprus (2008), Malta (2008), Slovakia (2009), Estonia (2011), Latvia (2014), Lithuania (2015) and Croatia (2023) (ECB, 2023b) (ECB, 2023b).

Foremost, it is essential to make a distinction between the ESCB and the Eurosystem. The first one is composed of the ECB and the central banks of the 27 EU Member States, instead the second group is referred to the European Central Bank and to the national banking institutions of the countries that adopted the euro. The main difference is the level at which the monetary policy is discussed, since in the euro area it is established by the Eurosystem while, in the other EU states, it is implemented by their governments.

Once this differentiation is clear, ECB composition can be explained properly. In the first place, its three principal bodies are the Governing Council, the Executive Board and the General Council.

Governing Council

It is composed of all the members of the Executive Board and the euro area national central banks' governors. Moreover, its main task concerns the definition of the monetary policy for the countries which adopted the euro, in other words, the Governing Council has to decide the level of interest rates and liquidity in circulation and formulate the guidelines necessary to achieve those results (ECB, 2023e).

Executive Board

This body comprises the ECB President (nowadays Christine Lagarde), Vice-President (Luis de Guindos) and other four members and it is charged of organizing the Governing Council meetings, implementing the monetary policy adopted by the latter and exercising the authority delegated (ECB, 2021).

General Council

Its members are the ECB President, Vice-President and the governors of EU Member States' national central banks. Furthermore, its main tasks concern the drafting of the annual report, the creation of standardizing rules in order to homogenize accounting at European level, independently from the adoption of the euro by the countries, and the gathering of the statistical data. The interesting thing is that once all EU Member States have embraced the common currency in their financial system, the General Council will be dismissed because it will coincide with the Governing Council (ECB, 2023d).

1.2 Main ECB tasks

Article 127 of the Treaty of the Functioning of the European Union (TFEU) affirms that *“the primary objective of the ESCB is to maintain price stability [...], support the general economic policies in the community with a view of contributing to the achievement of the objectives of the Community [...]”* (EU, 2012). In more detail, ESCB is charged of formulating and implementing the monetary policy of the euro area, coordinating exchange operations and managing the Member States’ foreign reserves.

Furthermore, the ECB has a legal personality, which means that it is an independent body and it mainly acts to achieve price stability. It also implies that the Central Bank can sign international agreements, but only in the fields of its competence, and take part in the works of organizations such as the International Monetary Fund (IMF) and the Organization for Economic Cooperation and Development (OECD) (Scheller, 2006). Moreover, it is the only institution charged of authorizing the printing of euro banknotes and in the case of coins, it establishes the amount that Member States can issue, as provided by article 128 TFEU (EU, 2012).

Nevertheless, if on the one hand the ECB is independent, on the other hand it is accountable to the European Parliament (EP), especially to the Economic and Monetary Committee (ECON), where the ECB President takes part to the meetings four times a year to update it about the monetary policy³. The main channels of accountability are exchange overviews with the ECON Committee, written questions posed by the MEPs (Members of the EP) and the annual report which is provided to that primary EU institutions: Parliament, Council of the EU, Commission and the European Council as provided by article 15 of the Protocol 4 concerning the Statute of the ECB and the ESCB (ibid).

Moreover, according to article 18 of Protocol 4, the ECB and the national central banks can conduct open market operations, through the purchase or sale of bonds, or by lending or borrowing credit. The Central Bank can also establish the level of required reserves that financial institutes must keep at European level and in their national banks (ibid).

Another important aspect is the prohibition to the ECB and to the domestic central banks of providing credit to public institutions or bodies, both European and national. Besides this, they

³ This process is also known as monetary dialogue.

cannot directly purchase debt instruments in the markets, such as sovereign bonds, as affirmed by article 123 of the TFEU (ibid). This issue has been relevant during the financial crisis of 2008 since some European monetary policies have been put under discussion and the German Constitutional Court undertook a dispute towards the ECB that will be discussed later in this chapter.

Moreover, article 127 of TFEU also states that it should be consulted by other institutions in the case of proposals concerning its fields of competence and by Member States' national authorities. On the other hand, opinions can be provided by the ECB on issues related to its area of expertise.

The establishment of a system instead of only a common central bank has been preferred for various reasons. First of all, national banks' experience is fundamental for the functioning of the ESCB and for this reason, their functions and competencies are preserved, especially those not related to the Eurosystem. Furthermore, the Member States which adopted the euro are allocated geographically across Europe and this implies having different cultures and ways of operating. Consequently, utilizing the central national banks was considered a better solution rather than setting up a supranational institution where it would have been difficult to reach an agreement (Scheller, 2006).

1.3 ECB Monetary, Exchange rate and Economic policies

1.3.1 Monetary policy

The monetary policy has been denationalized and centralized at European level with the creation of the ESCB and it has been attributed to the ECB, which has the exclusive responsibility for delineating the strategy for the euro area. Moreover, as stated in article 105 TFEU, the primary objective is to maintain price stability and this is possible by keeping inflation around a target value, generally established about 2%, over the medium term. Through its tools, the ECB can influence the economy and give it a boost when it is necessary but always with the aim of achieving price stability.

The main instrument is the setting of interest rates, they are increased when the inflation is high and they are reduced in the opposite situation. According to the Taylor rule⁴, in the case in which the inflation rate is above the equilibrium one (excess inflation), it prescribes a rise in the interest rate at the same aggregate demand and vice versa in a situation of deflation (Gaffeo et al., 2015).

Generally, the ECB establishes the rate to achieve considering the economic trend and consequently it modifies the money supply to reach the target. This has direct consequences on the economy since an increase of the interest rate should have negative effects on the consumption and investment's decisions. Families and enterprises would tend to ask for a lower number of loans due to the higher costs, and those who have already borrowed money would allocate less resources to purchase and invest. As two components of the GDP reduce, the production and the demand fall as well, generating an excess of supply. This situation will be adjusted by the market, through a reduction in the prices of goods and services and consequently, the inflation rate decreases.

In the case of monetary expansion, the interest rate reduction stimulates investment and consumption and, as a result, more enterprises invest, generating a rise in the demand and the production. On the other hand, individuals tend to consume more, creating a virtuous circle which leads to economic growth. This policy is usually adopted when inflation is low and stimulating the economy, an excess of demand is generated and in order to achieve the equilibrium, prices will increase.

⁴ Its author is John B. Taylor, a professor at Stanford University.

Open market operations are another tool that the ECB can use to implement its monetary policy. In more detail, they consist in purchasing or selling bonds by the Central Bank with the aim of providing or withdrawing liquidity from the circulation. In the first case, buying these financial activities leads to an increase in their demand and consequently of their price, and, on the other hand, the interest rate on those bonds will decrease. On the contrary, if they are sold in the markets to gather liquidity, a rise in the supply is generated and their price will reduce and therefore, the interest rate will increase (Blanchard et al., 2016).

Moreover, the required reserve ratio is a further instrument of the monetary policy. It is set by the ECB and consists of a minimum level of liquidity that banks must keep in order to ensure that they can fulfill their credit commitments and avoid a situation of huge indebtedness (Sole 24 ore, 2015). The Central Bank can reduce it, allowing the financial institutes to provide more loans to families and enterprises that, consequently, can allocate more resources to consumption and investment, generating an improvement in the economic conditions.

Another instrument at the disposal of the ECB is represented by standing facilities and they have the objective of supplying and absorbing overnight liquidity, the one that banks lend each other daily in order to face temporary shortages of money. Furthermore, there are two channels through which financial institutes can obtain the funds needed and they are Marginal lending and Deposit facilities. In the first case, the liquidity is provided by the national central banks at one condition, the provision of appropriate collaterals. In the second one, credit institutions can allocate their liquidity in overnight deposits in the national central banks (ECB, 2023d).

1.3.2 Exchange rate policy

As many industrialized countries across the world, even the euro area Member States adopted a flexible exchange rate system in 1998. As a result, the external value of the currency is decided in the financial markets and consequently it cannot be subject to economic policy. Nevertheless, having a flexible regime does not imply that the euro zone could not set up an exchange rate strategy (ECB, 2007). Foreign exchange interventions can be made, generally when formal agreements or guidelines are not signed, by the Eurosystem unilaterally or together with other central banks (ECB, 2023c).

On 1st January 1999, it was established the Exchange Rate Mechanism (ERM II) with the aim to guarantee that the variations of the exchange rate towards the currencies of those Member States which did not adhere to the euro area does not affect the economic stability. In case of adhesion of a non-euro zone Member States, the Eurogroup⁵ Finance's Ministers, the ECB and the respective ones for the country that would like to enter the ERM II, sign an agreement in which the parties negotiate the following information. First of all, they establish a central exchange rate between the euro and other currency, the latter can vary until reaching the 15% higher and lower the central value. In the case in which it exceeds this range, the ECB and the country's national central bank cooperate for putting in place the interventions needed to restore the value desired (European Commission, 2020).

⁵ Eurogroup is composed of the euro area Member States' finance ministers.

1.3.3 Economic policy

Economic policy includes all the interventions that a government puts in place in order to manage the market and achieve the results desired. Generally, it consists of two elements which are monetary and fiscal policies. In the first case, the measures are mainly decided by a central bank and in the euro area, they are under ECB competence as previously seen. On the other hand, fiscal ones are decided at national level, even if Member States cooperate to reach EU objectives and ensure the stabilization of the single market. In more detail, these actions concern, for example, taxation and public spending which are instruments that affect the economy differently, depending on their increase or decrease by the government (EUR-Lex, 2023).

As provided by article 119 of the TFEU, a coordination at European level on economic policy is necessary to achieve the European Union's objectives. Moreover, national policies are conducted in the context of an open market economy, where free competition is ensured, and these measures are coordinated by the Council. The latter has the commitment to draw up the guidelines for the economic strategy at Community and domestic level and subsequently, the results are exposed to the European Council which delivers a conclusion on these policies. Afterwards, the Council espouses a recommendation defining the ultimate guidelines which are known as Broad Economic Policy Guidelines (BEPGs) and informs the European Parliament (EU, 2012).

Being adopted as a recommendation, they are not legally binding and Member States are not obliged to respect them, nevertheless, the European Council support provides them political importance and it is its only measure undertaken formally in the field of the European Monetary Union (EMU) (Scheller, 2006).

Member State's autonomy in the economic strategy leaves space to the results of policy competition, but, on the other hand, the guidelines are necessary to ensure macroeconomic stability in the single market and, generally, to achieve the European Unions' objectives (ibid).

1.4 Confrontation with the Federal Reserve: differences and similarities of the powers

The ECB and the Federal Reserve have two different mandates which, consequently, delineate their distinct strategy to achieve the objectives desired. At European level, the ESCB is charged of pursuing two aims, the first is price stability that is generally reached when the level of inflation is around 2%, and the second one is the support to the economic policies in the community as provided by article 127 of the TFEU (EU, 2012). The latter purpose is quite general and does not have a clear definition of which measures or objectives it includes, nevertheless, it can be said that a high rate of employment, a level of economic growth that is sustainable in the long-term, competitiveness in the markets, may be elements included in the concept of support to the general economic policies (Gerdesmeier D. et al., 2007).

On the contrary, the Federal Reserve is charged of a multiple-objective mandate that not only includes price stability but also to sustain the growth of the amount of money and credits proportional to the US long-term potential in order to boost the production, encourage employment and achieve reasonable interest rates (ibid).

Besides this difference, the Eurosystem⁶ has a similar institutional structure to the Federal Reserve one and both can be defined as federal central banks. ECB composition has already been described, nevertheless, it will be recapitulated to make possible a better comprehension of its comparison with the USA. First of all, there are three main bodies which are the Governing and the General councils and the Executive Board, their primary tasks are the definition and execution of the monetary policy for the euro area, the draft of annual reports and monthly bulletin and the creation of standardizing rules concerning accounting at European level (ECB, 2023e; ECB, 2023d; ECB, 2021). The US central banking system, on the other hand, is composed of the Board of Governors (BoGs), 12 Reserve Banks and a Federal Open Market Committee (FOMC). The first one is charged of establishing the guidelines for the System and supervise the activities of the 12 financial institutions and moreover, it is accountable to the Congress (Board of Governors of the Federal Reserve System, 2022). Instead, the tasks of the FOMC concern the open market operations, one of the instruments

⁶ In the treaties the subject is the ESCBs, nevertheless, not all Member States joined the euro area and consequently it is clearer to talk about the Eurosystem which define the monetary policy for those countries that adopted the euro.

that a central bank can utilize to influence money supply and consequently domestic interest rates (Board of Governors of the Federal Reserve System, 2023).

Theoretically, there is a similitude between the ECB and the US Board of Governors' roles and also in the case of the Eurosystem national central banks and the 12 Federal Reserve Banks. At the same time, a difference emerged in the attribution of the voting rights, since in the euro area the national governors own an equal right in the Governing Council decisions. While in the USA, the Board of Governors' members and the New York Federal Bank's presidents have a permanent right and the other subsidiaries alternate themselves in voting (Gerdesmeier D. et al., 2007).

Apart from the monetary policy implementation, the Eurosystem and the Federal Reserve carry out further functions and, in this case, it is possible to underline other differences between them. In the first place, each is charged of tasks such as managing foreign exchange operations, handling the official reserves, encouraging macroeconomic stability, gathering statistical data and taking part in international institutions meetings, for example at the International Monetary Fund (IMF) or the Organization for Economic Cooperation and Development (OECD) (ibid). Nevertheless, the Reserve Bank can take measures as a fiscal agent if it is asked by the Secretary of the Treasury, and they shall provide services concerning the federal debt or they receive payments related to federal taxes and so on (Hillery & Thompson, 2000). Furthermore, the US Board of Governors oversees the federal banks, while in the Eurosystem this task can be performed only by a few national central banks (Gerdesmeier D. et al., 2007).

From the point of view of independence, both ESCB and the Federal Reserve are independent from political influence. In more detail, article 130 TFEU provides that the ECB or the national banks of Member States cannot receive instructions by any government or agencies even if they are at European level (EU, 2012). Moreover, the supply of money to the public sector is prohibited and this clause has the aim to ensure even more its independence from the political sphere. Besides this, another element in favour of its autonomy is that euro area national banks contribute to the provision of a capital which is intended only for the ECB and the implementation of its policies (Gerdesmeier D. et al., 2007).

On the other hand, independence from the government and its agencies is granted to the Federal Reserve and, as in Europe, it has its own budget which is distinct from the federal one. Furthermore,

the Board of Governors members are nominated by the President and successively elected by the Senate and they recover a fourteen-years mandate that cannot be reconfirmed, as in the case of ECB bodies (ibid).

A further element to take in consideration is the acquisition of government bonds by the ECB and the Federal Reserve that during the financial crisis of 2008 was recalled several times. According to article 123 TFEU, "*the purchase directly from them by the European Central Bank or national central banks of debt instruments*" is prohibited and they can only operate in secondary markets (EU, 2012). In the same way, the Federal Reserve cannot buy government bonds from the US Treasury and consequently it conducts open markets operations through which acquiring securities from the public and the latter are not a channel of funding US federal deficit (Board of Governors of the Federal Reserve System, 2015; Board of Governors of the Federal Reserve System, 2013).

With regards to the monetary policy tools, both central banks utilize the interest rate and variations to achieve the objective desired as the main instrument. ECB actions have already been subject of discussion and will be explained also in the next chapter, especially in the context of the financial crisis of 2008. The Federal Reserve varies the federal funds rate and the one concerning the overnight interbank lending through the open market operations, as the ECB, which consist of buying or selling bonds from and to the public (Labonte, 2015). After the collapse of the Lehman Brothers, the federal funds rate was reduced to a value between 0.00 and 0.25, with the aim to stimulate the economy. Nevertheless, the situation at the time was not solved by the usage of conventional monetary policy and unconventional tools were put in place. An example is the forward guidance, in other words the Central Bank states what are its future expectations and actions. It affirmed that the interest rates would have been taken low even when employment and inflation reached an optimal level, in order to encourage an economic recovery. Moreover, a further tool used in this context is the quantitative easing, the massive purchase of government bonds and mortgage-backed securities by the Federal Reserve since 2009 (ibid).

The interesting thing is that also the ECB put in place similar measures to face the effects of the financial crisis, nevertheless, they have been adopted in Europe much later than in the USA. On the one hand, the US Central Bank has purchased a huge amount of bonds to inject liquidity in the markets with the aim of stimulating an improvement of the economic conditions in the country. On

the other hand, the ECB provided funds to the economy mostly through the banking system during the first phase of the crisis. On the whole, together with fiscal policies from the states both measures succeeded in facing the decrease in the demand, stabilizing the production and encouraging a recovery of the economy. However, while the USA started their way to exit from the crisis, the euro area entered in the second phase, the one concerning the sovereign debt, that affected only Europe (ECB, 2016b).

This is the main reason according to which the ECB adopted policies similar to those of the Federal Reserve but it did not achieve the same results or, it is better saying that it reached an important improvement of the economic conditions only much later. A more detailed analysis of the measures put in place in the euro area during the financial crisis will be provided in the next chapter, entirely dedicated to this topic.

1.5 The dispute between Germany's Constitutional Court and the ECB

An interesting case is the one concerning the dispute between Germany's Constitutional Court and the ECB and the subject of discussion is the bonds purchase package put in place in the euro area during the financial crisis of 2008. In January 2015, it was expanded in order to include the public sector, with the aim of stimulating the economy through an increase of the liquidity supply and bringing the inflation around 2%, the desired level established by the treaties. These purchases would have taken place in the secondary market, since the ECB and the national central banks are not allowed to buy directly from the issuing institution, as provided by article 123 TFEU (EU, 2012).

A group of citizens made different appeals before to the Germany's Federal Constitutional Court concerning the already mentioned measures adopted by the ECB, and they made a complaint also towards the German federal bank, government and parliament, since they did not act to prevent their application. The alleged violations are related to article 119 TFEU which makes a distinction between the competences of EU institutions and those of the Member States and article 123 TFEU on the prohibition of direct purchase of securities. Moreover, according to the group of citizens these measures exceeded ECB competences and the mandate attributed by article 127 TFEU and generally, in the treaties (Court of Justice of the European Union, 2018). It is in this context that the Federal Constitutional Court suspended the proceeding and brought the case before the Court of Justice of the European Union (CJEU) for a preliminary ruling.

The latter has affirmed that the extension of the purchase package to the government bonds aimed at bringing the inflation below but close to 2%, the level considered optimal and consequently the measure would have contributed to the achievement of the monetary policy primary objective, which is price stability. Furthermore, the Court specified that the sovereign securities have been bought in the secondary markets and article 18 of the Protocol on the ECB and ESCB provides that they the European Bank and the national ones can buy and sell bonds denominated in euro, consequently, it has only been used an instrument provided by primary EU law (CJEU, 2018a).

In addition, for Member States the open market operations can facilitate the financing of their deficit but it is not crucial, and they influence the interest rate and the conditions at which banks refinance themselves, impacting also the financing conditions of Member States deficit (ibid).

In conclusion, the Court stated that the purchase programme established some guarantees for a correct conduction of budgetary policy and the duration of the measure is not expressed and consequently the countries cannot rely only on this source of financing for their policy.

The judgment made by the CJEU underlines that it is the supreme court at European level, since Member States attributed to it the authority and the competencies to act in these fields. The decision of the German court to put under discussion the measures adopted by the ECB and moreover to prevent the national bank from participating in the bonds purchase programme, from the moment that it declares that it is contrary to the federal constitution (EuroScientist, 2020). The problem is that the constitution provides that a guarantor role has been attributed to the Federal Constitutional Court and it was imposed by the Allies after the Second World War.

In June 2021 the European Commission provided a notification of violations of EU law, particularly with regards to the principles concerning its supremacy over national jurisdiction and the guiding role of the CJEU, included in the TFEU. Germany signed the agreement without proposing modifications or objections and consequently those articles are valid in their entirety (EuroScientist, 2022). The German government responded to the notification posed by the European institution, and it implicitly admitted the violation, recognizing the superiority of EU law to the national one and the key role of the CJEU in the interpretation of the treaties (ibid).

Evaluating this case is important as a demonstration that ECB policies can be put under discussion by the Member States and their institutions, especially its mandate, since it established price stability as the primary objective, but it does not specify the instruments that can be used to achieve that result.

Chapter 2 - Financial Crisis of 2007-2008

2.1 General overview

The last decade of the 20th century and the first years of the 21st are characterized by a significant increase in the GDP of many countries around the world, especially from 2000 to 2007. The biggest economy of the world, the USA, registered an increase of 32,16%, the Euro area even 35,21% and in general, the economic growth in the OECD members was around 36,02% (Organization for Economic Cooperation and Development, 2023). This data represents a huge moment of expansion for the major economies of the world and also for developing countries, such as China, which entered the World Trade Organization in 2001.

In the USA, the Federal Reserve maintained the interest rate low, allowing to many citizens to apply for a loan and in this way, the demand for buying a house increased and consequently, the price too. Usually, those who apply for a mortgage and did not satisfy the requirements, for example because they had a lower income than the average required, opted for a down payment or elevated interest rates which compensate the higher risk (Duca, 2013).

The interesting fact was the increase of subprime mortgages in the 2000s, in other words the credit was granted also “to applicants deemed the least creditworthy because of low credit scores or uncertain income prospects, both of which reflect the highest default risk and warrant the highest interest rates.” (DiMartino & Duca, 2007). In case of insolvency, the bank could have foreclosed the house, since it represented a guarantee of the loan itself. Moreover, credit institutions transformed these mortgages into financial assets with the aim to redistribute the high risks among several agents and also the purchasers convert them into other instruments, giving rise to the phenomenon of securitization. Specifically, it is the case in which a bank issues bonds that have as guarantee the mortgages registered among the assets of the financial institution, transferring a certain degree of risk of insolvency to the buyers (CONSOB, 2023b). The evaluation of these instruments by rating agencies was complex and an overestimated value has often been attributed.

In this case, the instruments created were the mortgage-backed securities (MBS), a financial asset secured by a set of mortgages. Creating and selling these products, banks shifted from the traditional model “originate-and-hold”, in which they issue a loan that is registered in the balance

sheet until its expiration, to the “originate-and-distribute” one (CONSOB, 2023a). In the latter, after the disbursement, the loan is transferred to other financial institutions in order to recover the liquidity necessary to provide credit to other citizens. This process is a representation of the phenomenon of securitization mentioned before and it led to another factor, which is leverage, that will later contribute to put the basis for the financial crisis in 2008.

Leverage can be defined as the ratio between the sum of third-party capital and equity, and the latter. Its multiplier effect can increase, on the one hand, profits and on the other, the loss of an investment, depending on its level. Securitization led to a rise in the leverage level of some banks, since they raised the number of assets, especially loans, in relation to the amount of equity and as a consequence, the financial institutions were in front of a higher and higher risk because their liquidity was not sufficient to cover eventual insolvent mortgages (Blanchard et al., 2016).

Furthermore, new companies called “structured investment vehicles” were created, with the aim of circumventing the regulations to which banks were subject. Their functioning was simple, on the one hand they borrowed money from the investors, and, on the other hand, they hold financial assets, among which there were mortgage-backed securities cited before. In case of necessity, liquidity would have been granted by the banks and the latter, at the same time, could increase their leverage without any violations of the regulations which provided that a rise of capital was necessary in order to maintain the stability of the financial institutions (ibid).

In the period between June 2004 and June 2006, the Federal Reserve increased the federal funds rate from 1% to 5.24% (Federal Reserve Bank of St. Louis, 2023a) in order to face the inflation rise which was around 2.7% in 2004, 3.4% in 2005 and 3.2% in 2006 (World Bank, 2023). According to the Taylor rule, in a situation of high prices it is necessary to increase the interest rate with the aim of returning it to the optimal level which is normally established at 2%. By raising the cost at which individuals borrow money, some became insolvent and especially those who owned subprime mortgages with variable rates.

When house prices started to reduce at the beginning of 2007 (Federal Reserve Bank of St. Louis, 2023), banks did not have enough resources to face the losses due to the mortgage-backed securities and this situation worsened in the moment in which some borrowers became insolvent and did not pay the down payments required. Moreover, the values of the structured investment

vehicles' assets fell significantly and consequently their risk of insolvency rose and shifted to the banks which guaranteed them liquidity, increasing the probability of bankruptcy.

During the year of 2008, some financial institutions started to have liquidity difficulties, among which the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac). Created by the US government with the objective, in the first case of guaranteeing sufficient liquidity in the market of home loans and, in the second one, of providing credit at a low cost, both were involved in the subprime market. In more detail, they purchased mortgages from the issuing institutions, transforming them in mortgage-backed securities to sell to other buyers (Nolen, 2023; Nolen, 2023a). These corporations owned a huge amount of these MBS and when the value began to decrease, they faced massive losses and consequently, the risk of bankruptcy was at the doors and both of them were nationalized by the government (Duignan, 2023).

Another bank in trouble due to the ownership of subprime mortgages was the Lehman Brothers, the fourth biggest one in the United States. Unfortunately, its collapse has not been prevented by the US Treasury Department like in the case of Fannie Mae and Freddie Mac and it filed for bankruptcy on 15th September 2008 (ibid). This event signalled the beginning of a period of uncertainty, especially because the US government did not intervene, causing turmoil in the markets all around the world.

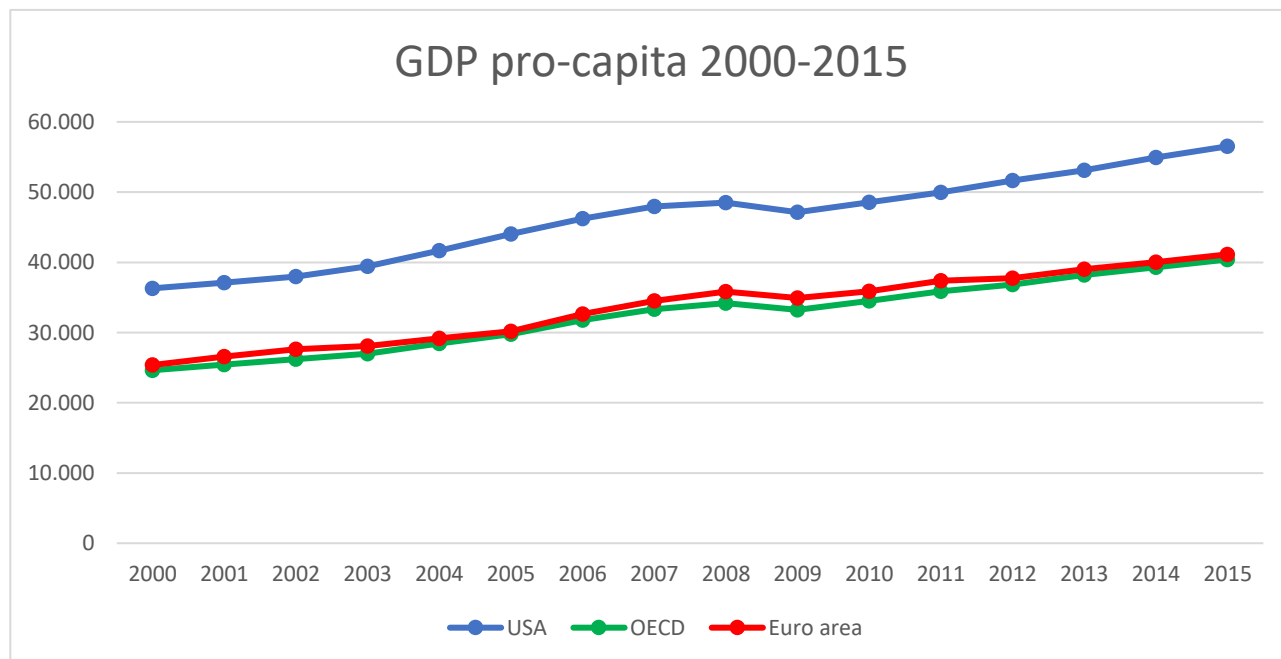
Consequently, financial institutions did not provide credit anymore to the others, since it was difficult to know if in their balance sheets there were some mortgage-backed securities. This decision increased, on the one hand, the risk of insolvency among the owners of MBS and on the other one, the interest rate at which banks lent funds between themselves. Financial bodies found themselves in a situation in which their assets were illiquid and, at the same time, liabilities were liquid. The impossibility to reconvert assets in liquidity made it difficult to face the fall in the mortgages' value and therefore these institutions risked failing.

The combination of low liquidity, several unrecoverable mortgages and high leverage are the main elements which originated the financial crisis in the USA in 2008. Moreover, banks provided credit for a lower amount of loans to consumers and enterprises and therefore they started to reduce two fundamental factors for economic growth, which are consumption and investment.

In August 2008 the Federal Reserve began to decrease the federal funds rate from 5.02% (August) to 0.15% in January 2009 (Federal Reserve Bank of St. Louis, 2023a). The objective of this policy was to allow more people to borrow money and utilize them to consume or invest, creating a positive circle that would have led to a recovery of the economy and an increase in domestic output. Moreover, the government decreased the level of taxation and at the same time, expanded public spending, and theoretically, these fiscal policies should have encouraged an improvement in the demand. Nevertheless, it did not happen, and the situation only worsened, affecting other markets worldwide.

As shown in the graph, there has been a decline in GDP between 2008 and 2009, not only in the USA but also in the Euro area, and generally in all OECD countries.

Graph n.1: GDP pro-capita between 2000 and 2015 in the USA, Euro area, and OECD countries



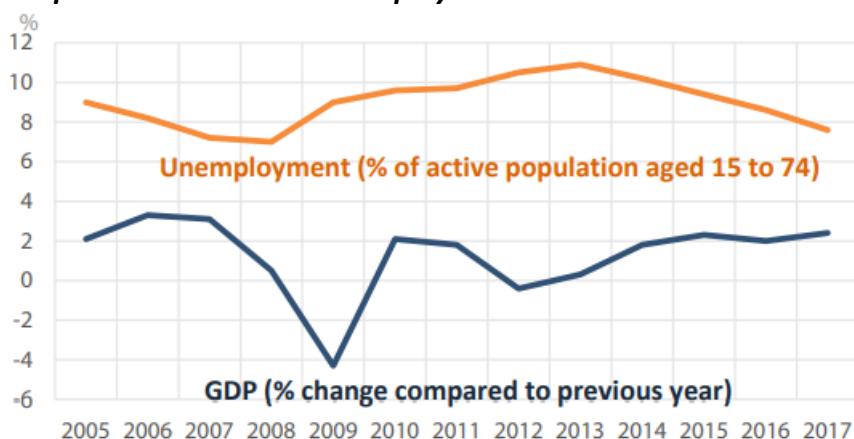
Source: Personal elaboration on OECD data, 2023

2.1.1 Situation in the euro area

In a globalized world in which every country is interconnected through its economy, financial system, and so on, the effects of a crisis can be perceived more heavily. The transmission to the euro area is largely due to the involvement of European banks in the subprime market and the consequent possession of MBS created in the United States. One important element that contributed to the crisis to take into consideration is the usage of similar business models in both areas, especially the “originate-to-distribute” one already cited, and consequently, they experienced comparable financial consequences (Eubanks, 2010).

As seen in the USA, GDP fell starting from mid-2008 to 2009 and was mainly caused by the lack of confidence in the financial institutions, the decrease in loans granted also to credit-worthy individuals, and the stop of interbank lending (Szczepanski, 2019). The consequence was an evident reduction in the percentage of the wage allocated to consumption by workers and of investments made by enterprises. Since these factors are two elements of the GDP (with public spending, taxes, and net exports), they affected the overall value of national wealth. In the next figure, it is possible to observe the variations of GDP and unemployment in the European Union and the effect of the financial crisis on EU economies is clear.

Graph n.2: EU GDP and unemployment between 2005 and 2017



Source: Elaboration of the European Parliament on Eurostat data

Moreover, the transmission of the crisis from the United States to the European Union has taken place through two channels, which are international trade and the global financial system (Blanchard et al., 2016). First of all, exchanges between countries decreased significantly and one of the main reasons was the fall in demand worldwide. Consequently, the amount of goods imported into the USA was lower, as the domestic demand fell and exporting states reduced their overall production. Secondly, US banks needed liquidity and they took back those funds allocated abroad, and doing this, the problem of illiquid assets shifted to European financial institutions, reducing the possibility to provide credit to individuals and enterprises (ibid).

The involvement of many European banks in the US subprime market and the consequent drastic reduction in interbank lending represented a threat to the real economy and its financing. The European banking system is interconnected and trust between banks is important in order to make the system working properly. As shown by the graph, in the second quarter of 2008 a period of the recession began and it will last until the second quarter of 2009, when the economy will register again economic growth (Szczepanski, 2019, page 2). This contraction led to a fall in consumption and investment which has been exacerbated by the decline in interbank lending, since a lower number of loans was granted, and by the sentiment of fear that hit the market. One of the main consequences of the crisis that uncombed Europe was the rise of unemployment which would increase until 2013, having an impact on the economy itself.

The response to the crisis took place at three different levels: European Union, European Central Bank, and the government. The focus of this paragraph is related to the national interventions, instead, the communitarian action will be analyzed in the next section. A rise in the threshold of deposit insurance, warranties for liabilities owned by banks, and recapitalization of the latter are only a few of the measures taken at the governmental level by Member States to face the issue. Moreover, some fiscal policies have been adopted in order to prevent the crisis to affect dramatically the economy, such as an increase in public spending used to invest, provide tax relief, and so on (Szczepanski, 2019, page 3). On the whole, this situation has contributed to an expansion of the public debt, putting a number of countries in difficult conditions. Consequently, after a period of economic improvement, the situation worsened again, shifting from the financial crisis to the sovereign debt one.

As reported in the next graph, the majority of eurozone states increased their government debt to face the period of uncertainty, especially between 2008 and 2012. In some cases, the rise has been so huge as to risk failing because the country wasn't able to afford the cost of its debt.

Table n.1: Government debt ratio between 2008 and 2015

Location	2008	2009	2010	2011	2012	2013	2014	2015
Austria	74.2	86.3	90.5	91.5	97.3	94.4	101.9	101.3
Belgium	102.4	110.7	108.7	111.6	121.0	118.6	130.6	126.2
Estonia	8.5	12.8	11.9	9.5	13.1	13.6	13.8	12.7
Finland	40.3	51.6	58.0	60.9	68.0	68.8	75.9	79.9
France	82.5	97.6	101.0	103.8	111.9	112.5	120.2	120.8
Germany	71.1	78.0	87.3	86.3	88.7	84.1	83.9	79.8
Greece	117.6	135.5	130.4	113.6	167.1	181.4	183.1	184.2
Ireland	47.3	67.5	83.4	110.8	129.1	132.2	121.5	88.5
Italy	112.5	125.5	124.3	117.2	135.4	143.2	155.6	156.9
Latvia	23.8	42.2	54.0	51.4	49.1	46.2	51.2	46.6
Lithuania	17.1	34.2	45.5	45.7	51.2	48.0	52.6	53.4
Luxembourg	24.5	22.3	27.1	26.7	27.5	28.1	28.9	28.9
Netherlands	62.7	65.3	69.3	73.6	79.3	78.8	83.3	79.6
OECD - Average	56.6	66.1	70.0	72.9	80.4	81.6	85.4	83.9
Portugal	84.5	97.6	105.7	109.9	137.3	141.1	150.7	148.4
Slovak Republic	34.9	44.0	48.3	51.1	60.7	65.1	67.8	66.2
Slovenia	29.9	43.8	47.9	51.3	61.5	78.5	99.3	102.4
Spain	47.7	62.7	67.4	78.3	97.1	111.3	123.8	121.1

Source: OECD, 2023

The average of EU public debt ratio increased significantly from 60% in 2008 to 87% in 2014, when some countries reached a higher level, such as Greece, Italy and Portugal (ibid). Furthermore, there were differences at financial level between EU states even before the crisis and this led to a classification in two groups, core and PIIGS countries. The first one refers to those with a strong economy and with low government debt, such as Germany. The second one is composed of Portugal, Ireland, Italy, Greece and Spain, where the level of indebtedness increased significantly in a context of low economic growth, leading to a consistent rise in public debt.

The interventions pursued by the governments contributed to a situation of uncertainty that hit also the markets, where a decrease in confidence in the worthiness of few states exacerbated the already critical economic conditions. It is in this context that the sovereign debt crisis began, starting from Greece in 2009.

Greece

Although Greece did not satisfy in the whole the requirements stated by the Maastricht Treaty to adopt the euro, in 2001 joined the euro zone with other few EU Member States (MS). Particularly, the requirements to satisfy were mainly related to the level of public deficit compared to GDP, which cannot be higher than 3%, and to the government debt ratio to GDP that should not exceed 60%. For various reasons, such as the previous high spending that has been exacerbated also by the investments made in the occasion of the Olympics in 2004, Greece did not meet the conditions necessary, but it entered the euro area anyway.

The financial crisis of 2008 contributed to worsen a situation of economic imbalances, revealing the huge amount of debt owned by the government and leading the country out of the main markets since it was not considered reliable. On 5th November 2009 Greek authorities announced that, after a revision, the amount of budget deficit was around 12.7% of GDP, sharply larger than the one previously declared and more important, to the percentage required by EU Treaty. Furthermore, as product of this situation, the spread⁷ between German and Greek 10 years-bond yields broadened and was over 300 basis points (Stuchlik et al, 2015). Consequently, Greece found itself in a situation in which it was not able to recover its debt and the bankruptcy was at the doors.

In order to face the issue, austerity measures have been adopted, among which a VAT rise, a stop in pension provision, but they were not sufficient and the government needed to ask aid to the European and international community. A Memorandum of Understanding was signed on 3rd May 2010, after which euro zone MS provided a disbursement for a 14.5 billion euros value, followed by a payment of 5.5 billion euros made by the International Monetary Fund (IMF) (ibid). The latter together with EU institutions would have financed a package of 110 billion euros to Greece with the aim of getting out of the crisis, modernizing and revitalizing the economy (IMF, 2010). At the beginning of 2011 Greek bonds were again downgraded by many rating agencies as a result of updated deficit estimates which were around 13.6% of GDP and austerity measures were necessary in order to contain the debt and to obtain other funds by the European Union (Stuchlik et al, 2015).

⁷ According to Cambridge Dictionary, spread is defined as the difference between two amounts, such as two prices or interest rates. Usually, in the euro area it is defined comparing the bond interest rate of a country to the German one, the reason is that Germany is the strongest economy in Europe and consequently it is perceived as the most secure "place" to invest.

<https://dictionary.cambridge.org/dictionary/english/spread>

Cuts to public spending, wages, pensions, and an increase of taxes were made and this led to a rise of unemployment and to discontent between the population. Nevertheless, these interventions were inevitable if Greece wanted to survive the crisis. During this phase, Ireland and Portugal were also in troubles and the reasons are respectively the effects of the subprime crisis and the consequent rise of public debt, and macroeconomic imbalances in the case of Portugal (Szczepanski, 2019). Both of them have been granted an assistant package by the EU and the International Monetary Fund around 67.5 and 78 billion euros each, provided in a three-years period (European Commission, 2011).

Overall, 73 billion euros were provided to Athens by the end of March 2012, of which 52.9 billion disbursed by euro zone MS, and the others by the International Monetary Fund (Stuchlik et al, 2015). In the same period a Memorandum of Understanding has been signed and afterwards, in November, a decision of the Eurogroup allowed to postpone the maturity of the loans granted from 15 to 30 years, together with the deferment of interests' payment. Subsequently, the government made other cuts in public jobs (around 15000 by the end of 2014) which resulted in a huge increase of unemployment, approximately registered at 26.8%, exacerbated by new austerity measures necessary to get access to further international fundings (ibid).

Spain

In the period preceding to the financial crisis of 2008 Spain experienced a 3.8% economic growth yearly from the beginning of the century to 2007, a budget surplus and a decrease of the ratio between debt and GDP, precisely from 58% to 35.6%. In other words, Spanish economy was growing and public accounts respected the requirements stated by the Stability and Growth Pact (Afonso & Verdial, 2020). It can be said that being part of the euro area has been beneficial in economic terms but, at the same time, financial and macroeconomic imbalances have laid the foundations for the transmission of the crisis that originated in the USA.

Spanish recession started at the 3rd quarter of 2008, after the announcement of bankruptcy by the Lehman Brothers and was mainly due to a lower liquidity available in the international financial

sector, a fall in real estate's values, uncertainty, and a decrease in exports as the world exchanged less goods and services. Therefore, the government had to intervene and implemented some measures which would have alleviated the impact of the crisis, stimulating an economic recovery and by doing so, the budget surplus of 2% in relation of GDP was transformed into a deficit of 11% in 2009 (ibid). In 2010, an austerity programme was put in place and cuts in public spending, wages, pensions, investments were made together with a rise in taxes. Nevertheless, what was happening in Greece created a loss of confidence in the markets and Spanish spread on ten-years sovereign bond yield sharply raise as other European countries, achieving the level of 485 basis point in 2011 (ibid). As happened with Greece, Ireland and Portugal, even Spain needed financial aid from the European community and an assistant package was approved in July 2012, which began in December with the contribution of the European Stability Mechanism.

Italy

Before the financial crisis of 2008 Italy already presented a huge public debt, it was around 100% of GDP and consequently, superior to the limits provided by the Stability and Growth Pact. When Greece required assistance from the EU, followed by Ireland and Portugal, the situation of many European economies started to worsen and, in the markets, operators began to lose confidence. In this context, Italian annual spread on ten-year sovereign bond yield remained constant at a level around 150 points (Busetti & Cova, 2013). With the announcement of a second assistant package towards Greece in July 2011, the crisis deepened, and another phase began. It is from this moment that the spread of the majority of euro area Member States rase and since their sovereign debts were all denominated in euro, the difference between the yield of a country compared to the German one is mainly due to the risk perceived in the markets (Lane, 2012). In the case of Italy, the sky-high public debt and the scarce economic growth have been two elements that heavily affected the opinion of investors and consequently the spread has gone up significantly. In November 2011 it reached its peak: 550 basis points, in other words, the Italian bond interest rate was above 7% (Busetti & Cova, 2013). Moreover, this increase has taken place despite the bond purchases of the European Central Bank within the Securities Markets Programme, explained in detail in the next paragraph. Nevertheless, by the end of the year the government approved measures to achieve a

balanced budget by 2013 and not by 2014 as previously stated. The interventions put in place by Italian authorities and by the ECB in order to ensure liquidity has been beneficial for the market, reducing the sentiment of fear among the financiers (ibid). However, at the beginning of 2012 tensions started to increase again due to the situation of uncertainty of Spain and Greece and in the markets, apprehension about the “risk of redenomination” started to be dominant. ECB President Mario Draghi affirmed that “fearing redenomination into a lower-value currencies, investors sold off domestic public and private debt, further widening spreads and exacerbating bad equilibria within vulnerable economies” (ECB, 2018). As he underlined, the result was the rise of the gap between sovereign bond yields of Germany and the majority of other European countries, achieving significant levels: 500 basis points for Italy, 600 for Spain and even higher in the case of Greece, Portugal and Ireland.

Italian economy started to face recession in the second semester of 2011, mainly due to the spread increase and the consequent loss of confidence in the markets with regards to the solvability of the sovereign debt which will cause a downgrade by the main rating agencies (Busetti & Cova, 2013). Negative effects on the gathering of liquidity and on the evaluations on the Stock Exchange are only a few examples of the situation in Italy at the time. Consequently, GDP fell in 2011 and in the following years, as employment, consumption, and investments, a vicious cycle that fed itself.

General considerations on the financial crisis in the euro area

The financial crisis had several effects on European economies and they have been different according to the previous governance of the public accounts and to each stage. During a speech at the European University Institute in Florence on 11th May 2018, ECB President Mario Draghi defined the phases of the crisis, in order to have a clear overview of the main events and consequences (ECB, 2018).

The first step affected in a similar way most of the advanced economies of the euro area, whose financial sector was characterized by bad management of the risk, a low level of capital and liquidity and most important, an inadequate supervision and regulation of the activities. After the collapse of the Lehman Brothers, the crisis was transmitted also to those banks which owned toxic US assets and consequently, they needed a recapitalization process by their own government. Bailouts programmes were put in place mainly in Germany, France and the Netherlands and their cost was respectively around 8%, 5% and 12% of GDP (ibid). Nevertheless, this did not considerably affect the public debt of those countries because of their strong economies.

The second phase is related to the transmission of the crisis in Greece and Spain, where financial institutions were overexposed and necessitated to be bailed out by the governments. The situation of each has been already explained in more detail before.

The Greek crisis destroyed the impression that public debt was risk-free and led to a rise of sovereign risk, representing the third step. Particularly, it mainly hit those countries with a high national debt and low growth and the channels through which it was transmitted were two. The first one concerned those banks exposed to their government's bonds, especially in Greece, Italy and Portugal, where losses on vulnerable states' sovereign assets were registered, affecting the perception of solvency in relation to the banking systems. On the other hand, possible national defaults negatively affected the confidence in the private sector with a consequent fall in the growth rate of the countries. In this way the crisis also hit those banks which were not greatly exposed to the subprime market and some countries found themselves in a situation where they could not intervene through the usage of public money because of the high debt.

Afterwards, the fourth phase is due to investors around the world who affirmed that the solution to the downgrade growth spiral for the countries hit by the crisis was the exit from the euro area, by doing this a depreciation of their currencies and a regain of monetary sovereignty would have been possible (ibid). It is in this stage that the already cited “risk of redenomination” began to be dominant between operators in the markets.

Finally, the crisis turned into a stop of the monetary policy transmission within the euro zone, generating a rise in the interest rates paid by families and enterprises, higher than the ones settled by the ECB. In order to face the issue, the latter created the Outright Monetary Transactions (OMTs) to restore confidence in the bond markets, contributing also to adjust the transmission mechanism of the monetary policy, stopping the downward spiral (ibid). In this context, thanks to the measures adopted mainly by the ECB, the economic growth rate started to increase again, representing a first step to bring these countries out of the crisis.

2.2 Policies adopted by the ECB

After the collapse of the Lehman Brothers, the first objective of the ECB was to assist banks need of funds, therefore, it wanted to reduce some of its interest rates, such as the one concerning the Main Refinancing Operation (MROs) which fell from 3.75% to 1% (Delivorias, 2015). Moreover, additional non-standard temporary policy measures have been adopted:

- *Extension of the Long-Term Refinancing Operations' (LTROs) maturity*

During the first phase of the crisis its maturity has been extended from three to twelve months, to maintain interest rates low and allow banks to plan liquidity for a longer period. By doing this, the ECB would have encouraged them to carry on with the provision of credit to families and enterprises.

- *Currency agreements*

ECB and national banks of euro area countries (Eurosystem) supported liquidity through the supply of foreign currencies, mainly US dollars and hereafter they signed agreements with the Federal Reserve. The latter would have provided its currency in exchange of collaterals at fixed interest rates, decreasing uncertainty among investors in the markets. Furthermore, the Eurosystem extended the list of eligible collaterals accepted for refinancing operations, in order to encourage these agreements.

- *First Purchase Programme of Covered Bonds*

In 2009 it has been launched the first Covered Bond Purchase Programme and, in this context, the Eurosystem purchased bonds denominated in euro for an overall value of 60 billion euros (ibid).

Afterwards, when the sovereign debt crisis began to hit several European economies, ECB delineated the Securities Market Programme in May 2010 which allowed it to purchase sovereign bonds on secondary markets, since it cannot directly buy them, for an amount above 200 billion

euros (ibid). The objective was to face the spread sharply rise due to a loss of confidence in the markets and, moreover, ECB “sterilized”⁸ these purchases through deposits for an amount equal to the one of the bonds acquired by the Bank.

When the sovereign debt crisis intensified, between 2011 and 2012, and tensions on public debt solvency increased significantly, the Council adopted a measure according to which banks had to expand capital reserves to achieve the Core Tier 1 capital level of 9%⁹ in order to create a temporary capital buffer to face fears about sovereign risk in the markets (ibid).

However, to achieve the desired result credit institutions necessitated further 115 billion euros and ECB responded by providing them liquidity support on the short-term. In more detail, it established two LTROs (Long-Term Refinancing Operations) one in December 2011 and the other in February 2012, respectively of 489 and 529 billion euros, each of them with a three-years maturity (ibid). Moreover, the ECB decided to reduce the minimum required reserve ratio level from 2% to 1%, with the aim of decreasing the demand liquidity of banks and encouraging interbank lending since the extra amount of money could have not been deposited in the reserves.

In November 2011, the Second Purchase Programme of Covered Bonds was launched, under which the Eurosystem purchased other covered bonds for an overall value of 16.4 billion euros and the programme lasted until October 2012 (ibid).

Several European countries have been hit by the sovereign debt crisis and many rating agencies (such as Standard & Poor’s, Fitch and Moody’s) have downgraded government bonds of nine euro area Member States: Austria, Cyprus, France, Italy, Malta, Portugal, Slovakia, Slovenia and Spain (ibid).

In this context, on 26th July 2012 ECB President Mario Draghi gave a speech at the Global Investment Conference, during which he affirmed that the progresses made are more than the ones generally recognized and that the situation improved on average in the whole euro area, even some countries

⁸ Sterilization aims to maintain the same central bank liquidity after the implementation of a monetary policy. European Central Bank (2010), Euro Area Money Growth And The “Securities Markets Programme”, https://www.ecb.europa.eu/pub/pdf/other/mb201006_focus01.en.pdf

⁹ Banks’ capital solidity indicator expressed in percentage terms and it is the ratio between the banks basic assets and the amount of the risk-weighted ones. <https://www.treccani.it/enciclopedia/core-tier-1/#:~:text=Indicatore%20della%20solidit%C3%A0%20patrimoniale%20delle,attivit%C3%A0%20ponderate%20per%20il%20rischio>

more and others less (ECB, 2012b). Furthermore, he pronounced a phrase that would have become famous: *“Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough”* (ibid). According to Draghi, the main short-term challenges concerned the financial fragmentation, in other words, investors transposed their activities only to the national territory and the interbank market was not working properly. Moreover, the risk aversion element prevented an agent from lending to the counterpart because of a possible default but the ECB President affirmed that this should have been solved by the two LTROs issued between 2011 and 2012.

Afterwards, in September 2012 the Governing Council announced the introduction of the Outright Monetary Transactions Programme, which allowed the ECB to purchase government bonds of euro area Member States in the secondary markets but it concerned only those countries which previously had obtained funds under the European Financial Stability Facility (EFSF) or the European Stability Mechanism (ESM). The objective was to safeguard the monetary policy transmission mechanism and avoid the achievement of new maximums in the sovereign bond yields' value. EFSF was established in June 2010 as a temporary programme which allowed to financially assisted Greece, Ireland and Portugal which at the time were the countries mostly hit by the sovereign debt crisis (European Commission, 2023). Subsequently, it has been replaced by the ESM, created in October 2012, which is a permanent mechanism and its main task is to provide assistance to euro area Member States that were not able to gather liquidity in the markets (ESM, 2023).

These measures combined with the ones undertaken by some euro area states opened the doors at a period of improvement in the monetary policy transmission and to a decrease in sovereign bond yields and consequently to a fall in the spread's value. In spite of that, in the second quarter of 2013 another element started to threat markets, in other words, inflation began to reduce. Its maximum level during the crisis was around 3%, slightly above the ECB target of 2% stated by the treaties. The decrease of the prices together with the slow economic growth led the ECB to adopt further measures and Draghi affirmed that interest rates would have remained at the levels of the time or lower for a long period. This initiative has been seen as a forward guidance and the aim was influencing expectations on the short-term rates which would have affected the long-term ones, in this way the transmission mechanism of monetary policy would improve and consequently the economy too (Delivorias, 2015).

In 2014 the European Commission stated that in order to obtain economic growth, it was necessary to broaden the banks' capacity of lending and to achieve this objective the ECB intervened, establishing two further programmes. The first one is represented by the third package of covered bond purchases and the second measure is called Asset-Backed Securities Purchase Programme, each of them had a duration of two years. By February 2015, the acquisitions were respectively equal to 45 954 million euros and 2 870 million euros, but ECB action was not ended (ibid).

In its analysis, it noticed that in December 2014 inflation was at -0,2% and the economy's growth was weak and consequently interventions by the European Central Bank were needed to encourage an economic recovery (ibid). Moreover, interest rates were close to zero and the main channel of monetary policy could not be used, therefore, non-conventional measures should have been implemented. In January 2015, ECB established the Expanded Asset Purchase Programme, usually known with the name of Quantitative easing. This typology of initiative has already been applied in other countries, such as the USA or Great Britain, and it consists of creating money that will be used to purchase financial assets. The intervention would have started in March and lasted for one-and-a-half-year or until the inflation would have been on the road to reach a level around 2% (ibid).

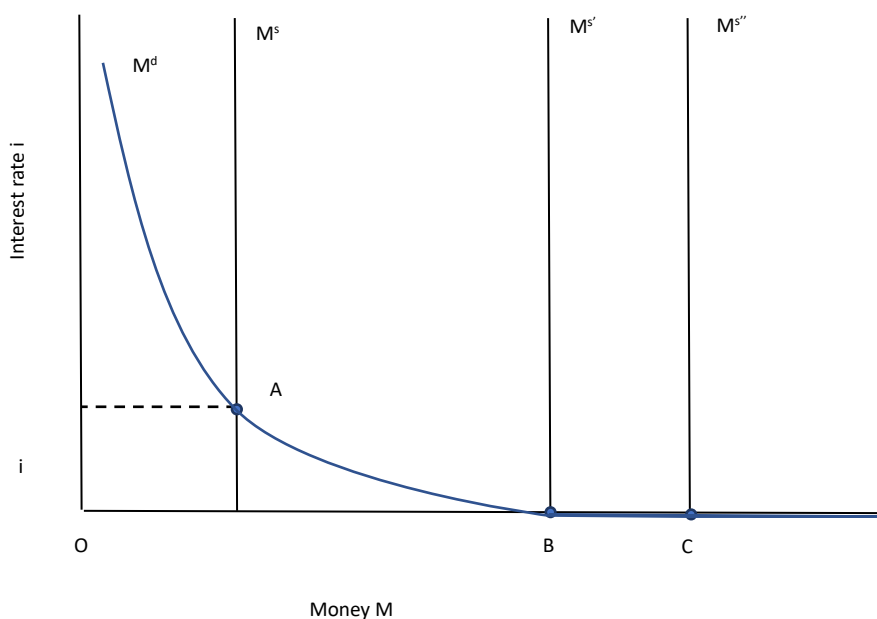
Overall, the ECB acted quickly to respond to the different phases of the crisis, trying to stabilize the economy and provide the liquidity needed to the banks. It is important to underline that it had a limited room of manoeuvre compared to other Central Banks, especially the Federal Reserve, since every action it undertakes must comply with the treaties' provisions.

2.2.1 The problem of the zero lower bound

A variation of the interest rate represents the main instrument of monetary policy that a central bank owns, and it is used to achieve the desired level of liquidity in circulation. In more detail, it can influence the amount of money through the Open Market Operations which can increase or decrease that quantity, depending on the objective to pursue. For example, if the central bank wants to raise the money supply, in this case it purchases financial assets in the markets and by doing so their demand increases and consequently also the price, reducing the interest rates and vice versa.

The zero lower bound is a macroeconomic condition in which the interest rate is close or equal to zero and the central bank cannot reduce it since it represents in some ways a limit, freezing the room of manoeuvre of the monetary policy main conventional tool. This generates a liquidity trap, in other words, a situation in which agents are indifferent between owning liquidity or bonds because the interest rate is around zero for both instruments and consequently, they prefer holding money. The graph reported below shows money demand and supply in the context of the liquidity trap.

Graph n.3: Money demand and supply



Source: Blanchard, O., Amighini, A., & Giavazzi, F., 2016

Usually, when ECB lowers the interest rate a person tends to own more liquidity with respect to financial assets and money demand (M^d) increases and vice versa. Nevertheless, in the case of the zero lower bound, as already said individuals are indifferent between owing bonds or liquidity and they prefer the second one: specifically, the quantity they want to hold for their transactions is equal to the distance OB (Blanchard et al., 2016). Moreover, considering that interest rate is around 0, they could be interested in keeping a larger amount of money and a lower one of financial assets. Consequently, starting from point B, the demand function is no more a curve but a line which coincides with the horizontal axis. In B and C, any variation of the supply (M^s) is ineffective on the interest rate because it is already equal to zero and the main instrument of monetary policy cannot be used by ECB for further stimulus of the markets (ibid). It is an explanation of the liquidity trap, in other words, as money supply raises current account deposits also increase, instead of allocating those resources in investments and as result, stimulate the economy.

Returning to the financial crisis of 2008, the modification of interest rates has been the first measure taken by several central banks around the world. After the collapse of the Lehman Brothers, the Federal Reserve cut the main interest rates, which achieved 1% in October and a value comprised between 0.00 and 0.25% in December 2008 (De Fiore & Tristani, 2018). On the other hand, in the same year ECB¹⁰ acted to reduce them but only in 2009 the decrease was close to 1% and it would have remained at the same level until 2012. In July, the interest rate on Deposit facility reached 0.00, instead the one related to the Main refinancing operations was around 0.75% and would have achieved 0.00 only in March 2016 (ECB, 2023f). The affirmation of ECB President Mario Draghi, according to which interest rates would have remained low for a long period had the aim of influencing the expectations on the short-term as already said but, at the same time, it implies some risks too. First of all, banks could be induced to promise an excessive amount of liquidity, and this could lead to a future need of lowering interest rates. Secondly, credit institutions could be less stimulated to restore their balance sheet since they have a longer period to re-establish the equilibrium of the accounts (ECB, 2012a).

¹⁰ In the Eurosystem context, the more important interest rates that ECB can modify are the following: Main refinancing operations (MRO), Marginal lending facility and Deposit facility.

Nevertheless, in the zero lower bound context, the instrument of forward guidance can be used by central banks to stimulate and reassure markets and not to freeze the room for manoeuvre of monetary policy. Moreover, unconventional measures have been put in place in order to face the effects of the financial and sovereign debt crisis and sustain the recovery of financial institutions and governments' budget accounts.

2.2.2 Unconventional tools

In order to understand the concept of unconventional tools, it is necessary to come back to the definition of conventional measures. In more detail, a central bank can vary the amount of money supply of the interest rate to influence monetary conditions and achieve the interest rate target desired. The primary objective is to maintain price stability and it is achieved when inflation is around 2%. On the other hand, unconventional measures have been considered as complementary to the standard ones and are mainly used when the latter are ineffective, such as in the case of the zero lower bound. Interest rates cannot be reduced further and in order to intervene in the money market central banks use other instruments, such as the purchase of financial assets and the forward guidance.

During the first stage of the financial crisis, ECB launched the First Covered Bonds Purchase Programme in order to provide liquidity and sustain the monetary policy transmission mechanism. A second package was launched in 2011 which lasted until 2012, when another instrument was introduced, the Outright Monetary Transactions (OMT). In more detail, it allows the ECB to buy sovereign bonds of countries which asked for financial assistance only after some passages. First of all, the country in question must have required support to the European Financial Stability Facility (EFSF), which should be accepted by EU institutions. Afterwards, the latter have the task to formulate an adjustment programme for sustaining and improving the economy that the state needs to undertake to get EU rescue. Since ECB could purchase any amount of bonds, it announced that it will sell an equal quantity of assets in order to do not affect money supply (Ferrando et al., 2021).

Another unconventional policy adopted in 2014 is represented by the reduction of interest rate on deposit facility under the level of that year, which was 0.00, achieving a value of -0.10%. The aim was to face an eventual deflationary risk since inflation reached -0,2% in December 2014 (Delivorias, 2015). Nevertheless, it has been shown that the deposit rates have not been affected by the negative interest rate because banks did not want to charge costs to customers. In that case, depositors would have been induced to withdraw their money to keep it as cash not to pay a deposit fee (Ferrando et al., 2021).

Afterwards, the deposit facility rate was cut further in the years and the maximum level registered was -0.50% in 2019, after that it began to increase again (ECB, 2023f).

Furthermore, the ECB established the Expanded Asset Purchase Programme (commonly known as Quantitative easing) in 2015 and it will be the subject of the following paragraph.

2.2.3 Introduction to the quantitative easing

In January 2015, ECB announced the launch of the Extended Asset Purchase Programme, otherwise known as Quantitative easing. Already used in other countries, such as the USA and Japan, by the national central banks, it is an unconventional monetary policy instrument that aims to encourage a proper functioning of the transmission mechanism and to assure price stability in the euro area (ECB, 2023a). In more detail, it is composed of four packages and each of them concerns the purchase of a different instrument:

1. Corporate sector
2. Public sector
3. Asset-backed securities
4. Covered bonds (3rd purchase programme)

In the period between 2015 and 2016 ECB purchased assets for 60 billion euros, in the following year the amount increased to 80 billion euros and returned to 60 billion in 2017. Afterwards, the overall quantity of resources allocated to the programmes decreased until stopping in 2019, when there were only reinvestments of redemptions (ECB, 2023a).

Quantitative easing generally consists of a bond purchase by the ECB and by doing so, the asset's price raises, generating money in the system. As a result, the interest rates fell and the cost of a loan decreased. In this way individuals and enterprises can borrow more resources from the banks and allocate some of them to consumption and investment, encouraging economic growth and employment. Consequently, if prices increase, the inflation target of 2% is reached in the medium term (ECB, 2016a).

This unconventional measure allows to promote risk-taking as it is under the socially desired level, due to the loss of confidence in the markets. Nevertheless, it is important to underline that in the case in which that level is surpassed, financial instability may be generated in the future. On the whole, non-standard instruments appeared to be more beneficial than risky, however, more supervision by the ECB is necessary to assure financial stability (Claeys & Leandro, 2016).

Chapter 3 – The Three-equation New Keynesian Model

The previous chapters introduced the European Central Bank, its role and functions and subsequently its policies during the financial crisis of 2008. In this way, it is possible to have a broader overview of the causes and consequences of one of the most significant crisis of the last decades. It can be said that the objective is to deepen the dynamics related to these elements and the usage of non-conventional policies, given the ineffectiveness of the monetary policy traditional channel since the interest rate was already low before the crisis and subsequently established around zero.

Interventions have been fundamental to face the issue that, otherwise, could have been even worsened. Nevertheless, it is not all roses and flowers, and the European banking institution has been put under discussion, as previously seen with the dispute brought before Germany's Federal Constitutional Court.

One element that has been always contested is that the European Union exited from the crisis much later than the USA, even implementing at large extent similar measures. One of the reasons can be found in the second phase in which Europe found itself involved did not arrive overseas, impacting the economies' recovery. Consequently, the ECB had to put in place further actions to safeguard the economic stability of the Union.

This chapter aims to analyze its policies and the instruments used through the lens of the Three-equations New Keynesian Model, created by Wendy Carlin and David Soskice. The objective is to deepen the dynamics related to these elements and the usage of non-conventional policies, given the ineffectiveness of the monetary policy traditional channel since the interest rate was already low before the crisis and subsequently established around zero. Before the discussion of the Model, a brief overview of Keynesian and New Keynesian macroeconomics will be made to have a better comprehension of the topic.

3.1 Founding elements of Keynesian Macroeconomics

In front of the Great Depression of 1929, many economists did not have a clear explanation of the crisis and of the measures to implement. It is in this context, John Maynard Keynes, one of the most important economists of all the times proposed its intuitions to tackle the crisis, thoughts that have been used by the US government at that time and that have been used also to face the recent economic recession, and his name is John Maynard Keynes. He is the author of the *General Theory of Employment, Interest and Money*, where he paid attention to the concept of effective demand and according to him, it determines the amount of production. Moreover, according to Keynes, if it is true that in the long run the production returns to its natural level, it requires a lot of time (Blanchard et al., 2016).

In his studies, Keynes took into consideration a monetary economy, where goods and services are exchanged with money, and savings and investments follow the same logic. Moreover, families and enterprises decisions are made individually, and it is the financial market the one charged with the reallocation of resources from one agent to the other, through the buying and selling of the securities. In this way, an individual can decide to purchase an amount of them in exchange for a sum of money which will be returned with interest. An important element is represented by the interest rate since it regulates the demand and supply levels and according to Keynes it is not only a means of payment as at that time many economists believed. Specifically, it would constitute a tool that transfers over time the purchase power, in other words, it can be defined as a value reserve (Gaffeo et al., 2015).

Keynes stated that liquidity is preferred in a situation of financial uncertainty and consequently, the interest rate is proportional to this preference and the economic turmoil. Namely, as the level of uncertainty increases, more individuals wish to hold their money physically and the result is a rise in the rate. Furthermore, it can be seen as the element that equals demand and supply in the financial markets and consequently, it is not established by savings and investments in the capital markets (ibid).

Moreover, Say's law according to which the supply of a good creates its own demand and consequently, the two curves equal themselves, has lost its efficiency within the Keynesian theory. In other words, since in certain historical moments such as the Great Depression individuals prefer

to hold liquidity rather than invest or purchase, the demand decreases, and an excess of supply is generated. It is in this context that Keynes introduced a new element, which is the multiplier. The latter has a amplificatory effect, it means that in front of a reduction of consumption enterprises produce a lower amount of goods and this implies that less employees are necessary for the production, generating a rise of unemployment. For this reason, individuals must cut their spending, provoking a further fall of the demand (ibid).

The revolutionary reasoning that Keynes introduced concerns the market imperfection. Namely, markets do not regulate themselves by their own, as Smith and generally the Classical economists, previously affirmed with the theory of the “invisible hand”. The economist believed that sometimes government intervention is needed, especially in a situation of economic recession. Public spending is essential for providing financial resources to families and enterprises with the aim of encouraging the recovery of the demand, generating effects also on the level of production and employment as a virtuous cycle.

Subsequently, the main elements of the Keynesian theory were translated into a mathematic model, known as IS-LM, by John R. Hicks. It is important to recall it since it constitutes the basis of macroeconomics, at least until the 1970s and it is still taken into consideration for a simplified interpretation of the equilibrium in the goods and monetary markets (ibid).

3.2 Founding elements of the New Keynesian macroeconomics

In the 1970s a new class of economists developed, known as New Keynesian macroeconomics. The main exponents are J. B. Taylor, O. Blanchard, P. Krugman, J. Stiglitz, and many others took part in the development of the theory.

First of all, they wanted to recall the assumption made by Keynes, according to which markets are not perfect, as said by classical thinkers. On the contrary, sometimes prices and wages did not adjust immediately in front of variations in the market conditions and consequently, the latter are not always able to reach the point of efficient equilibrium. In this situation, government intervention through fiscal and monetary policies is useful to encourage the economy and achieve the level of maximum efficiency that markets would not have been capable of by themselves (ibid). Nevertheless, these measures must be used only temporarily in the short term, otherwise, they can affect the proper functioning of the economy and they may not have the desired effect when needed.

One of the main pillars of the New Keynesian thought is represented by the aggregate demand theory, according to which its fluctuations can be seen as the major cause of macroeconomic unbalance. Another element is the “real rigidity” assumption, which states that the relative prices of equilibrium determined by the markets can conduct to a level of equilibrium that is not efficient, and, for example, it can lead to reaching an output lower than the one desired (ibid).

Moreover, an important rule in modern macroeconomics has been proposed by John B. Taylor, concerning the interest rate and its usage by the central banks. First of all, an equilibrium rate i^*t is delineated and on the contrary to the past, inflation is taken into account. The idea is that the interest rate it is bound to i^*t (its equilibrium value) and it is modified by the central banks only in the case in which the GDP value is not equal to the one of maximum efficiency or when inflation deviates from the target defined by the banking institutions. With regard to the latter element, the rule works as the following:

- In the case in which the inflation rate is higher than the targeted one, central banks raise the interest level with the aim of reducing the prices;

- On the contrary, if the inflation gap is negative, and in other words, it means that the current value is lower than the desired percentage (deflation), the interest rate is decreased.
- Central banks modify the latter also taking into consideration the output fluctuations concerning its equilibrium level (ibid).

The recent financial crisis of 2008 represented an opportunity to observe the implementation of the Taylor rule and, especially, if it is followed by the main central banks in defining their monetary policy. In front of the rise in the prices between 2007 and mid-2008 from around 2% to a value above 3%, the ECB increased the interest rate, at least until September 2008. After Lehman Brothers declared bankruptcy in October and the crisis exploded in the USA which also affected the European economies, the Central Bank decided to invert its manoeuvre and subsequently, the interest rate fell. These two different policies put in place in a short period, can be explained through the Taylor rule. First of all, at the beginning, the inflation rate was increasing and to maintain price stability that, furthermore, is the main objective of the ECB, the interest rate needed to be lowered. Successively, when the crisis started to take place in the international context, most of the countries' demand collapsed, as well as the output level. In order to face this situation, the ECB decided to implement a reduction of the interest rate, with the aim of stimulating the recovery of the economy (ibid).

In conclusion, it can be affirmed that the Taylor rule has effectively been used by the European Central Bank during a phase of economic instability and uncertainty and consequently, has a relevant role in the definition of the monetary policy.

3.3 Introduction to the Three-equation New Keynesian Model

The model proposed by Wendy Carlin and David Soskice aims to bridge the gap between the simple models explained in intermediate macroeconomic volumes and the ones that are the object of debate in academic and central bank environments.

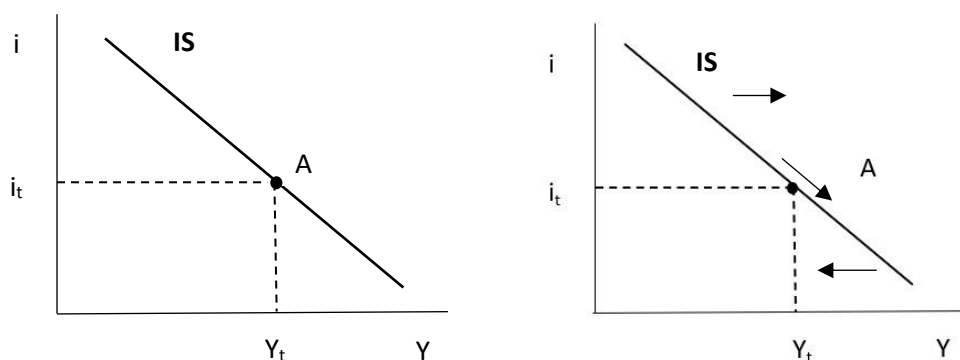
The three-equation model is composed of three elements, as can be deduced by the title itself, and they are the IS and the Philips curves and a monetary policy rule equation, namely IS-PC-MR (Carlin & Soskice, 2005). According to the authors, it can be used for analyzing the behaviour of the central bank and consequently, it can be useful to make some considerations about the measures taken by the ECB during the financial crisis of 2008. Especially, concerning the variations of the interest rate and the situation of the zero lower bound.

In the following paragraphs, it will be explained the model through the usage of diagrams, concerning an inflation increase that leads the ECB to intervene by modifying the interest rate in order to reduce the level of the prices and the burst of the financial crisis shifted the priorities of the Central Bank, which is obliged to implement other measures. Since this situation is explained at the graphical level through the IS, PC, and monetary rule equation, it is necessary to introduce these concepts before going deeper into the analysis.

3.3.1 A brief description of IS and Philips curves in Macroeconomics

The IS (Investment and Saving) equation has been introduced in the context of the Keynesian theory, and it consists of all the combinations of output (Y) and interest rate (i) that lead to an equilibrium in the goods market. It is better explained in the following graph:

Graph n.4: IS curve in the Keynesian theory



Source: Personal elaboration on Gaffeo et al., 2015

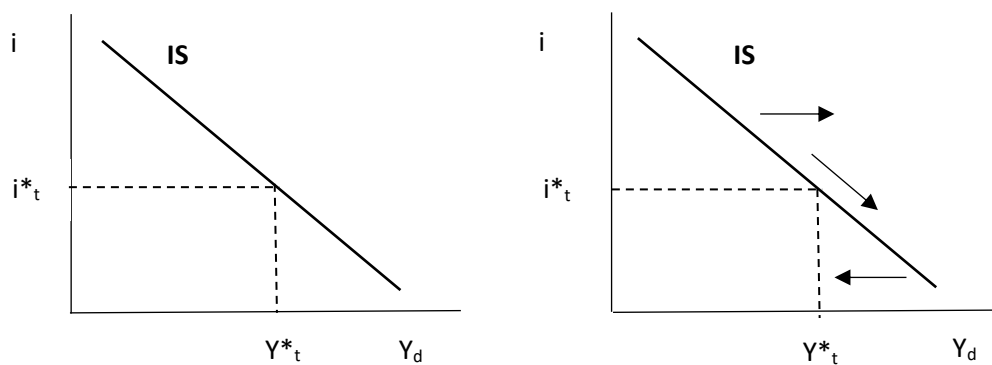
It is important to say that any rise in the interest rate generates a decrease in the output and vice versa. In this case, it implies movements along the IS curve, depending on the entity of the variations. Furthermore, it could be that exogenous variables change provoking some effects on the equilibrium in the market and leading to curve shifts, and not along it. In more detail, those shocks which bring aggregate demand increases, generate a movement rightward, and on the other hand, the ones that affect it negatively are translated into an adjustment of the curve leftward. These variations lead to a rise or a decrease in the output level, nevertheless, the interest rate is given and it is not modified (Gaffeo et al., 2015).

Afterwards, the IS curve has been studied by New Keynesian economists and since the three-equation model has been developed in the context of this theory, it is functional to take into consideration also their vision. First of all, the decreasing relation between aggregate demand and interest rate is maintained in the New-Keynesian IS curve, nevertheless, some new elements have been introduced. According to them, the capital market is efficient and consequently, a real interest rate of equilibrium is generated between savings and investments, also known as the natural

interest rate (r_t^*) and it is the effective real interest rate (r_t^e) that regulates the securities demand and supply. It is important to say that these two values may differ sometimes but, generally, the first one is considered a benchmark for achieving equilibrium in the economy (ibid).

Furthermore, the New-Keynesian IS varies from the traditional equation in two main ways. Firstly, it represents the aggregate demand, while, before it illustrated the balance between demand and supply in which the latter adequates itself to the quantity demanded because of fixed prices and wages. This assumption has later removed, allowing an analysis of each of the two as independent elements. Moreover, in the new equation, the interest rate is anchored to the natural one (which provides the equilibrium in the market), differently from the previous theory (ibid).

Graph n.5: IS curve in the New-Keynesian theory

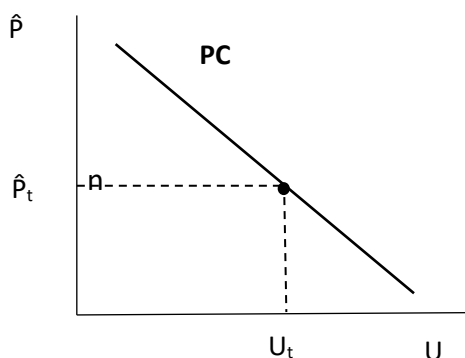


Source: Personal rielaboration on Gaffeo et al., 2015

The graph shows the functioning of the IS curve in the New-Keynesian theory, more specifically when the monetary interest rate i_t differs from the equilibrium one i_t^* (while the other variables are equal), the capital market balance is affected by this deviation and consequently investment and aggregate demand levels are modified, generating shifts along the curve. Moreover, in this theory it has been added a variable generally representing exogenous variations of consumption or investment, in other words, it shows the real shocks of the aggregate demand. In the case in which the latter increases, IS shifts rightward, and if it falls, the curve moves leftward (ibid).

With regards to the Philips curve, in 1958 the economist A.W. Philips showed a decreasing relation between the unemployment rate and nominal wage growth rate, in other words, when the first one is positive, wage inflation was around zero. Furthermore, the increase in the goods' prices is mainly determined by wage inflation, and subsequently, other economic theorists expanded the analysis to the general rise of prices and unemployment. Policymakers must take into consideration the trade-off between these two elements and consequently, decide the direction they want to follow and the objective to achieve. It means that in order to reach a lower level of unemployment, they should accept higher inflation and vice versa, depending on the priorities of the government (Blanchard et al., 2016). In the following graph it is shown the functioning of the curve:

Graph n.6: Philips curve (relation between inflation and unemployment)



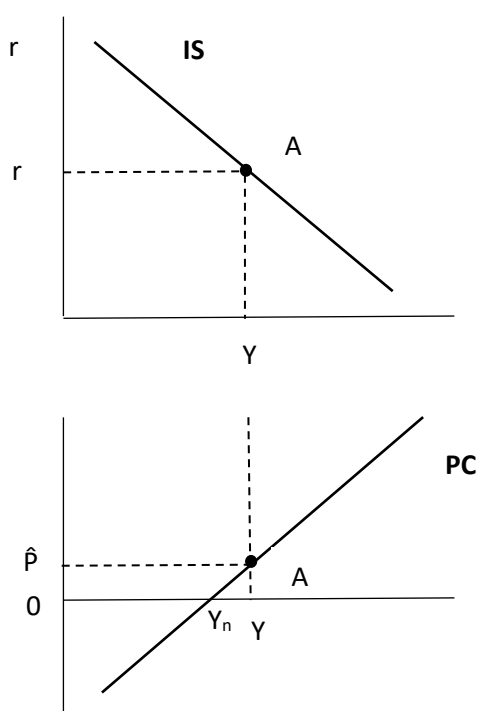
Source: Personal rielaboration on Gaffeo et al., 2015

Subsequently, other economists affirmed that the trade-off could have continued to exist if in the determination of the wages, inflation would have been underestimated systematically, and that in the case in which governments made efforts to maintain a high level of employment, this trade-off would have disappeared. Consequently, the unemployment rate would not decrease below its natural level, which corresponds to an effective inflation equal to the one expected (ibid).

The Philips curve can be expressed also in terms of output rather than of unemployment, considering the output gap that consists of the difference between the effective and potential levels. First of all, when the percentage of unoccupied people is at its natural level, the production is equal to its potential quantity and the output gap corresponds to zero. On the contrary, when the

unemployment rate is above or under the natural one, the amount produced does not correspond to its potential. Another important element to take into account is that inflation expectations assume a rise of the prices equal to the previous year, and following this hypothesis, it increases when the production level is beyond its potential one and the output gap has a value above zero, and vice versa (ibid). Graph number 7 shows the relation between the IS and Philips curves with regard to production:

Graph n.7: IS and Philips curves



In the upper part of the graph, it is possible to see the relation between the real interest rate and the output, the lower the first one is, the higher the production.

Below, it is represented the interaction among inflation and output. The level is the same of the one outlined by the IS curve, at which corresponds a specific level of rise in the prices.

It is interesting to notice that Y_n represents the amount produced which leads to a zero inflation.

Source: Personal elaboration on Blanchard, O., Amighini, A., & Giavazzi, F., 2016

The main aspects of the IS and Philips curves have been outlined, and a brief description of the monetary rule seems to be fundamental in order to allow a better comprehension and analysis of the Three-equations New Keynesian Model. As underlined by its author, there are two approaches according to which the monetary rule can be explained. Firstly, it can be seen as an interest rate rule that, given to the current inflation rate, points out the interest rate that should be set and it is known

as IR equation. Otherwise, it can be expressed as the amount of output that is necessary to reach the aim of counterbalancing the level of inflation and it is identified with the MR-AD equation (Carlin & Soskice, 2005). It is now possible to analyze deeply the Three-equation New-Keynesian model, contextualized in the financial crisis of 2008.

3.4 Analysis of ECB monetary policies during the financial crisis of 2008

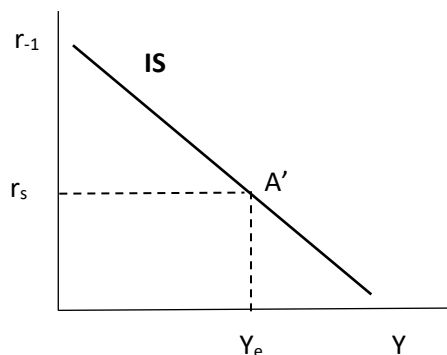
At the beginning of the twentieth-first century, the Federal Reserve maintained interest rates low, giving the possibility for more citizens to apply for a loan, generally used to buy a new house. It is at this moment that a sharp increase in the number of subprime mortgages took place, granting credit also to those who provided less warranties or whose solvency was uncertain. Furthermore, these mortgages were transformed into financial assets to redistribute the high risks among several agents and also the purchasers convert them into other instruments, giving rise to the phenomenon of securitization and they were known as mortgage-backed securities.

Nevertheless, in 2004 the US Central Bank started to rise the interest rates, given the improvement in economic conditions and consequently, the cost of loans grew as well. Some individuals were in trouble in front of refunding the mortgage payments, since the latter became higher, and insolvency cases began being more frequent. The result was a fall in the housing demand, fewer families were able to ask for credit and it implied that prices started to reduce at the beginning of 2007 and the bursting of the housing bubble seemed quite inevitable (CONSOB, 2023). The combination of low liquidity, several unrecoverable mortgages, and high leverage are the main elements that originated the financial crisis in the USA in 2008 and since banks started to grant credit to fewer individuals, consumption and investment fell and the GDP as well.

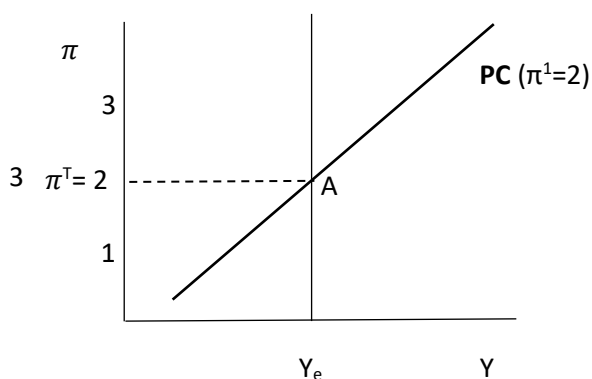
After the collapse of the Lehman Brothers, the crisis transmitted from the United States to Europe, through the channels already outlined in chapter two. It required interventions both at the national and European levels: domestically, governments recapitalized those banks in liquidity troubles and enlarged the government spending to sustain the economy, leading to an expansion of the public debt. On the other hand, the ECB decided to reduce the main interest rate, the one concerning MROs, and between October 2008 and May 2009, it shifted from 3.75% to 1% (ECB, 2023f). The primary reason was that of providing more liquidity to credit institutions, since interbank lending was quite compromised but, at the same time, indirectly it had beneficial effects also for the economic recovery. Furthermore, the ECB implemented other measures to face the crisis, such as the purchase of covered bonds, but they are not relevant for the analysis in the Three-equation New-Keynesian model and consequently, only interest rate variations will be taken into account.

Starting to go deeper into the analysis of ECB measures implemented during the financial crisis, it is useful to show an initial equilibrium situation in the Three-equation New Keynesian model.

Graph n.8: IS and PC in an initial equilibrium situation



In the upper part of the graph, it is shown the IS curve that represents the relation between the real interest rate and the output. It is interesting to notice that according to authors Carlin and Soskice, r_s is understood as the stabilizing rate.

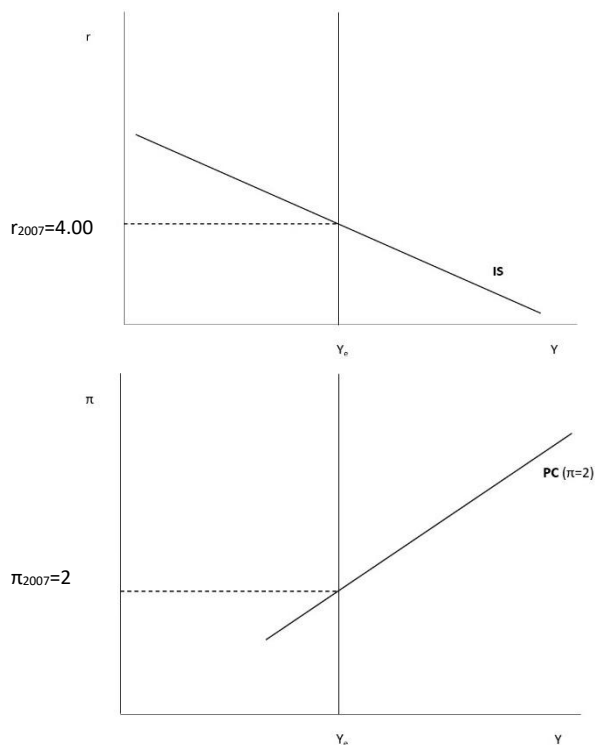


Below, is represented the interaction among inflation, defined with the symbol π , and output. The level is the same as the one outlined by the IS curve.

Source: The 3-Equation New Keynesian Model, Carlin, W., & Soskice, D., 2005

The graph shows the starting point of the analysis, where r_s is the interest rate which ensures that the aggregate demand is congruous with the output level of equilibrium Y_e . Nevertheless, Graph n.9 is more useful to understand the initial situation of equilibrium in November 2007, where inflation was equal to the 2% target and the interest rate was around 4.00% (Eurostat, 2023; Banca d'Italia, 2023). Moreover, it is important to notice that the interest rate considered in the analysis is the one concerning the Main Refinancing Operations (MROs), already outlined in Chapter 2.

Graph n.9: IS and PC in an initial equilibrium situation in 2007



Source: Personal elaboration on The 3-Equation New Keynesian Model, Carlin, W., & Soskice, D., 2005

From December 2007, inflation started to rise and in July 2008 it reached 3.1%, and, in the same month, the ECB decided to intervene varying the interest rate that until that moment was around 4% (Eurostat, 2023; Banca d'Italia, 2023). All the following passages will be reported in Graph n.10, which is based on the Three-equation New Keynesian Model, with the aim of allowing a comprehension also at the graphical level.

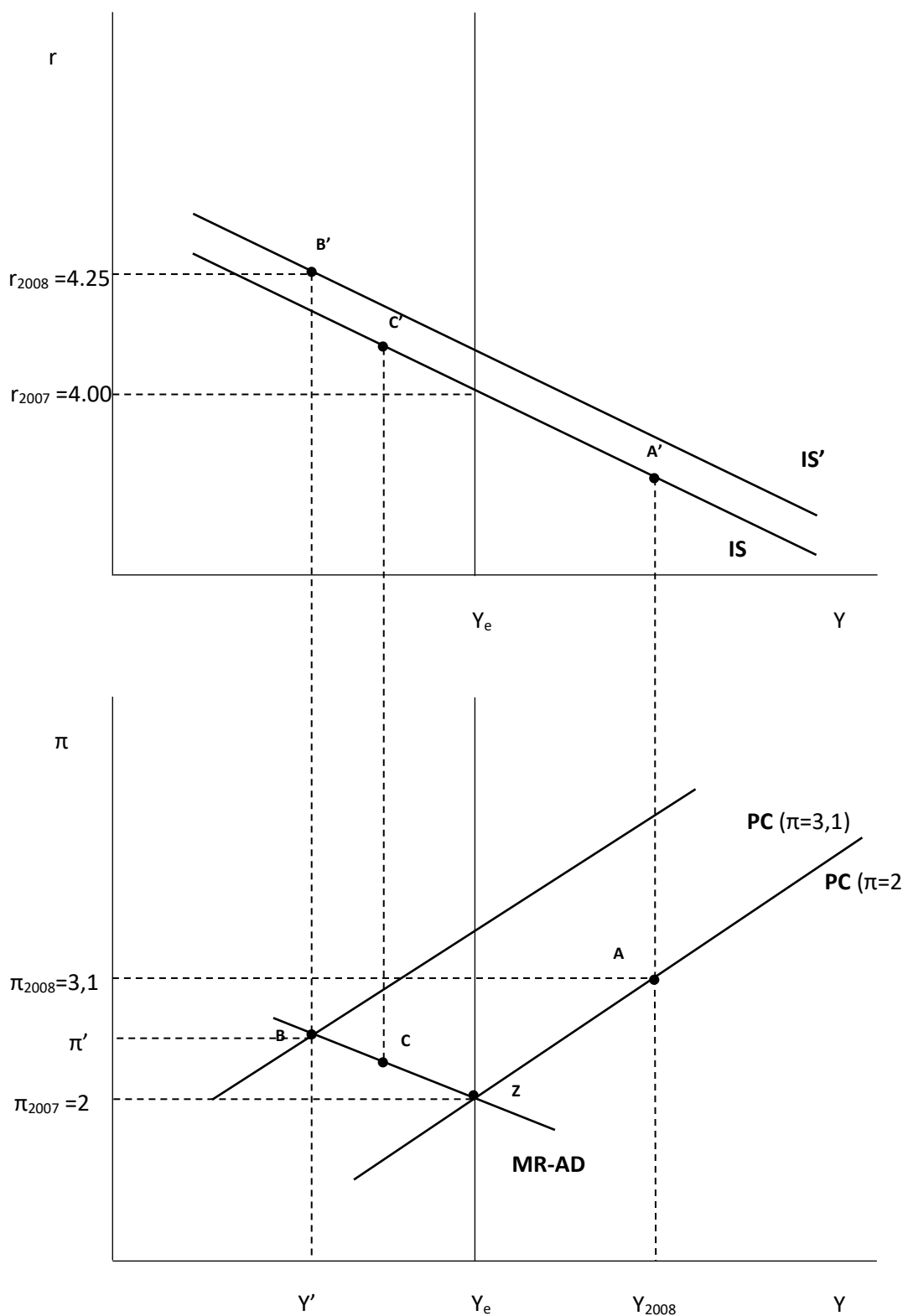
As already said, in July 2008 the increase in the prices was around 3.1%, sharply higher than the 2% target. This rise is represented by point A, still projected to the initial Philips curve ($\pi=2$), and which corresponds to a huger output (Y_{2008}), shown both in the PC and in the IS, generating an output gap. At this stage, taking into consideration the changed economic conditions, the ECB must modify the interest rate, nevertheless, before doing that a new PC ($\pi=3.1$) should be predicted. The Central Bank will decide which combination of inflation and output along the adjusted curve is suitable, considering also its preferences (β). In other words, the more the ECB is averse to the rise in the

prices and the higher is β , consequently, the more it will intervene to reduce it through variations of the interest rate. After these evaluations, point B is outlined, at which the indifference curve and PC ($\pi=3.1$) are tangent, forecasting an output level equal to Y' that temporarily is below the equilibrium one and which constitutes a target in the aggregate demand that the Central Bank would like to achieve in the following period. The monetary rule is useful in the determination of point B, since it represents the relation between the production level adopted directly by the ECB and the inflation rate decided indirectly, and it materializes itself in the MR-AD equation. In Graph n.10, it is represented as a line that joins points B and Z, in which the latter is understood as a situation where inflation equals the 2% target and output corresponds to its equilibrium level.

Subsequently, the ECB should forecast the new IS curve for the following period, in the graph it is shown as IS' and it is important to outline the interest rate that is necessary to implement in July 2008 (t_0), in order to reach the desired output level (Y') in the following period t_1 . In this case, in correspondence with point B along the IS' curve, it is possible to notice that the r_{2008} decided by the Central Bank is equal to 4.25% (Banca d'Italia, 2023). As formulated by the Taylor rule a rise in the cost of money should lead to a reduction in the level of prices, and this relation has been taken into consideration also in the Three-equation New-Keynesian model.

According to authors Carlin and Soskice, the next step would be an adjustment process, during which a new Philips curve is forecasted by the Central Bank and passes through point C. After that, a level of output closer to the equilibrium one is settled and the interest rate will be corrected to finally achieve point Z' in the IS' curve and bring back the economy to a situation of stability (Carlin & Soskice, 2005).

Graph n.10: Three-equation New Keynesian Model contextualized in 2007 and 2008



Source: Personal elaboration on The 3-Equation New Keynesian Model, Carlin, W., & Soskice, D., 2005

Nevertheless, after the collapse of the Lehman Brothers in September 2008, the interest rate did not increase due to the bursting of the financial crisis and the subsequent transmission from the United States to Europe. The fear of economic recession led the ECB to intervene in order to provide more liquidity to credit institutions, since interbank lending was quite compromised and, at the same time, indirectly sustain the economy through a reduction of the MROs interest rate from 4.25% to 3.75% in October and 3.25% in November. Moreover, between December 2008 and May 2009, it was reduced from 2.50% to 1.00% and such variations are summarized in Table n. 2.

Consequently, the impact of the previous measures was weak, as reported by Tables n.3 and 4. Nevertheless, it is important to underline that the rise of interest rate shown in Graph n.10 necessitates time to produce effects on inflation and generally, on the economy, and it is not immediate and it may have needed a longer period with a high-interest rate to possibly achieve the equilibrium point Z' as predicted by the Three-equation New Keynesian Model. On the one hand, it can be said that the ECB objective of reducing the level of prices has been reached, as seen in Tables n.3 and 4, but on the other hand, inflation did not stabilize around the 2% target and it continued to decrease even faster in the following months due to the fall of the aggregate demand and generally, of output.

Table n.2: Interest rate (MROs) variations during the financial crisis of 2008

Year	Oct 2008	Nov 2008	Dec 2008	Jan 2009	May 2009	Dec 2011	July 2012	May 2013	Nov 2013	Sept 2014	Mar 2016
Interest rate	3.75	3.25	2.50	2.00	1.00	1.00	0.75	0.50	0.25	0.05	0.00

Source: Personal elaboration on ECB data (ECB, 2023f)

Table n.3: Inflation rate variations in 2008 (HICP index)

Year	July 2008	Aug 2008	Sept 2008	Oct 2008	Nov 2008	Dec 2008
Inflation	3.1	3.3	3.4	3.5	3.4	3.3

Source: Personal elaboration on Eurostat data, 2023

Table n.4: Inflation rate variations in 2009 (HICP index)

Year	Jan 2009	Feb 2009	March 2009	Apr 2009	May 2009	June 2009	July 2009	Aug 2009	Sept 2009	Oct 2009	Nov 2009	Dec 2009
Inflation	3.1	2.9	2.7	2.4	2.1	1.8	1.4	1.1	0.7	0.5	0.3	0.3

Source: Personal elaboration on Eurostat data, 2023

Table n.5: Inflation rate variations in 2010 (HICP index)

Year	Jan 2010	Feb 2010	March 2010	Apr 2010	May 2010	June 2010	July 2010	Aug 2010	Sept 2010	Oct 2010	Nov 2010	Dec 2010
Inflation	0.3	0.3	0.3	0.4	0.6	0.7	0.9	1.00	1.2	1.4	1.5	1.6

Source: Personal elaboration on Eurostat data, 2023

Table n.6: Inflation rate variations in 2011 (HICP index)

Year	Jan 2011	Feb 2011	March 2011	Apr 2011	May 2011	June 2011	July 2011	Aug 2011	Sept 2011	Oct 2011	Nov 2011	Dec 2011
Inflation	1.7	1.9	2.00	2.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.7

Source: Personal elaboration on Eurostat data, 2023

Table n.7: Inflation rate variations in 2012 (HICP index)

Year	Jan 2012	Feb 2012	March 2012	Apr 2012	May 2012	June 2012	July 2012	Aug 2012	Sept 2012	Oct 2012	Nov 2012	Dec 2012
Inflation	2.7	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.6	2.5	2.5

Source: Personal elaboration on Eurostat data, 2023

Table n.8: Inflation rate variations in 2013 (HICP index)

Year	Jan 2013	Feb 2013	March 2013	Apr 2013	May 2013	June 2013	July 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013
Inflation	2.4	2.4	2.3	2.2	2.1	2.00	2.00	1.9	1.7	1.6	1.5	1.4

Source: Personal elaboration on Eurostat data, 2023

Taking into consideration a longer period of time, it can be said that the interest rate remained at the same level until 2011, while inflation, which was around 0.3% in December 2009, increased and reached the 2% target in March 2011 (Eurostat, 2023; Banca d'Italia, 2023). It can be supposed that these variations in the level of prices cannot be explained through the usage of the Three-equation New Keynesian Model, since interest rate has not changed, and they may be due to exogenous factors.

In the second quarter of 2011, inflation continued to raise surpassing its target value and, at the same time, the ECB raised the interest rate from 1.00% to 1.25% in April and 1.50% in July (ibid). Nevertheless, in November it was reduced to 1.25% and in December it reached the initial 1.00% value (ibid). Considering that an increase in the cost of money theoretically should imply a reduction in the inflation rate, as also predicted by the Taylor rule, it can be assumed that the rise in the interest rate was not so consistent to produce effects on the level of prices and there could have been exogenous factors that influenced that situation, such as the beginning of the sovereign debt crisis and its intensification between 2011 and 2012.

Subsequently, as shown in Table n. 7, in 2012 inflation remained at a higher level than the one desired and it started to decrease only in the fourth quarter, and its reduction continued also in 2013 when in June it reached the 2% target (Eurostat, 2023). Meanwhile, the interest rate was set at 0.75% in July 2012 and 0.50% in May 2013 (Banca d'Italia, 2023).

It is interesting to notice that from August 2013 inflation started to reduce, accompanied by a decrease in the cost of money in November, which was adjusted to a 0.25% rate (Eurostat, 2023; Banca d'Italia, 2023). Furthermore, in 2014 both factors continued going towards zero, more specifically, in June the interest rate was set at 0.15%, while inflation at that time was around 0.8%, meaning that the measures implemented to face the crisis were not sufficient to encourage a recovery in the economy and in September they reached respectively 0.05% and 0.6% (ibid). Taking into consideration this data, the assumption is that the traditional channel of monetary policy is not sufficient, and it is necessary to utilize other instruments, such as unconventional tools. They are considered complementary to the standard ones and are mainly used when the latter are ineffective, such as in the case of the zero lower bound. Interest rates cannot be reduced further and in order to intervene in the money market central banks use other measures, such as the purchase of financial assets and the forward guidance.

As already outlined, the interest rate was around 0.05% and since it was very close to zero, in January 2015 the ECB announced the launch of the Extended Asset Purchase Programme, otherwise known as Quantitative easing, which aimed to encourage the proper functioning of the transmission mechanism and to assure price stability in the euro area (ECB, 2023a). It was composed of four packages, each one concerning the purchase of a different instrument, which are the corporate and public sectors, asset-backed securities, and covered bonds (3rd programme because two were already implemented before). During 2015, inflation stabilized itself at around 0.2%, while the interest rate still was at 0.05%, and in March 2016 it was set at 0.00 and the level of prices fluctuated between 0.1% and 0.3% (Eurostat, 2023; Banca d'Italia, 2023).

3.4.1 The zero lower bound case

As outlined in Chapter 2, the zero lower bound is a macroeconomic condition in which the interest rate is close or equal to zero and the central bank cannot reduce it since this represents in some ways a limit, freezing the room of manoeuvre of the monetary policy main conventional tool. It is interesting making a consideration about the financial crisis of 2008, the already-seen reduction in the interest rate from October 2008, and the decrease in inflation at the same time. As reported in Table n.4, the latter reached 0.3% in November 2009 and it continued to be at such a level even in the first months of the following year, not achieving a lower value.

In the case of a great economic recession, the Central Bank should significantly reduce the interest rate and it could be necessary to bring it under zero to somehow produce effects on the economy. Nevertheless, the situation of the zero lower bound could prevent the ECB to do so (Blanchard et al., 2016).

Suppose that after the beginning of 2009 inflation fell to 0.00%, it would have not been possible to set the interest rate needed to encourage the production to reach its equilibrium level due to the constraint of the ZLB and it will be brought to 0.00%, which corresponds to an output lower than the natural one. The negative gap ($Y' < Y_e$) implies that inflation would have continued to decrease and there could have been the risk of a deflationary spiral, and at the starting point if it was equal to 0.00%, it may have become negative, and in this case, it is known as deflation. As a result, the nominal interest rate would still have been 0.00%, while the real one would have increased, generating an even lower aggregate demand and consequently, production as well. It is important to notice that a low level of output affects the level of prices and encourages deflation, and, at the same time, the latter leads to an increased real interest rate and a reduction in GDP (ibid).

As already outlined, in 2015 inflation stabilized around a 0.2% value, while the interest rate was very low, at 0.05%. It is the moment in which the ECB implemented one of its unconventional measures, the Extended Asset Purchase Programme, which consists in the purchase of different instruments, from the corporate and public sectors, asset-backed securities, and covered bonds in order to stimulate the proper functioning of the transmission mechanism and to assure price stability in the euro area.

Subsequently, in 2016 inflation did not increase and it still stabilized around a 0.2% value and in March the ECB decided to implement a further reduction of the interest rate, achieving 0.00% (Eurostat, 2023; Banca d'Italia, 2023). The negative output gap ($Y < Y_e$) could have implied that inflation continued to decrease but the main channel of monetary policy was ineffective, since the interest rate already reached 0.00%, and there was the risk of a deflationary spiral. Nevertheless, through the usage of unconventional policies, the ECB prevented that from happening and inflation did not go under 0.1% and, in 2017 it started to raise achieving 1.5% in December. However, it is important to say that the interest rate has remained at 0.00% for some years, during which economic conditions improved, especially for the usage of non-conventional measures.

3.5 Conclusions of the analysis

In conclusion, it can be said that in 2009 inflation decreased partially due to the rise in the interest rate made by the ECB, explicitly with that intention. Nevertheless, with the advent of the financial crisis, the Central Bank decided to implement a reduction in the cost of money for the reasons already outlined and this affected the efficacy of the previous anti-inflationist measure.

On the other hand, the effects of the crisis have been felt by individuals and enterprises who drastically decreased consumption and investment and since the aggregate demand fell, production reduced as well. Consequently, considering other factors being equal, the lower level of goods and services demanded influenced inflation, provoking an even marked reduction in its rate.

Taking into consideration a longer period of time, it can be said that the interest rate remained at the same level until 2011, while inflation, which was around 0.3% in December 2009, increased and reached the 2% target in March 2011 (Eurostat, 2023; Banca d'Italia, 2023). It can be supposed that these variations in the level of prices cannot be explained through the usage of the Three-equation New Keynesian Model, since interest rate has not changed, and they may be due to exogenous factors. Moreover, in 2011 inflation continued to rise while, at the same time, ECB increased the interest rate from 1.00% to 1.25% in April and 1.50% in July but in November it was reduced to 1.25% and to 1.00% in December. In this context, it can be assumed that the rise in the interest rate was not so consistent to produce effects on the level of prices and there could have been exogenous factors that influenced that situation, such as the beginning of the sovereign debt crisis and its intensification between 2011 and 2012.

In 2012, inflation remained at a level above the 2% target, and it started to decrease only in the fourth quarter and its reduction continued also in 2013 when in June it reached the 2% target (Eurostat, 2023). Meanwhile, the interest rate was set at 0.75% in July 2012 and 0.50% in May 2013 (Banca d'Italia, 2023). The interesting thing is that from August 2013 the level of prices started to reduce and in the same period the cost of money decreased as well, achieving a 0.25% rate in November (Eurostat, 2023; Banca d'Italia, 2023). Both factors continued their way towards zero also in 2014, more specifically, in June the interest rate was around 0.15%, while inflation was at 0.8% and it can be supposed that the measures implemented to face the crisis were not sufficient to encourage a recovery in the economy. Nevertheless, in September the ECB reduced even more the

cost of money, setting it to 0.05% (ibid). Since the interest rate was very close to zero and further reductions may have been at that time excluded due to the low inflation, in January 2015 ECB announced the launch of the Extended Asset Purchase Programme, also known as Quantitative easing, with the aim of encouraging the proper functioning of the transmission mechanism and to assure price stability in the euro area and between 2015 and 2016 assets were purchased for 60 billion euros (ECB, 2023a). In 2015, while the interest rate still was at 0.05%, inflation stabilize around a 0.2% value. However, in March 2016 the ECB reduced the cost of money to 0.00% and the level of prices fluctuated between 0.1% and 0.3% (Eurostat, 2023; Banca d'Italia, 2023). The negative output gap could have implied that inflation continued to decrease and since the main channel of monetary policy was out of time because the interest rate was already at 0.00%, there was the risk of a deflationary spiral. Nevertheless, through the usage of unconventional policies, the ECB prevented that from happening and inflation did not go under 0.1% and it increased in 2017, achieving a 1.5% value in December. However, it is important to say that the interest rate has remained at 0.00% for some years, during which economic conditions improved, especially for the usage of non-conventional measures.

To sum up, the analysis of the first stage of the financial crisis of 2008 into the Three-equation New Keynesian Model revealed that the approach of the authors is generally valid, and the behaviour of a Central Bank can be forecasted through it. Despite that, in the case in which other variables appear and they must be taken into consideration, as the decrease in the aggregate demand and of the overall output, it seems evident that a Central Bank can follow other ways, implementing different measures, even in contrast with the ones previously adopted, as done by the ECB from 2008. Moreover, it can be assumed that any variation of the interest rate did not have many effects on inflation and that exogenous factors sometimes prevented the cost of money to affect the level of prices and consequently, encourage an improvement in the economic conditions. Nevertheless, the usage of unconventional tools by the ECB seemed to be efficient, since in 2017 inflation started to increase and the risk of a deflationary spiral was no longer so close.

In conclusion, it can be said that the Three-equation New Keynesian Model is useful to analyze the first measures adopted by the ECB, the ones concerning the fight against the rise in inflation, and this is also shown in Graph n.10. Moreover, it can be seen that the behaviour of the Central Bank could be predicted in normal circumstances and that the relation between interest rate and inflation

is respected. However, it seems that the Model does not fit to evaluate the following monetary policies due to the presence of exogenous factors that are not taken into consideration by the authors and it is assumed that the usage of unconventional tools could not be predicted by the Model itself.

Conclusions

The thesis aimed at analyzing the measures put in place by the ECB during the financial crisis of 2008, especially those concerning the variations of the interest rate that have been a little controversial in the period taken into consideration. In order to allow such analysis, chapters 1 and 2 introduce the functioning of the Central Bank and the primary events of the crisis, paying particular attention to the euro area. Having all these elements in mind, it was later possible to start thinking about possible evaluations in the context of the Model, and at the beginning of Chapter 3, a brief overview of the New Keynesian thought is reported, allowing a clearer comprehension of the IS and Philips curves that will be utilized to make assumptions concerning ECB behaviour.

The situation analyzed in the Three-equation New Keynesian Model starts from an initial equilibrium, in November 2007, where inflation is equal to the 2% target and the interest rate is around 4%. Subsequently, inflation started to rise and in July 2008 it reached 3.1%, at this moment the ECB decided to act to tackle that increase preventing it to affect the economy and it raised the interest rate, understood as MROs, from 4.00% to 4.25%. According to the authors, before any variation in the cost of money, the Central Bank should identify a new Philips curve, taking into consideration its preferences and the new economic conditions. In this way, it decided that point B would be consistent with the forecasts made and it outlined the output level that in the following period it wants to achieve. The subsequent step is the determination of a new IS' curve, along which a point B', corresponding to B in the bottom part of the Graph, determines the interest rate that the Bank should adopt to achieve the desired output and inflation. According to authors Carlin and Soskice, the next step would be an adjustment process, during which a new Philips curve is forecasted by the Central Bank which passes through point C. In order to achieve a situation of equilibrium, where π corresponds to the 2% target and the output gap is equal to zero and represented by point Z' in the IS' curve, it is necessary to follow again the passages already mentioned, leading to a further rise in the interest rate.

The consideration that must be made is that to reach the 2% target the ECB should have raised again the interest rate, but with the bursting of the housing bubble in the USA and the transmission of the financial crisis to Europe, the priority was to avoid an economic recession and stabilize the economy

before its conditions worsened. Consequently, the ECB intervened to provide more liquidity to credit institutions, since interbank lending was quite compromised, and to sustain the economy through a reduction of MROs interest rate from 4.25% to 3.75% in October and to 3.25% in November 2008 and Table n.2 shows all the variations put in place to face the crisis, even years later. In the analysis, it is evident that the rise of interest rate shown in Graph n.10 necessitates more time to produce effects on inflation and on the economy, and it did not have a sufficient period to reach the equilibrium point Z as predicted by the Three-equation New Keynesian Model. Nevertheless, the ECB's objective of reducing the level of prices has been reached in the short run, although, inflation did not stabilize around the 2% target, and it continued to decrease even faster in the following months due to the effects of the crisis.

It can be said that the ECB partially achieved its initial objective of reducing inflation and that, in the context of the financial crisis it acted properly by reducing the interest rate, as provided for example by the Taylor rule. The shift in priorities led the Central Bank to abandon the first measure, implementing one which is the opposite and, consequently, the equilibrium has not been realized, even because inflation continued to fall achieving a value scarcely above 0. In the long term, if the ECB continued to raise the interest rate, point Z' would have been reached, as forecasted by the Three-equation New Keynesian Model, and the 2% target met but it would have implied that economic conditions had not changed and that other variables had not affected the economy in such a period.

It can be affirmed that the Three-equation New Keynesian Model is useful to analyze the first measures against the rise in inflation adopted by the ECB during the first phase of the crisis, and this is also shown in Graph n.10. Moreover, it appears that the behaviour of the Central Bank could be predicted by the Model in normal circumstances and that the relation between interest rate and inflation is respected. However, it seems that the Model does not explain the following monetary policies, and this can be due to the presence of exogenous factors that are not taken into consideration by the authors. Moreover, it appears also that the Model does not predict the usage of unconventional tools, and that the only instrument that can be used by the Central Bank is the interest rate. Nevertheless, there are situations in which variations of the cost of the money are not efficient, as seen in the second phase of the crisis, and it is necessary to implement non-traditional measures, especially in the context of the zero lower bound, where there could be the risk of a

deflationary spiral which leads to a further reduction in the level of prices and consequently, to a worsening of economic conditions.

In conclusion, it seems that the Three-equation New Keynesian Model taken into consideration in the analysis of the measures adopted by the ECB during the financial crisis of 2008 cannot explain every phase and that its predictions can be suitable only in the first years analyzed and not in the entire period considered.

Summary in Italian

La recente crisi finanziaria è stata uno degli avvenimenti più importanti degli ultimi decenni, basti pensare agli effetti che ha avuto sulla maggior parte delle economie di tutto il mondo. Un elemento ancor più evidente dopo il 2008 è l'interconnessione che caratterizza oggi il sistema finanziario, ed in generale l'economia, dovuta alla maggiore apertura dei mercati, alle innovazioni tecnologiche e così via. Indubbiamente, questo comporta diversi vantaggi, sia a livello individuale che per le aziende, dal momento che i prodotti possono essere esportati in qualsiasi parte del mondo dove ve ne sia la domanda, generando competizione tra le imprese stesse con effetti benefici in termini di innovazione. Tuttavia, questa interrelazione presenta anche degli svantaggi, ed uno di questi è stato evidenziato dalla crisi finanziaria, ovvero quanto velocemente le instabilità dei mercati si possono trasmettere da uno stato all'altro.

L'obiettivo a cui mira questa tesi è quello di analizzare e proporre delle valutazioni su alcune politiche adottate dalla Banca Centrale Europea (BCE) per far fronte alla crisi, in particolar modo attraverso il Modello Neo Keynesiano a tre equazioni (Three-equation New Keynesian Model) proposto da Wendy Carlin e David Soskice. Lo scopo del loro lavoro è di ridurre il divario che oggi è presente tra i modelli studiati nei volumi intermedi di macroeconomia e quelli che effettivamente possono essere utilizzati e sono oggetto di dibattito in ambito accademico e finanziario.

Tuttavia, prima di svolgere un'analisi più dettagliata delle misure di politica monetaria implementate a livello europeo, si ritiene necessaria un'introduzione sulla BCE, in particolar modo su quale sia il suo ruolo, il suo funzionamento ed anche le politiche che può o meno mettere in atto. Essendo una competenza delegata all'Unione Europea in maniera esclusiva, avere una maggiore comprensione di come le decisioni prese in tale sede possono influenzare tutti i paesi facenti parte dell'area dell'euro è fondamentale per poterle successivamente analizzare. Innanzitutto, il mandato della BCE è volto principalmente al mantenimento della stabilità dei prezzi, intesa come un livello di inflazione che si aggira attorno al 2%, ed inoltre ha il compito di supportare le politiche economiche nell'Unione in modo da raggiungere gli obiettivi comunitari.

I trattati prevedono anche che la Banca possa operare attraverso operazioni di mercato aperto, con cui vengono influenzati i livelli di domanda ed offerta aggregata di moneta. Tuttavia, esiste anche un divieto, spesso richiamato durante la crisi finanziaria del 2008 per contestare o limitare l'operato della BCE, secondo il quale quest'ultima non può fornire credito ad istituzioni o agenzie pubbliche, né acquistare direttamente strumenti di debito, ad esempio i titoli di stato, come previsto dall'articolo 123 del Trattato sul Funzionamento dell'Unione Europea.

Lo strumento principale utilizzato è il tasso di interesse e quest'ultimo viene modificato a seconda delle condizioni economiche. Ad esempio, in caso di inflazione elevata, l'obiettivo della Banca Centrale sarà quello di riportarla al livello target del 2% attraverso un aumento del tasso e per raggiungere tale incremento modificherà l'offerta di moneta. È importante notare che questa variazione produce degli effetti sull'economia, in particolar modo, la domanda di prestiti da parte di famiglie ed imprese diminuirà, dato l'aumento del tasso di interesse, incidendo su due componenti del prodotto interno lordo (PIL), quali consumi ed investimenti. Tuttavia, esistono anche delle misure non convenzionali messe in pratica quando quelle tradizionali non sono efficaci, ed un esempio è stato la crisi finanziaria del 2008.

Questo evento ha influenzato diversamente gli Stati Uniti rispetto all'Europa, in particolar modo l'area dell'euro. Innanzitutto, si può dire che le problematiche statunitensi si sono trasmesse attraverso due canali principali, ovvero il commercio internazionale ed il sistema finanziario globale. La quantità di beni e servizi scambiati tra i vari paesi è diminuita, dovuta alla minore domanda aggregata, mentre, a livello bancario, il coinvolgimento delle banche europee nel mercato dei mutui subprime e il ritiro di fondi statunitensi per fronteggiare la crisi di liquidità sono sicuramente degli elementi che hanno contribuito a creare le condizioni per una crisi finanziaria anche in Europa (Blanchard et al., 2016). Ciò che ha differenziato l'operato delle due banche centrali è, primo tra tutti, il loro mandato che attribuisce più margine di manovra alla Federal Reserve rispetto alla BCE, essendo che nel primo caso l'obiettivo non consiste solo nella stabilità dei prezzi ma anche nel sostenere la produzione e l'occupazione. Da un lato, la Banca Centrale Europea ha fornito liquidità all'economia principalmente attraverso il sistema bancario nella prima fase della crisi, mentre, la banca statunitense ha effettuato degli acquisti massicci di titoli con lo stesso obiettivo, incoraggiando un miglioramento delle condizioni economiche del Paese. Tuttavia, con l'aiuto di politiche fiscali adeguate entrambe hanno fronteggiato la diminuzione della domanda, e la principale differenza è

rappresentata dalla diversa situazione in cui i paesi si trovavano. In altre parole, gli Stati Uniti si stavano indirizzando già verso una ripresa, mentre, nell'area dell'euro iniziava la seconda fase, quella riguardante la crisi del debito sovrano.

Come già evidenziato le misure messe in atto a livello europeo furono tante, prime tra tutte la diminuzione del tasso di interesse sulle operazioni di rifinanziamento (MROs), che nei diversi anni arrivò anche ad un valore pari a zero. Ci furono, inoltre, pacchetti di acquisti di titoli sui mercati secondari da parte della BCE già nel 2009 e successivamente ne vennero comprati altri, ed è importante sottolineare che come previsto dai trattati le operazioni di compravendita non avvennero direttamente con l'emittente di suddetti strumenti. In aggiunta, furono utilizzate anche delle misure non convenzionali, considerate complementari a quelle tradizionali e che solitamente vengono impiegate quando quest'ultime non sono efficaci nel raggiungere gli obiettivi preposti.

La politica monetaria analizzata nel Modello Neo Keynesiano a tre equazioni riguarda principalmente le variazioni del tasso di interesse, e queste vengono valutate attraverso tre equivalenze, quali le curve IS (Investment and Saving) e Philips (dall'autore A.W. Philips) e la retta MR-AD che rappresenta l'aspetto monetario. Il punto di partenza dell'analisi è rappresentato dalla situazione di novembre 2007, dove l'inflazione eguagliava il suo target, il tasso di interesse si aggirava attorno al 4.00% e la produzione è al suo livello ottimale (Eurostat, 2023; Banca d'Italia, 2023). Tuttavia, da dicembre il livello dei prezzi cominciò ad aumentare, arrivando ad un valore di 3.1% a luglio 2008. Nello stesso periodo, la BCE decise di intervenire per fronteggiare tale incremento e la valutazione di come variare il tasso di interesse è inserita nel Modello Neo Keynesiano a tre fattori. In particolare, viene valutato il cambiamento delle condizioni economiche nel grafico iniziale, e per rendere più chiara la comprensione viene riportato il grafico n.10 illustrato nel capitolo 3. Si può notare che in corrispondenza della curva di Philips iniziale PC ($\pi=2$), l'aumento dell'inflazione, a parità delle altre condizioni, comporta un livello di produzione superiore rispetto a quello di equilibrio, generando un output gap. L'intervento della BCE consiste nel prevedere una nuova PC che corrisponda alle nuove informazioni, decidendo successivamente quale combinazione di inflazione e tasso di interesse è più congruo impostare, date le preferenze della Banca, ovvero la sua avversione all'aumento dei prezzi. In questo modo viene delineato il punto B, al quale corrisponde un livello temporaneo di produzione inferiore rispetto a quello ottimale e viene impostata l'equazione MR-AD, la quale rappresenta una linea che unisce i punti B e Z, quest'ultimo

inteso come una situazione di equilibrio in cui l'inflazione è pari al suo target. Successivamente, viene prevista dalla BCE una nuova curva IS per il periodo successivo, ovvero IS', che permette di delineare il tasso di interesse da adottare per raggiungere il livello di produzione desiderato (punto B) e viene stabilito un livello di 4.25% (Banca d'Italia, 2023).

Secondo gli autori Carlin e Soskice, il passo successivo consisterebbe in un processo di aggiustamento, nel quale una nuova curva di Philips viene prevista e che porta ad una situazione di miglioramento, rappresentata dal punto C. Di conseguenza, la produzione si aggira ad un ammontare più vicino a quello ottimale ma ancora non coincide, e per raggiungere tale obiettivo servirebbe un ulteriore incremento del tasso di interesse da parte della BCE (Carlin & Soskice, 2005).

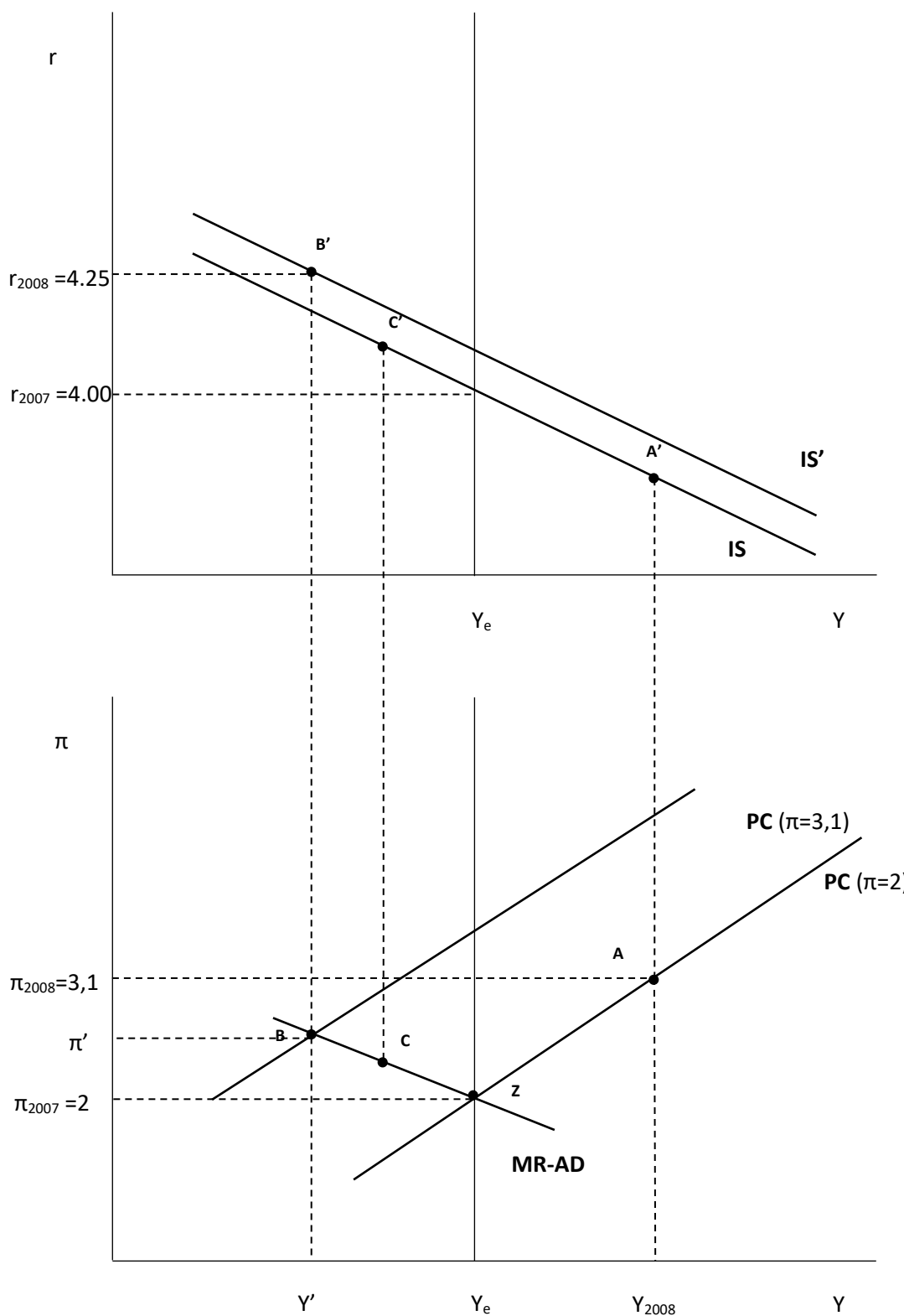
Tuttavia, dopo il fallimento della Lehman Brothers nel settembre 2008, lo scoppio della crisi finanziaria, la maggiore instabilità dei mercati ed il timore di una recessione, ha portato la Banca ad intervenire fornendo più liquidità agli istituti di credito che ne necessitavano, dal momento che il prestito interbancario era congelato, e attraverso la riduzione del tasso di interesse ha cercato di sostenere la domanda aggregata e di conseguenza il livello di produzione prima che venissero troppo compromessi. Le diminuzioni del costo della moneta furono massicce, basti pensare che da 4.25% venne diminuito a 3.75% ad ottobre, a 3.25% a novembre, arrivò ad un valore di 1.00% a maggio 2009.

Dal 2009 in poi, a variazioni negative del tasso di interesse non corrisponde un aumento dell'inflazione e se le due variabili sembrano slegate tra loro, si suppone che delle variabili esogene abbiano influenzano il livello dei prezzi e che, conseguentemente, questo non risponda alle politiche della BCE. In particolar modo, nel 2014 entrambi i tassi sono molto bassi ed essendo vicino lo zero, si creano le condizioni dello zero lower bound, in cui ulteriori variazioni a ribasso del tasso di interesse sono inefficaci. Pertanto, la Banca Centrale decise di adottare degli strumenti non convenzionali, come l'Extended Asset Purchase Programme, noto anche come Quantitative easing, il quale consiste nell'acquisto di vari titoli, con l'obiettivo di fornire liquidità al sistema e ripristinare il corretto funzionamento del meccanismo di trasmissione della politica monetaria.

In conclusione, si può sostenere che il Modello Neo Keynesiano a tre equazioni possa essere utilizzato per analizzare le misure antinflazionistiche adottate nella prima fase della crisi, come dimostrato anche nel grafico n.10. In generale, ciò che appare è che il comportamento della Banca

Centrale possa essere previsto attraverso questo Modello in normali circostanze e che la relazione tra tasso di interesse ed inflazione in quel caso è rispettata. Tuttavia, si suppone che le successive politiche non possano essere spiegate dal Modello, presumibilmente perché quest'ultimo non tiene in considerazione fattori esterni che possono incidere nelle condizioni economiche e, soprattutto, l'utilizzo di misure non convenzionali non sembra essere considerato, dal momento che, come politica monetaria, sembra che venga esaminata solo quella tradizionale.

Grafico n.10: Il modello a tre equazioni contestualizzato nella crisi finanziaria del 2008



Fonte: Elaborazione personale del Modello Neo Keynesiano a tre equazioni di Carlin, W., & Soskice, D., 2005

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