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# *Certain Macroeconomic Effects of the Federal Reserve's Quantitative Easing Program*

**SUMMARY:** Quantitative easing (QE) may be considered as one of the most controversial monetary policy tools in recent times. The launching of the programme has been triggered by the events of the financial and economic crisis unfolding in the United States in 2007, which caused a general loss of confidence of economic agents, as well as other serious problems such as the drying up of the interbank market<sup>1</sup> or the liquidity crisis<sup>2</sup>. There is no clear agreement on the success of the strategy of money printing. With numerous arguments for and against, it is still debated whether the unprecedented amount of money pumped into the economy – about USD 3,750 billion in the United States – has effectively contributed to restoring the health of the economy. It is indisputable, however, that the US can still be regarded as one of the most stable economies, and the normalisation of the economy is also confirmed by the interest rate hike in December 2015. It should be also noted that the large amount of money created by the central bank has affected many areas of the economy in various channels through the increase of money supply, and due to globalisation many countries of the world could enjoy the possibilities offered by cheap money via spillover effects. The turning point of events can be connected to the withdrawal of the QE (also known as tapering), which was also a clear signal of the coming end of the asset purchase programme. Generally, it caused uncertainty and volatility in the markets. The period before the interest rate hike provoked similar reactions, and moving away from the zero interest rate policy can be regarded as the most important milestone of monetary tightening. This article is based on the review of the literature on the topic and on a comparison of the different views in order to reveal the role of QE in the period after the crisis.\*

**KEYWORDS:** financial and economic crisis, quantitative easing, zero lower bound, money supply, macroeconomics

**JEL CODES:** E52, E31, E43

## WHAT IS QUANTITATIVE EASING?

Quantitative easing is one of the best known non-conventional monetary policy tools, whose primary aim is to promote the adequate operation of the economy and improve money market conditions in the economy in a period when conventional monetary policy tools have proved insufficient. In normal circumstances the central bank is in a position to influence money demand by changing the key policy

rate, and to regulate the economy by easing or tightening financial conditions. In certain periods, however, traditional monetary policy tools are unsuitable for stimulating the economy. They are unable to contribute to the development of an adequate environment that facilitates economic growth. This is what happened in the wake of the financial and economic crisis of 2008 when, after the rejection of the Lehman Brothers' bankruptcy protection request the loss of confidence of the market players resulted in the drying up, then collapse of the interbank market. As

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a result of the crisis, the demand for liquid instruments – assets generally characterised by their ability to be used for the fulfilment of payment obligations – increased. Banks, however, for fear of new losses or that their own demands may also increase in the future – accumulated these instruments instead of lending them to each other. The shrinking availability of loans and the resulting increase in counterparty risk aggravated the situation even further. The bigger the need for liquid instruments grew, the less the participants of the financial sector were willing to lend funds to each other.

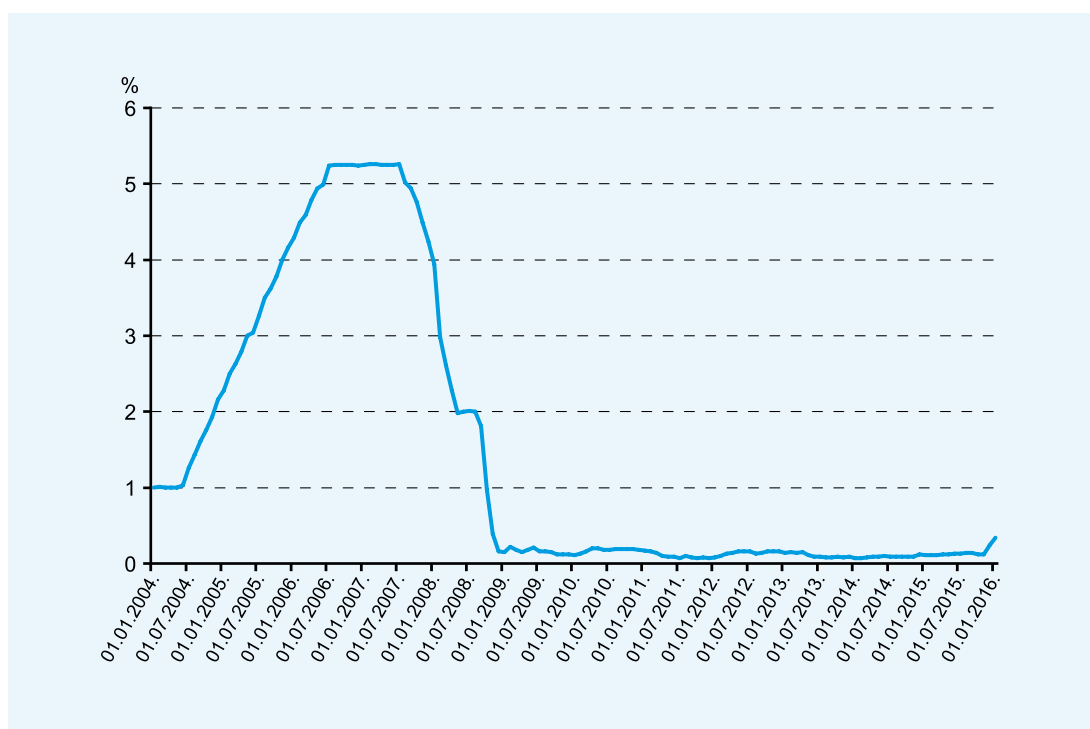
Similar processes took place among consumers as well, who – following the principle of prudence – restrained their spending. The companies faced a decreasing aggregate demand, which was eventually manifested in declining

incomes and the reduction of production volume. This was reflected over time partly in the drastic fall in employment, and partly in the slackening of investment and growth appetite.

To remedy problems, a loose, expansionary monetary policy that was in line with fiscal measures became predominant. There were attempts to increase liquidity in the frozen banking markets through a series of sharp interest rate cuts, helping to relieve the tension developing in the interbank markets, and satisfying the inflationary and employment objectives set in accordance with the target system of the central bank. As a result of the process, by end–2008 the policy interest rate of the Fed reached its lower limit (0–0.25 per cent) (*Figure 1*). Any further interest rate cuts would have caused the rate to move into the negative range. This, however, would have been contrary to econom-

Figure 1

**THE FED'S POLICY INTEREST RATE**



Source: Federal Reserve Bank of St. Louis

ic rationality to some extent.<sup>3</sup> Due to the zero lower bound, economic agents could get credit almost for free; however, it still proved insufficient for the economy to get on the right track, and the transmission mechanism of monetary policy<sup>4</sup> narrowed down significantly. Decision-makers faced challenges they had never seen before. Resorting to non-conventional tools seemed to be the solution. Eventually, in November 2008 the Fed announced its monumental asset purchase programme, in other words, quantitative easing. During the three phases of the programme, between 2008 and 2014 the U.S. Federal Reserve pumped about USD 3,750 billion into the banking system. This process is frequently referred to as money printing as well, since it is practically the same in its outcome and impacts. Quantitative easing means in essence that the central bank spends the newly created money on buying bonds as a means of increasing liquidity in the markets. It should be noted, however, that this money does not appear in any physical form; we are talking about e-money that is used by the central bank for the aforementioned goals. Nevertheless, it constitutes the intentional increase of the central bank's balance sheet and monetary base. Another characteristic of quantitative easing is that the demand for bonds and other instruments drives the price of the instruments up, and on the other hand reduces yields. Thus, with a view to achieving higher yields investors will be inclined to turn towards other, alternative, potentially higher-risk investments. The fall in long-term interest rates and hence, higher asset prices will be reflected in more stable bank balance sheets, which may result in more intense lending, and might trigger a more robust growth in the economy as regards business and consumer demand.

In the following, this article focuses on the transmission mechanisms of QE, followed by a presentation of the changes in macroeconomic variables in more detail. The impacts of quan-

titative easing are so wide-ranging that it is impossible to describe all areas in the scope of one article; therefore, this article is limited to the examination of a few selected areas – inflation, unemployment, exchange rates and GDP.

## THE IMPACT MECHANISM OF QE

The increased money supply exerts its influence through different impact mechanisms, which are primarily manifested in the decline in long-term yields. Driving yields and interest rates to a lower level will in the long run contribute to the recovery of the economy. This can be attributed to the same factors as the impacts of expansionary monetary policy used in normal circumstances. What is common in them is that both foster the advancement of the economy, among other things, by making loans cheaper.

In the case of US government securities with a maturity of 10 years (*see Figure 2*, where the blue background means the different phases of QE), evidently, launching the first phase of quantitative easing resulted in a sharp decline in yields. As regards the second and third phases, this trend prevails to a lesser degree, presumably because the new phases of asset purchases were no longer perceived by the markets as a surprise.

There are several studies in international literature that support the trend described above. It may be concluded that the nominal interest rates of government securities, subsidised corporate bonds, corporate bonds and mortgage-backed securities also fell significantly. The level of the fall, however, is different depending on the type of the bond, as well as in respect of the different phases (Krishnamurthy – Vissing-Jorgensen, 2011, 2012).

As regards the functioning of quantitative easing, basically, 5 main channels may be identified through which it exerts its influence

Figure 2

**YIELDS OF 10-YEAR U.S. GOVERNMENT SECURITIES**



Source: Federal Reserve Bank of St. Louis

on the economy.<sup>5</sup> Before any detailed analysis of the different transmission mechanisms, however, it might be worth taking a short theoretical detour. Long-term yields may be broken up into two major constituents: the sum of short-term risk-free interests expected until the date of maturity, and risk premium. The latter is an additional yield which is due to the investor in exchange for the higher risk associated with the longer investment period (Gagnon et al., 2011a). These may be of course influenced by inflation expectations: as inflation increases, potential yields may decrease. Proceeding along this line of thought, a distinction can be made between the portfolio balance channel and the signalling channel. The former primarily influences the risk premium and the latter the short-term interest rates. Mention should also be made of the in-

flation channel, which is much emphasised by Krishnamurthy – Vissing-Jorgensen (2011) in their analyses. The basic assumption here is that expansionary monetary policy measures raise inflation expectations, thereby increasing uncertainty regarding the yield of the instrument. Kaminska – Zinna (2014) add that this implies an upper limit for the effectiveness of QE, as due to the increase of inflation expectations long-term interest rates may rise sharply. Therefore QE may work successfully only if monetary policy has credibility, and inflation expectations are stable. Experience shows, however, that quantitative easing in the U.S. did not cause inflation to skyrocket, therefore this channel may be regarded as relatively insignificant. In the following we place emphasis on the other transmission channels and their operation.

### The portfolio balance channel

The portfolio balance channel is regarded as highly significant among others by Gagnon et al. (2011), *Joyce et al.* (2011a, 2011b), *D'Amico – King* (2013) and *Bernanke* (2010). The starting point for the operation of the channel is again identified as the decreasing yields that may be realised on securities. These compelled investors to turn towards other instruments with similar features that offered higher profit for them. Therefore shifts occurred in the portfolio of the private sector, and demand for other instruments also increased, as a result of which the impact passed through to their yields as well.

According to the approach of Gagnon et al. (2011a), through the asset purchases the central bank reduced the quantity of securities held by the private sector, while at the same time short-term risk-free bank reserves increased. In order for the investors to be inclined to implement these processes, the expected yield of the given security must fall. In other words, the purchases drive asset prices up, thereby reducing their yields. This phenomenon was first described by *Tobin* (1958, 1969), and is generally called the portfolio balance effect.

*Bernanke* (2010) also identifies the portfolio balance channel as the most important channel for asset purchases to influence long-term interest rates and financial terms. Its importance lies in the composition and quantity of the financial instruments held by the private sector. Therefore, the Fed's strategy was based on the premise that the different financial instruments in the investors' portfolios do not perfectly substitute each other. Accordingly, any changes in the supply of available instruments have an impact on the yields of securities as well as of other instruments that have identical features as securities; therefore, spillover effects are also significant.

### The signalling channel

According to certain approaches, quantitative easing does not primarily exert its influence through the reduction of risk premiums. *Bhattarai – Eggertsson – Gafarov* (2014) assert that long-term interest rates may also decrease if the central intervention system gives unambiguous signals to the private sector that the central bank will maintain the zero lower bound (despite its potential future negative consequences) in the long run. Therefore, this channel works as a type of signalling system.

Several empirical studies attribute the decline in long-term interest rates to the expectation of low future short-term interest rates.<sup>6</sup>

If monetary policy decision makers seem committed to keeping interest rates low in the long term, market participants will revise their future short-term interest rate expectations, and expect the zero lower bound to prevail over a longer time horizon. This signalling system may also reduce yields so that the average expected short-term interest rate is in fact an element of long-term interest rates (*Bauer – Rudebusch*, 2013).

### The liquidity channel

The liquidity channel is frequently mentioned as the “market operation” channel as well, which refers to the fact that higher liquidity in the markets in fact facilitates their satisfactory, smooth operation. The starting point for the operation of the liquidity channel is that the strategy of quantitative easing covers the purchase of long-term securities from increasing reserve balances. This may be regarded as a much more liquid instrument than long-term securities; therefore, investors will obtain more liquid instruments, hence the supply of liquid assets will grow. As a result of the process, liquidity premium –

which in certain phases of the crisis was at a rather high level – will decrease on most liquid bonds, and the yield that may be attained with them increases<sup>7</sup> (Krishnamurthy – Vissing-Jorgensen, 2011).

Gagnon et al. (2011a) associate the importance of the liquidity channel only and exclusively with the early phase of the programme, which was characterised by strong money market disturbances. The lack of liquidity of certain instruments affected their prices; however, QE provided a continuous demand for long-term instruments, enabling investors to take on longer positions, knowing that if necessary, the Fed will purchase these instruments. The Fed purchases helped restore liquidity in the markets, reducing the liquidity risk of the instruments.

According to *Joyce et al.* (2011), however, the central bank's presence in the market improves the operation of the market through the substantial asset purchases, thereby reducing illiquidity premiums and increasing the price of the instruments.<sup>8</sup> The importance of the liquidity premium channel actually lies in the fact that the purchases made by the central bank make it cheaper for the investors to sell their assets. They also emphasise that under normal circumstances the liquidity and depth of the markets are satisfactory, but unusual conditions may raise the illiquidity premium significantly. However, the impact of the liquidity channel is only temporary, and it lasts only as long as the central bank continues with the purchases.

### The announcement effect

The basis for the announcement effect, as it obviously follows from its name, is constituted by the major monetary policy announcements connected to the QE measures. Its essence lies in the market reactions and changes

following the announcements, as market participants are getting prepared for the new economic environment and adjust their actions accordingly.

The announcement effect is based on the communications of the central bank. When issuing an announcement, the central bank gives a signal to the market that it will intervene in the management of market dysfunctions in order to restore the confidence of the market participants (Eggertson – Woodford, 2003). The channel is verified by the findings of *Hancock – Passmore* (2011). They argue that the Fed's purchases of mortgage-backed securities reduced yields by 85 basis points through the announcement effect. (They attributed an additional 50-basis-point drop to the change in risk premiums). The majority of the decline, however, occurred between the announcement and the actual implementation of the programme. After that, both yields and risk premiums remained relatively stable until the conclusion of mortgage-backed security purchases.

*Krekó et al.* (2012) propose that the Fed's asset purchase programmes increased market liquidity, reduced spreads and increased securities issues. In numerous cases, the announcement relieved market tensions and panic in itself, and subsequently, the asset purchases pushed yields down even further. As far as effectiveness is concerned, communication had a key importance, as the announcement effect influenced market expectations almost immediately.

### The confidence channel

Besides the channels listed so far, the confidence channel should also be mentioned. Its basic assumption is that QE measures may improve the expectations concerning future macroeconomic results, whereby the confidence of the market participants

strengthens, and the demand for riskier instruments increases. This concept was formulated by *Fratzscher et al.* (2012). The same position is represented by *Joyce – Tong – Woods* (2011), who argue that as long as the measures result in more favourable economic prospects, they directly increase the confidence of consumers, hence, their willingness to spend. Increasing confidence may also be reflected in the higher prices of instruments, primarily via the reduction of risk premiums. *Neely* (2011) warns, however, that in the opposite case, i.e. if QE is understood by the market participants as a signal for a worse than expected economic scenario, it may provoke “flight to quality”, and increase the probability of risk aversion.

## THE EFFECTS OF QE ON INFLATION

One of the basic pillars of the Fed’s double mandate – besides full employment – is its mission to ensure price stability. Inflation is defined on the basis of the personal consumption expenditures price index (PCEPI), whose target value was determined in 2012 at 2 per cent. This explicit specification was implemented primarily as a result of the turbulence caused by the crisis, when aggressive monetary easing raised the potential threat of long-term inflation problems. The absence of an explicit target could have contributed to the rising of inflation expectations or to the exacerbation of already high uncertainty.

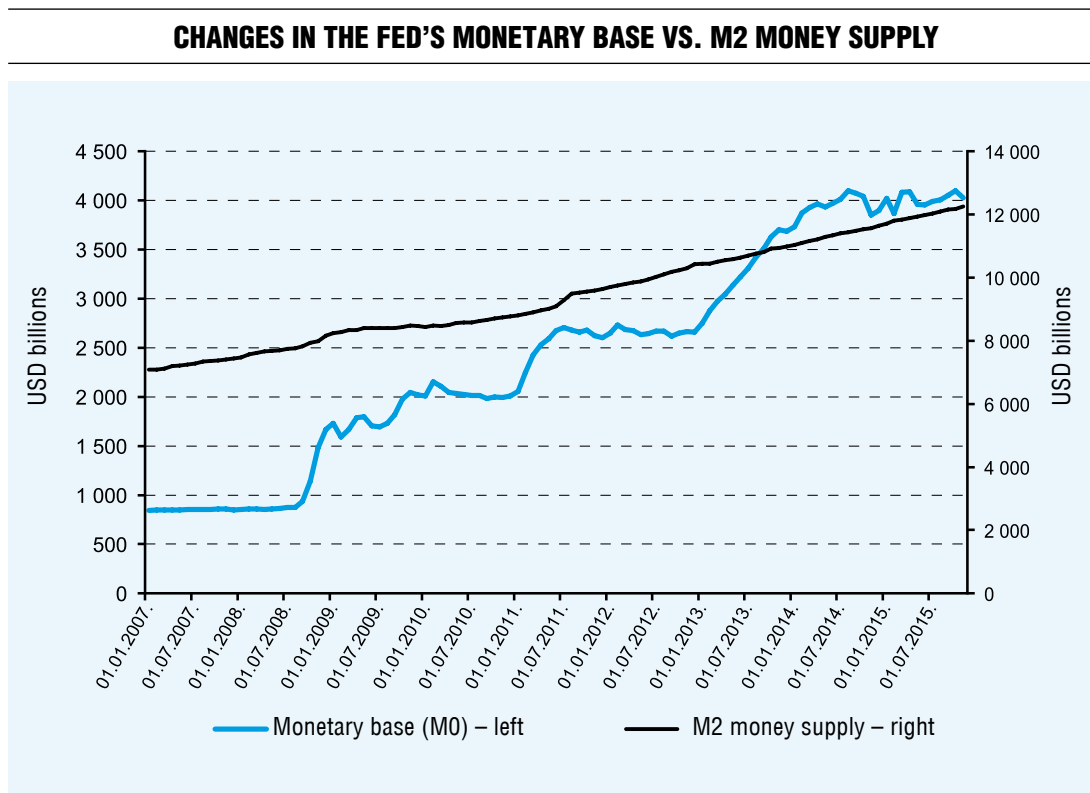
The strategy of QE significantly influences the size of money supply; therefore, after the launch of the programme its effect on the price level was a highly debated issue. Economists were fundamentally split regarding their opinions, with one group emphasising the inflationary threats arising from the increased money supply, whereas others rejected this position, and said that until these

measures sufficiently contribute to increasing demand, inflationary fears may be regarded as ungrounded.

It can be said in general that the money supply available in an economy exerts a strong influence on inflation developments. This is also supported by the quantity theory of money, which says that an increase in money supply leads to the devaluation of money; in other words, it facilitates the rise of inflation.<sup>10</sup> This means that if the Fed increases its money supply, according to the model described above this may be reflected in a rising price level. Therefore, it is no accident that several economists gave voice to their concerns about the possibility of uncontrollable inflation. Such fears were supported among others by *Meltzer* (2009), who argued that the Fed’s policy interest rate being kept around 0 per cent, coupled with the enormous increase in bank reserves, will almost certainly lead to severe inflation problems. Besides the issues listed above, he mentioned the cooperation of the Federal Reserve in the financing of the oversized budget deficit as another mistake. In his opinion, sooner or later the result of the process will be inflation in any case (*Meltzer*, 2014). Threats were increased by the fact that the required reserve ratio was fairly low, around 5 per cent. Consequently, if banks had tried to lend extensively, this could have contributed significantly to an increase in money supply, and through that to the rocketing of inflation (*Thornton*, 2010). The Fed’s reserves, rising from a level of about USD 800 billion at the outset of the crisis, by mid-2014 reached the level of USD 4,000 billion. The growth of money supply during the different phases of QE can be seen clearly in *Figure 3*, where the dark background signifies the three phases of the programme.

Drastic growth, however, did not lead immediately to a rapid increase in commercial bank deposits. According to *Feldstein* (2012),

Figure 3



Source: Federal Reserve Bank of St. Louis

this may be explained by the fact that in October 2008 the Fed started to pay interest on the reserves of commercial banks deposited with the Fed. Consequently commercial banks chose to place their surplus funds as risk-free deposits at the Fed rather than lending them in the form of loans to the private sector<sup>11</sup>. As a result, the growth rate of the money supply became far more restrained than the increase in reserves. As shown on *Figure 3*, the growth rate of the Fed's monetary base exceeds that of the M2 money supply. Therefore, a significant portion of the money supply flowing into the economy only increased banks' balance sheets, and this is why inflation could remain at low levels. This statement, however, holds true only until banks decide to give up the interest paid by the central bank and grant loans to households instead. Such a scenario could

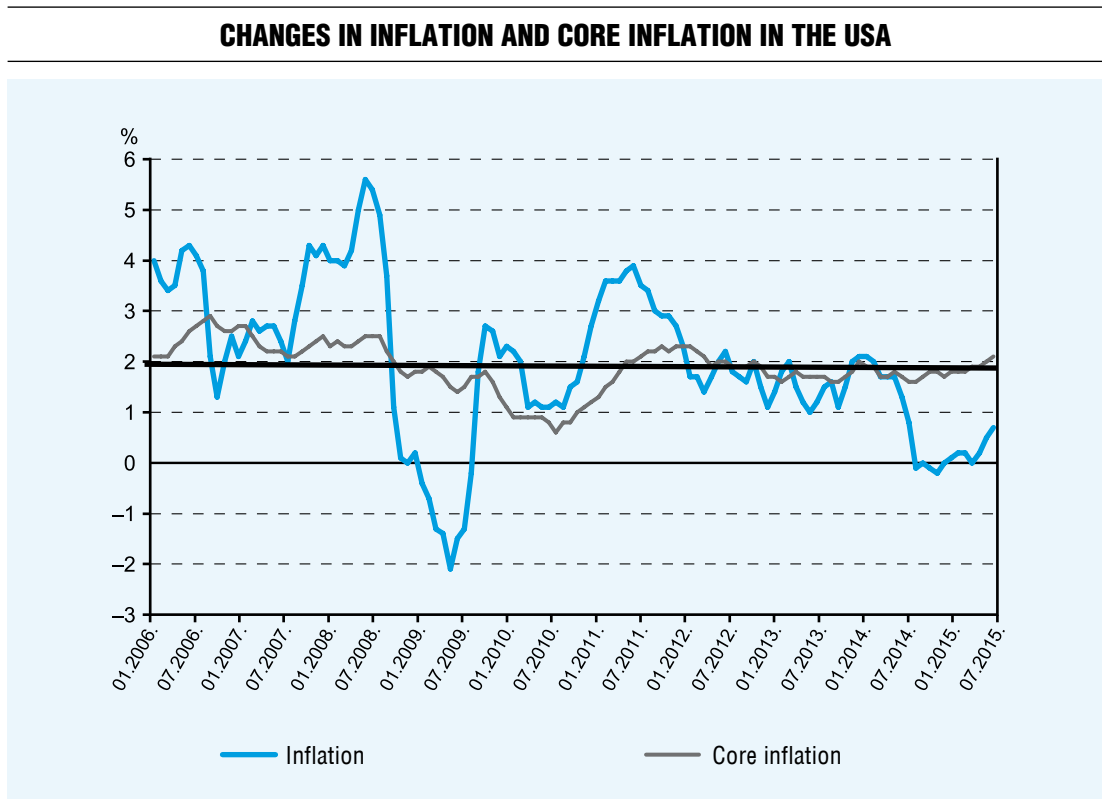
have exerted a significant inflationary pressure on the economy (Feldstein, 2012).

Contrary to fears, the actual danger of inflation or hyperinflation was insignificant. It can be seen on *Figure 4* that, although core inflation appears relatively stable, inflation fluctuated significantly after the crisis. The inflation rate grew at the fastest pace in the first phase of the Fed's asset purchase programme. After this, there were some who envisaged the possibility for a longer deflation.

Returning to the quantity theory of money, some analysts say that the classical theory does not prevail in each case today. Based on a regression analysis founded on the above described model, *Cline* (2015) concludes that as regards the period of the 1970s and 1980s, in fact a loose positive relationship can be seen between inflation and money supply in excess



Figure 4



Source: Based on [www.usinflationcalculator.com](http://www.usinflationcalculator.com) and Bureau of Labor Statistics

of real GDP growth. On the contrary, between 1985 and 2013 there is a negative relationship already, which calls into question the explanation of the quantity theory of money relevant to inflation. *Sargent – Surico* (2011) also underline this negative relationship. They found that a monetary policy shift towards a significantly more aggressive anti-inflationary stance can generate results that might cause instability in the quantity equation of inflation to money supply. Cline (2015) adds, however, that in the case of other countries this twist cannot be seen. It is not primarily the velocity of money supply that he emphasises as an explanation, but the operation of the money multiplier. The increase in excess bank reserves adds up to nearly three-fourths of the increase in the Fed's total assets, which means that the money multiplier no longer works as it used to.

According to another approach, the problems may be traced back to the lack of an upturn in spending. Exponents of this position say that an increase in aggregate demand is indispensable for an increase in price levels. High aggregate demand (or low aggregate supply) generally makes prices rise. Essentially, then, spending is needed for inflation to arise. According to *Roche* (2013), QE does not have an adequate transmission mechanism to increase aggregate demand. Incomes generally did not increase as a result of QE, and furthermore no increase could be seen in the volume of demand either. A similar position is taken by *Cochrane* (2010), who says that since interest rates are basically zero, money and short-term bonds have become almost perfect substitutes, and the effects of QE on inflation are negligible. Buying long-term bonds and providing

banks with money at zero interest do not contribute to the rise of inflation any more than buying long-term debt and giving short-term bonds to the banks. According to Cochrane, the inflation generating effect of an increasing money supply holds true only for periods when interest rates are not around zero. In such cases, people try to spend more money, and money is not left unused. *Krugman (2012)* also emphasises the weaknesses of the demand side, saying that the low level of inflation can be explained by the liquidity trap<sup>12</sup>. If a country is caught in a liquidity trap, it does not essentially matter how much money is printed by the Fed. Money printing may cause inflation only if it results in an economic boom, and the recovering lending activity leads to an increase in consumption and demand. The same is illustrated by *Figure 5*, where it can be

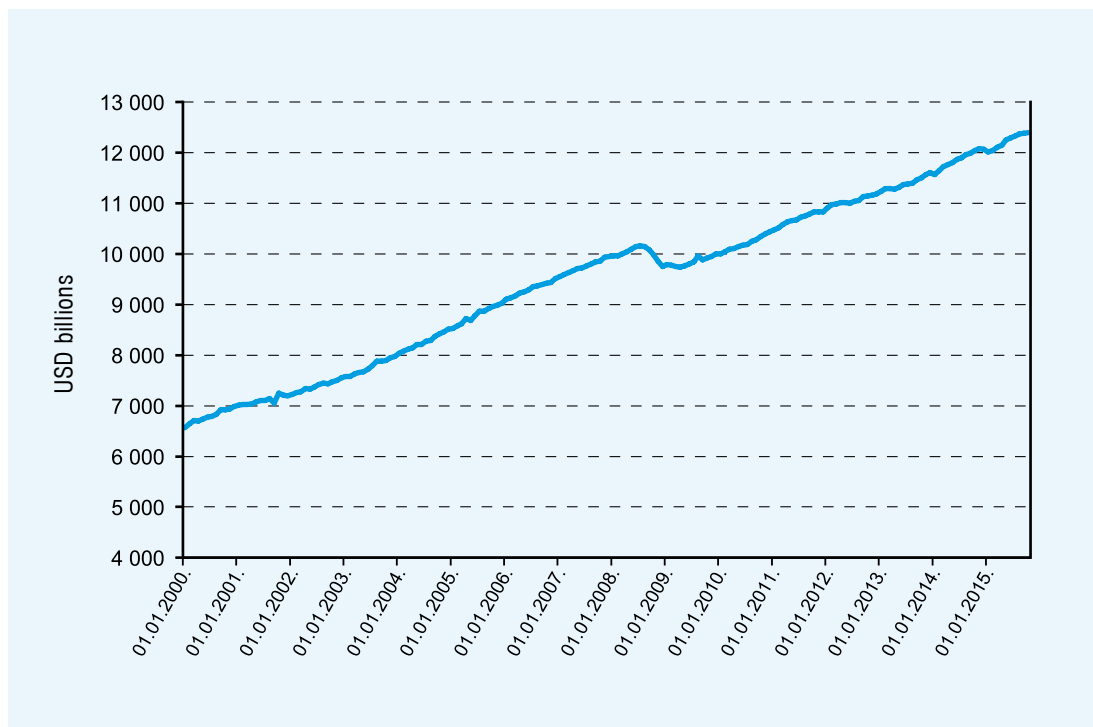
seen that after the recession following the crisis personal consumption expenditures started on a growth path of a much lower level.

Mention should also be made of the theory according to which inflation is determined by the output gap, i.e. the difference between actual and potential output. In the case of a negative output gap, the output of the economy falls short of its potential level, and has strong deflationary effects.<sup>13</sup> *Considering all these, it is not really surprising that no inflation occurred in the U.S., as the gap was negative in that period.*

By now it has become evident that the policy of quantitative easing in the U.S. was a successful means of averting a deep and long-lasting deflation, and at the same time it did not lead to any serious inflation problems. Despite the fact that money supply grew significantly

Figure 5

**PERSONAL CONSUMPTION EXPENDITURES IN THE USA**



Source: Federal Reserve Bank of St. Louis

in the economy, inflation did not become uncontrollable. The measure is nevertheless severely criticised because the price level in fact lagged behind the target inflation throughout the period, and even despite the monetary easing – the zero interest rate, and the enormous quantity of money pumped in the economy – they failed to achieve the set objective. All this does not necessarily mean that the asset purchase programme was ineffective in this respect. It should be remembered that falling oil prices also played a significant role in the low level of inflation. When analysing effects it should also be kept in mind what would have happened to the American economy had the Fed not implemented its QE programme. Presumably, the country would have had to overcome much more severe and deeper problems.

### THE RELATIONSHIP BETWEEN QE AND THE UNEMPLOYMENT RATE

The other basic pillar of the Fed's double mandate is its mission to facilitate full employment. In line with this, one of the main obligations of the central bank after the crisis was to get the ever-increasing unemployment under control. After the eruption of the crisis, the unemployment rate started to soar in the U.S. as well, reaching its peak in October 2009 at a value of 10 per cent. This was followed by a slow but continuous decline, which trend persists to this day. In November 2015, the unemployment rate was 5.0 per cent.

According to some analysts, due to the laws of the economy QE significantly contributes to the mitigation of unemployment, while others reject this opinion and question the impacts of the programme on the labour market. It may be stated at any rate that unemployment rate is a delayed economic indicator. As regards this indicator, any changes will be perceived only later (relative to other econom-

ic indicators). Accordingly, it is one of the last indicators to recover after a significant recession. Therefore, it is more difficult to monitor the impacts of QE on the labour market than, for example, changes in interest rates.

In the short term, monetary policy influences inflation and the demand for products and services by determining financial terms. These derivative effects influence the demand for labour force. The central bank primarily intervenes by modifying the policy interest rate. In the period following the crisis, policymakers tried to achieve the same objective via asset purchases. When interest rates fall, borrowing becomes cheaper and households will be inclined to buy more products and services; this benefits companies, allowing them to expand their businesses. The demand of companies for labour force will increase, and employment will grow. Production will boom, which indirectly also contributes to a gradual decline in the unemployment rate.<sup>14</sup> Therefore, it can be said in general that an expansionary monetary policy reduces unemployment as the cost of funding will be cheaper for companies, and their production will grow. As employment grows, aggregate demand increases with a parallel increase in companies' revenues, which in turn will create even more jobs.

Critics of this theory say that changes in the labour market are always short-lived, lasting until the development of the next economic bubble only. Any recovery that is based on QE in fact favours those who are to be blamed for the eruption of the economic crisis in the first place, and who are the least in need. Sharing the position of the sceptics, *Tenwick* (2013) emphasises the quality of the jobs created during the QE. Although the QE contributed to the creation of a significant number of jobs, the quality of these jobs often falls short of pre-crisis standards. Many people perform lower-level jobs than before the recession, and have no opportunity to fill in positions pro-

viding higher income or find jobs adequate to their qualifications. The majority of newly created jobs frequently cover part-time and minimum wage jobs.

It can be said on the basis of the American labour market report that in January 2016 an additional 151,000 new jobs were created, whereby the unemployment rate fell to 4.9 per cent, its lowest value in the past 7 years. The number of unemployed Americans is still approximately 7.8 million. Attention should be paid to the fact, however, that although the number of jobs increased, changes are not nearly as favourable in respect of wages.

It can be said overall, that a clearly improving trend can be seen in terms of employment ratios. According to several analysts, the QE programme launched in 2008 contributed favourably to labour market developments,

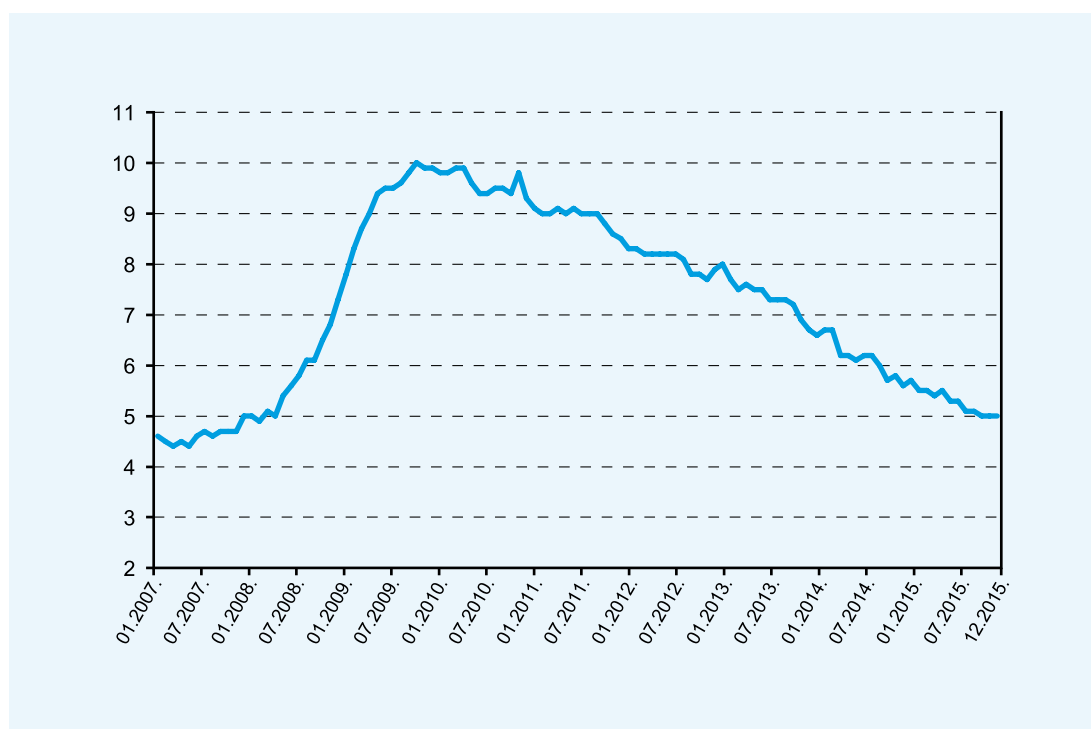
while others question the significance of asset purchases. Presumably, without the programme, data would be far more unfavourable today.

It also proves the effectiveness of the programme that in the countries of the euro area – where after the crisis the European Central Bank (ECB) abstained from introducing QE – in December 2015 the unemployment rate was still at a level of 10.4 per cent (see Figure 6). In March 2015 the effects of the asset purchases launched by the ECB may be still regarded as insignificant, and since then they have succeeded in reducing the value of the ratio by a mere 0.8 percentage points.

The successfulness of the measures is supported by the estimates of *Chung et al.* (2011) as well. The authors claim that by 2012 unemployment rate was down 0.75 percentage

Figure 6

**CHANGES IN UNEMPLOYMENT IN THE U.S. (JANUARY 2007 TO DECEMBER 2015)**



Source: Based on the Eurostat database

points compared to the level calculated without the implementation of the programme. The second phase of the asset purchases contributed by to the decline in the value of the ratio 0.25 percentage points (Chung et al., 2012). The researches of Wu – Xia (2014) also testify to the effectiveness of the programme. The relevant data are summarised in *Table 1*.

Despite the favourable trends, the U.S. has still failed to achieve the pre-crisis level to date (in 2007 the monthly average of unemployment rate was 4.6 per cent).

### THE EFFECTS OF QE ON EXCHANGE RATES

The effect of QE on exchange rates lies in the key role played by the U.S. dollar in the world economy. The U.S. dollar may be regarded as one of the most widely used reserve currencies. As a result of increasingly expanding economic relations and the liberalisation of cash flows, changes in the exchange rate of the dollar may have an impact on numerous economies worldwide and may function as an exchange rate modifying factor.

The role of the U.S. dollar as a reserve currency requires the dollar to be strong and stable. In addition, a strong currency does not increase inflation significantly. There are some, however, who argue for the necessity of a weak dollar, as this would facilitate exports, thereby improving competitiveness and benefiting the trade balance. It also contributes

to economic growth and to the improvement of employment. In accordance with the laws of operation of quantitative easing, the Fed’s action supported the latter primarily, as the U.S. dollar – disregarding the opposite effects of other factors – also depreciated as a result of the programme.

Through the increasing dollar supply, quantitative easing reduced its value against the currencies of other countries having a floating exchange rate regime. The purpose of American investors selling their bonds to the Fed was to invest the dollar amounts received as consideration in a diversified way. One form of this is to purchase foreign bonds and equities which, stemming from the laws of demand and supply, resulted in the appreciation of foreign currencies, and consequently the devaluation of dollar (Feldstein, 2010). As regards the Fed’s policy, it should be mentioned that apart from the aforementioned factors, the process also increased the future inflation concerns of investors. This served as one more reason for American investors to convert a part of their portfolios into currencies that are unlikely to experience an increasing inflation. QE enabled banks to lend more money. A part of this flowed out of the United States and increased foreign investments as investors found better opportunities outside the country. As investors sold their monies in exchange for foreign currencies to support their investments, the value of foreign currencies increased, which also resulted in the weakening of dollar (Chen, 2013).

*Table 1*

#### MODELS EXAMINING THE IMPACTS OF QE CONCERNING UNEMPLOYMENT

Authors	Method	Result
Chung et al. (2011)	DSGE model	Until 2012, decrease by 0.75 percentage points
Chung et al. (2012)	DSGE model	QE2: decrease by 0.25 percentage points
Wu – Xia (2014)	Nonlinear yield curve model	Between 2009 and 2013, decrease by 0.13 per cent

In their studies concerning exchange rates, *Glick – Leduc* (2013) focused on the reactions of the dollar on the non-conventional monetary policy changes. The analyses were based on the announcements of the FOMC<sup>15</sup> and certain speeches by Bernanke<sup>16</sup>, in which potential political changes and modifications are mentioned regarding the Fed's intentions, and in connection with the QE. They focused on changes in the exchanges rates of four major currencies – Japanese yen, Canadian dollar, euro and British pound – relative to the U.S. dollar. Their results confirm that after the announcement of the first phase of QE the U.S. dollar immediately depreciated sharply against all four currencies. After the announcement of QE2 and QE3, the depreciation of the dollar was less pronounced. Based on commercial weighting, the U.S. dollar depreciated by 62, 24 and 14 basis points on average after the announcement of QE1, QE2 and QE3, respectively. According to *Glick – Leduc* (2013), the relatively small impact concerning the third phase of QE may be explained by the fact that the markets had anticipated these announcements well in advance, and incorporated them into their prices, therefore the announcements did not carry any extra information for them. Easing by one percentage point resulted in a 3 percentage-point depreciation within 30 minutes in the commercially weighted value of the U.S. dollar. Obviously, the level of the effects varied in time and across the specific currencies. The smallest impact was observed in respect of the Canadian dollar, while the largest in the case of euro.

*Riesco* (2011) already emphasised that although there was in fact some negative relationship between the Fed's balance sheet and the U.S. dollar index<sup>17</sup>, the exchange rate of the dollar was influenced, overall, by several factors. Such factors for example are GDP growth in the United States, the phenomenon of risk aversion, and the monetary policies of

major central banks. It should be noted that the Japanese yen and the British pound also weakened in the wake of their own versions of QE, which took the edge off the drop in the value of the American dollar. As the euro area abstained from launching a quantitative easing programme, in the case of the euro some strengthening could be seen against the dollar. Also, the U.S. dollar is frequently regarded as the currency of risk averse investors. In the event of global economic problems, the dollar is looked upon as a kind of safe haven, which causes a rise in the value of the dollar and the weakening of the currencies of other countries (Chen, 2013).

As regards China, it can be said that the market forces driving the appreciation of numerous currencies against the dollar fail to work as far as the *renminbi* is concerned. The reason for this is that due to its limited convertibility, investors are unable to buy renminbi or renminbi-based bonds freely as is the case with other currencies. The exchange rate of the renminbi is determined by the People's Bank of China directly. In June 2010, in response to the Fed's QE policy, the government allowed the renminbi to appreciate at a moderate pace against dollar. Meanwhile, however, the dollar's weakening against the other currencies implied that, in general, the renminbi's exchange rate also fell against the currencies against which the dollar depreciated (Feldstein, 2010).

In conclusion, therefore, the effects of the bond purchase programme on the exchange rate manifested themselves through several impact mechanisms. The first factor that led to the depreciation of the dollar against other currencies is money supply, that is the growth of the quantity of money present in the economy. The second factor – the phenomenon of diversification – is the consequence of the first one: the value of the U.S. dollar investors wished to sell depreciated as a result

of demand and supply effects, while greater demand for the other currencies drove their prices up; accordingly, more dollars had to be paid to purchase one unit of foreign currency. As the third cause, the increase in banks' lending activity may be mentioned, since a part of these funds flowed abroad in the hope of more favourable and more attractive investments. A process similar to the one described above took place. Other macroeconomic factors and the monetary policy decisions of other national economies also acted as significant modifying factors. The type of the exchange rate regime applied by the relevant country to which the value of the currency is compared is not negligible either. Different effects could be observed in proportions compared to the currencies of countries applying floating or fixed exchange rate regimes. Monetary policy an-

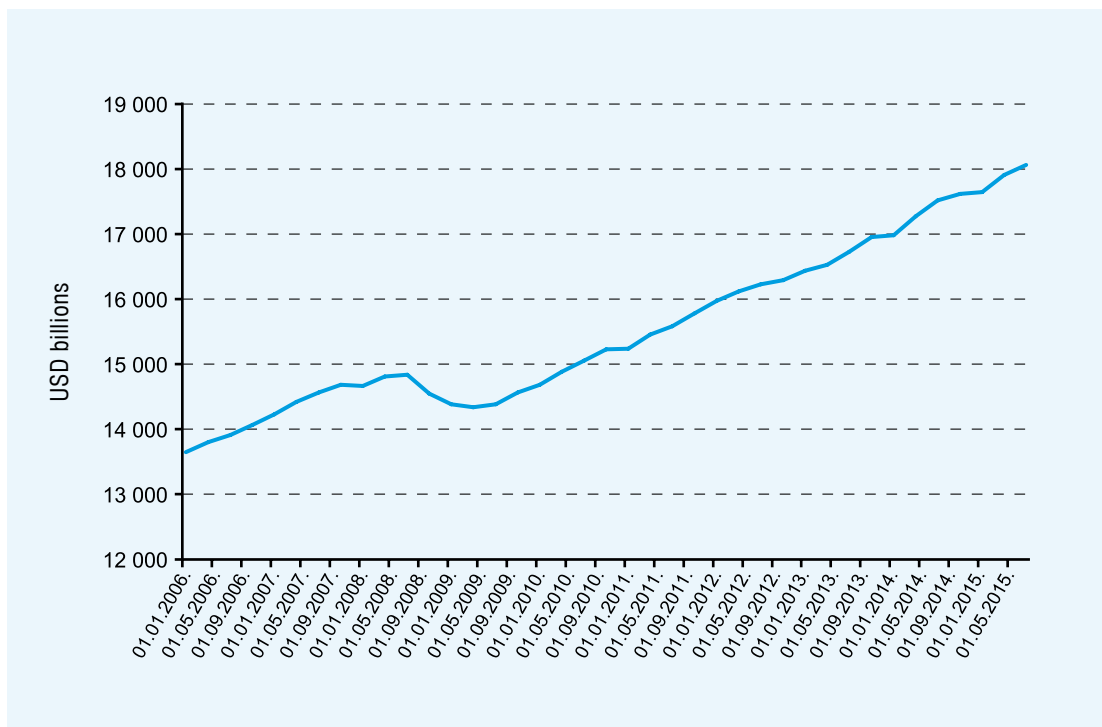
nouncements to which market participants respond with prompt decisions, influencing the value of the currency, may also be important.

### THE EFFECT OF QE ON GDP GROWTH

Recovery after the crisis, in general, can be considered fairly slow (*see Figure 7*), in which the slow increase in spending and the strong presence of risk aversion also played a role. GDP growth is influenced by a combination of numerous factors, and their effects are very difficult to distinguish from each other. It can be said about the Fed's 2008 asset purchase programme that, although it did not mean a full remedy of the wounds caused by the economic crisis, and most of its effects took hold subsequently, it still contributed significantly

Figure 7

#### GDP GROWTH RATE IN THE USA



Source: Federal Reserve Bank of St. Louis

to channelling economic processes in the right direction. The studies dedicated to the topic yielded fairly different results; however, each paper found that quantitative easing measures played an important role in economic recovery. They also agree that without the programme the downturn in GDP would have been far more significant.

This is supported, for example by *Chen – Cúrdia – Ferrero* (2012), who concluded – based on the results of a model developed by the authors – that the ex-post effect of the programme accelerated annual GDP growth by 0.13 per cent. According to the estimates, the impact on GDP continues in the long term; 6 years after the launch of the programme the level of GDP was still 0.07 per cent higher than it would have been without the asset purchases. Nonetheless, the impacts on GDP growth probably fall short of a 0.33 percentage point value.

By way of comparison, according to *Chung et al.* (2011) the first phase of the programme in itself increased real GDP by 2 per cent by 2012, while the entire programme contributed to GDP growth by approximately 3 per cent by mid-2012. Lower long-term interest rates, together with high equity prices and the lower currency value of the U.S. dollar, will give a significant boost to real economic activities over time. At the same time, the boom in

real output contributed to the improvement of labour market conditions as well, which are significantly better than what they would be without the asset purchases.

Based on their analyses, *Chung et al.* (2012) concluded that the second phase of QE contributed to the level of GDP by approximately 0.6 per cent.

According to the estimates of *Baumeister – Benati* (2011), GDP growth increased by 3 per cent owing to the programme.

The factors described above are summarised in *Table 2*. Based on data for 2015 Q3, GDP rose by 1.5 per cent, which means a minor relapse after 3.9 per cent in Q2. Nevertheless, the Fed emphasises the improvement of the American economy, which reflect, in part, data confirming an increase in the labour market and consumption. These developments, as well as events that are in line with world economy trends, formed the foundation for the interest rate hike executed in December 2015.

## QUANTITATIVE EASING IN THE WORLD ECONOMY

The quantitative easing programme started in 2008 in the United States is not unique in the world economy. This measure was applied for the first time in the United States in the 1930s,

*Table 2*

### MODELS EXAMINING THE IMPACTS OF QE CONCERNING GDP

Authors	Method	Result
Chen – Cúrdia – Ferrero (2012)	DSGE model	0.13 per cent annual increase
Chung et al. (2011)	FRB/US model	QE1: real GDP growth of 2 per cent; by mid-2012 total: 3%
Chung et al. (2012)	FRB/US model	QE2: GDP growth of 0.6 per cent
Baumeister – Benati (2011)	VAR model with coefficients changing over time	GDP growth of 3 per cent
Weale – Wieladek (2014)	Bayesian VAR model	QE1: GDP growth of 0.72 per cent



when the Fed spent approximately USD 1 billion on government securities (*Anderson, 2010*). Focusing on the economic history of recent decades, the Japanese economy should be mentioned, where first between 2001 and 2006, large-scale asset purchase programmes were carried out, with interest rates sinking as low as zero. After this in October 2010 and in April 2013 again quantitative easing continued in Japan. After the crisis, the Bank of England also resorted to QE as a survival strategy. Sweden also committed itself to the measure in February 2015 in order to counteract the persistently weak inflation trends. Most recently it was the European Central Bank to launch an asset purchase programme in March 2015, which is still in progress. In connection with the measures it should be emphasised that as a result of the globalisation of the world economy, the impacts of QE are limited to single countries. The effects of the rather loose monetary policies implemented after the crisis by the central banks of the biggest countries of the world spilled over to numerous developed and emerging countries as well, including Hungary. In these countries, as one of the spillover effects of quantitative easing the supply of foreign currencies increased and consequently, foreign loans became available at relatively cheap prices. These surplus funds could be spent among others on financing the increased public debts of these countries. *Lavigne – Sarker – Vasishtha (2014)* also emphasise that QE increased the volume of capital flows to these countries, as well as the prices of assets, and also strengthened exchange rates. The impacts may be understood as being positive altogether due to the favourable commercial and confidence effects, whose foundations were sufficiently laid by the countries resorting to QE. It should be remembered, however, that the changes seen in exchange rates gave rise to serious concerns and tensions in the countries that did not apply QE. These countries, most of which are

settled on an export-based economy, seeing the appreciation of their currencies faced severe problems, which even manifested themselves in the deterioration of their competitiveness. After the second phase of QE in the United States, *Guido Mantega*, the Brazilian Minister of Finance even hinted at the brewing of a currency war. Countries with deteriorating export output tried to adjust to the changed economic environment with diverse measures.

The turning point in the impacts generated by QE coincided with the launch of *tapering*, i.e. the phase-out of QE. In December 2013 the Fed announced that it would gradually decrease the amount of purchases. It can be said in general that the announcement of the tapering resulted in the worsening of global investor sentiment, which means that a selling wave started in both the equity markets and the government securities markets. Meanwhile, the currencies of emerging markets also started to weaken (*Szabó, 2014*). It is important to note that the withdrawal of QE may be regarded as the first milestone in the process of getting the monetary policy back to normal. With this, the American central bank made unambiguous hints at the approaching end of the asset purchase programme, which was eventually closed in October 2014.

A parallel can be drawn between the launch of tapering and the uncertainty and risk surrounding the issue of the interest rate hike. The economic situation of emerging countries is an important factor in both cases, as due to their large dollar-based corporate loan exposures these countries may be affected adversely by such a step (*Kovács – Maróti, 2015*). Therefore, in adopting monetary austerity measures, not only the condition of the country's own economy should be taken into account, but world economy events as well. It is an additional risk that leaving the interest rate around zero would have created a serious problem for the Fed later to manage potential

unexpected negative economic effects. As regards the decision, the potential consequence of a decision taken too early might be a slower economic recovery, but negative effects should also be expected regarding the increase in real wages. This, however, is a very important and complex topic, that may not be covered in its entirety in the scope of this article.

The interest rate was eventually removed from the zero lower bound in December 2015, which may be understood as the next major monetary austerity measure after the tapering. For the first time in 9 years, the Fed raised its policy interest rate (0.25–0.5 per cent), which at the same time meant the conclusion of a phase in the history of the U.S. Federal Reserve. This step also sent a signal to the markets that after a long period monetary policy was going to operate again in “normal” circumstances.

## SUMMARY

The question arises whether the robust monetary easing of the United States – lasting several years – was effective or not. Based on the Fed’s double mandate – i.e. focusing on the issues of price stability and unemployment – the strategy can be considered successful. Changes in the

unemployment rate obviously show a positive trend, which is in line with the objective of full employment. Inflation developments, on the other hand, imply a far more complex issue. It may be rightfully pointed out that the 2 per cent target was not achieved. However, looking at core inflation alone – excluding products that show strong fluctuations as a consequence of external economic shocks – it is evident that the situation is not that bad after all (in November 2015 the level of core inflation was 2 per cent). It is also clear that no major inflation or deflation swings occurred either, resulting in a relatively stable picture. Although the Fed managed to put the economy from recession back on a path of growth, it failed to increase aggregate demand or consumer expenditures (that constitute the largest portion within aggregate demand) to the expected extent. As regards exchange rates, it is important to remember that they are not influenced directly by any single central organisation, i.e. there are no exchange rate targets. From the point of view of the United States, the weakening dollar brought about favourable commercial impacts; in the case of the countries that saw an appreciation of their currencies, however, negative effects prevailed. Cross-border effects also appear to be positive; increased liquidity favourably affected numerous countries worldwide.

## NOTES

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<sup>1</sup> Interbank lending practically stopped, banks were reluctant to lend money to each other. Increased counterparty risk has been also reflected in rising interbank rates.

<sup>2</sup> A sudden and long-lasting process in which financial and funding liquidity both vanish. The former means

the possibility to buy or sell a financial instrument within a short time without any major changes in prices, while the latter refers to the opportunity to obtain funding in relation to asset sale or lending. The liquidity crisis may constitute significant threats to the stability of the financial system as well as for the real economy (BIS, 2009).

- <sup>3</sup> When interest rates are negative, in essence, depositors pay banks in exchange for being allowed to deposit funds with them. There have actually been examples for negative interest rates (e.g. Switzerland – January 2015, Sweden – 2015), and in some cases, they may well be justified. If inflation exceeds interest rates, this solution may reduce loss. As far as banks are concerned, the real threat is an excessive cash inflow, because if the volume of lending lags behind an overgrown deposit portfolio, it may be manifested in a decreasing profit for the bank.
- <sup>4</sup> The series of effects through which monetary policy decisions exert their influence on the economy appear in inflation rates, in consumer decisions and in growth.
- <sup>5</sup> The 5 major channels that may be regarded as relevant in respect of the operation of QE are the portfolio balance, signalling, liquidity, announcement and confidence channels.
- <sup>6</sup> Bauer – Rudebusch (2013), Bauer – Neely (2013), and Rogoff (2015) also emphasise the predominant role of the signalling channel.
- <sup>7</sup> Based on the above, the liquidity channel would demand yields to grow through QE. In reality, however, there is no growth – yet the fall in the yield of government securities (as instruments with the highest liquidity) will be much smaller compared to the yield of the less liquid subsidised corporate bonds. Therefore, the gap between these yields will narrow.
- <sup>8</sup> The terms “liquidity premium” and “illiquidity premium” are interchangeable, depending on their use, as there is a reverse relationship between interest rate and price. Illiquidity premium links the premium to the yield (or interest rate) on illiquid instruments, whereas liquidity premium links it to the price of liquid instruments.
- <sup>9</sup> Flight to quality refers to a phenomenon where investors get rid of their riskier assets and try to place their capital in safer investment instruments. This relocation of capital is primarily the result of a high degree of uncertainty developing in the financial or international markets.
- <sup>10</sup> According to the exponents of classical economics, the product of money supply and the velocity of money equals the value of nominal output:  $Y = MV$ , where the velocity of money may be regarded as constant (for details, see Mankiw, 2005).
- <sup>11</sup> This statement is the conclusion of a model in which money creation by banks is disregarded. It should be noted that commercial banks do not lend central bank money to the private sector, but commercial bank funds (created by the commercial banks themselves); consequently, the deposits placed at the Fed and the loans provided to the private sector are not alternatives to each other (although lending presupposes central bank liquidity).
- <sup>12</sup> In accordance with the definition of Krugman (2009), liquidity trap describes a situation where conventional monetary policy becomes inefficient.
- <sup>13</sup> The output gap equals the difference between actual and potential GDP values. Its amount and direction is determined by demand: if demand grows, the output gap will also grow, as in order to satisfy the increased demand the production of companies will increase in excess of their capacities. The output gap theory is often associated with inflation as well, and output is determined at a level that does not put any pressure on prices. If the gap is positive, prices will start to rise upon the pressure of demand, and in the opposite case the reverse process takes place.
- <sup>14</sup> For more details, see Fed, 2015a.
- <sup>15</sup> The Federal Open Market Committee (FOMC) is the body responsible for the Fed’s most important monetary policy decisions, whose primary task is to determine the policy interest rate and to regulate the size of the money supply.

<sup>16</sup> Ben S. Bernanke is an American economist, chairman of the FED's Board of Governors between 2006 and 2014. In the U.S. his name is associated with the launch of the three phases of QE.

<sup>17</sup> It measures the value of the U.S. dollar against a basket comprising 6 rival currencies (euro, Japanese yen, British pound, Canadian dollar, Swiss franc and Swedish krona).

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