

Does the ECB's Unconventional Monetary Policy Endanger the Exit from the Current Low Interest Rate Environment?

Authors: Markus Demary / Michael Hüther
Phone: +49 221 4981-732 / +49 221 4981-600
demary@iwkoeln.de / huether@iwkoeln.de

Abstract

Many Eurozone governments, corporations and private households are still involved in an unfinished balance sheet repair process. Debt levels are still high and there are looming risks that negative developments, e.g. deflationary dynamics, cause debt to become unsustainable. The state of these Eurozone countries is comparable to a patient who recovers from a bad disease and whose immune system is not yet able to protect him from further infections. Despite the still unstable Eurozone, the European Central Bank's (ECB) monetary policy measures, especially its large-scale asset purchase program, are under attack. This policy paper will show that overcoming the Eurozone balance sheet recession is the only way to enable monetary policy to exit from the low interest rate environment. Hence, the ECB's current monetary policy stance is imperative against the background of the still unfinished balance sheet recession. Moreover, it demonstrates that the ECB's unconventional monetary policy measures do neither contradict a speedy exit from the low interest rate environment nor do they contradict a continuation of the supply-side reform agenda. In fact, policy measures that increase potential growth and stabilize inflation expectations are inevitable to enable a successful deleveraging. In light of this, the ECB's large-scale asset purchase program is a strong signal that could bring inflation expectations back to the vicinity of the ECB's inflation target. Stabilized expectations in turn will pave the way for a successful balance sheet repair. Only a finished balance sheet recession enables a successful exit from the low interest rate environment. Although necessary, the ECB's large-scale asset purchases have risky side-effects. Attenuating these side-effects, however, is the responsibility of national governments because the ECB's monetary policy can only prevent deflationary dynamics. It is not a substitute for supply-side reforms.

Keywords: Balance sheet recession, banking- and sovereign debt crisis, inflation expectations, monetary policy, supply-side reforms

JEL-Classification: E44, E52, E58, E61

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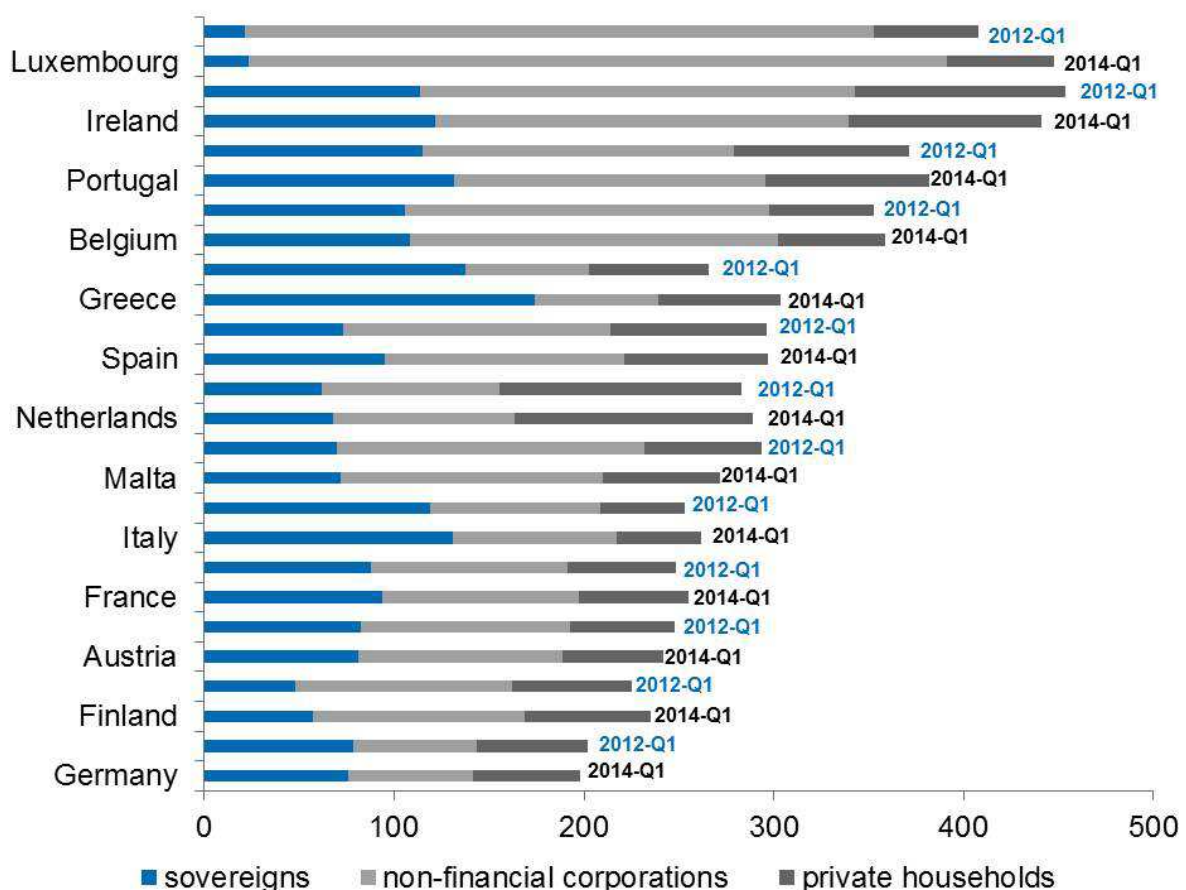
Literature

1. Balance Sheet Repair under Low Growth and Decreasing Prices

The Eurozone economies did not only accumulate high levels of sovereign debt, but also of private debt. Figure 1 shows clearly that the process of balance sheet repair in many Eurozone countries did not proceed successfully in the last years. Hence, future financial fragilities are still likely. Albeit, it is not the objective of monetary policy to support the process of balance sheet repair in the private and sovereign sectors, debt has implications for the conduct of monetary policy. These implications arise from the dangers of deflationary dynamics for debt sustainability. Unsustainable debt, in turn, aggravates the conduct of monetary policy, i.e. the normalization of monetary policy towards a neutral level and thereby an exit from low interest rates.

Figure 1: Private and sovereign debt in Eurozone economies

In percent of Gross Domestic Product, selected Eurozone economies



Source: European Central Bank

This policy paper will show that overcoming the Eurozone's balance sheet recession is the only way to enable monetary policy to exit from the low interest rate environment. The most recent monetary policy decisions, i.e. Quantitative Easing (QE) with monthly bond purchases of 60 billion Euros, thereby do not contradict an exit from the low interest rate environment. Rather, they serve as an instrument to stabilize inflation expectations at the same time supporting the ECB's overriding objective of

low and stable inflation. By stabilizing inflation the ECB avoids a further tightening of the balance sheet recession and enables deleveraging processes in the Eurozone economies to progress. Only a finished balance sheet repair enables the ECB to increase its policy rate without jeopardizing debt sustainability.

A crucial indicator for measuring the deleveraging processes and the sustainability of debt is the ratio of debt to Gross Domestic Product (GDP). An additional important measure when extraordinary redemption and interest agreements have been reached – as happened in November 2012 between the Eurozone and Greece – is the debt burden level. Achieving debt sustainability, either for private or for sovereign debt, does not only require a reduction of the numerator of the debt-to-GDP-ratio, but it also requires a non-diminishing denominator. Hence, in addition to the debt level, the growth rates of real GDP as well as the inflation rate are essential determinants of debt sustainability. Not only a delayed reduction of the debt level can endanger debt sustainability, but also a fall in either real growth of GDP or a fall in the price level (Buttiglione et al., 2014).

In the recently published *Geneva Report on the World Economy* Buttiglione et al. (2014) state that financial crises cause balance sheet recessions that make it harder to deleverage compared to ordinary recessions. The authors differentiate between three types of financial crises:

- Type 1 financial crises lead to a stark fall in GDP, but not to a diminished growth of potential output. They refer to the banking crisis in Sweden in the 1990s as an example for a type 1 financial crisis.
- Type 2 financial crises are characterized by a diminished growth of potential output as found in Japan ever since its banking crisis in the 1990s.
- In type 3 financial crises a combination of a fall in GDP and a diminished growth in potential output materializes. The authors assume this type of crisis as plausible for the current situation in the Eurozone.

In contrast to an ordinary recession, GDP in a balance sheet recession is not expected to exceed its longer term growth trend. Instead, it will evolve below its potential for a long time. This is the situation that can be observed in the Eurozone since 2009.

The main problem in a balance sheet recession in the aftermath of a type 3 crisis is not the lower growth per se, but the reinforcing dynamic of diminished potential growth and debt dynamics. This dynamics is due to the deleveraging processes of

economic agents that lower growth and lower growth that hinders deleveraging (Buttiglione et al., 2014). From this we can conclude that supply-side reforms that enhance potential growth are necessary to improve the debt-to-GDP-ratio and thereby help to overcome the balance sheet recessions. However, raising potential growth is a necessary but not a sufficient condition to ensure debt sustainability: In case of a deflation, the denominator of the debt-to-GDP ratio can deteriorate although potential growth improves. These are the channels, through which monetary policy and debt interact.

For our further analysis, we differentiate between two forms of declining prices (deflation):

- Declining prices can be due to improvements on the supply-side, i.e. enhanced productivity as the result of product and process innovations. This phenomenon can strikingly be seen in the pricing of notebooks, tablet computers and smartphones, when the introduction of a new and improved version leads to a fall in the prices of predecessor products that are still more or less up to date. A fall in prices can also be due to supply-side reforms which improve the general competitiveness of firms. Falling prices due to supply-side reforms are unlikely to endanger debt sustainability, however, since supply-side reforms normally improve potential growth (Anderson et al., 2014; Bouis/Duval, 2011; Djankov et al., 2006; Eggertson et al., 2014; Matthes, 2015; Nicoletti/Scarpetta, 2003; Varga et al., 2014).
- More critical are falling prices that result from a decline in aggregate demand, which has the potential to start a reinforcing dynamic due to self-fulfilling expectations. The latter can arise in a situation when firms and households expect prices to decline and thereby delay expenditures. When delayed expenditures lead to a decline in demand, expectations will be confirmed and cause further delays in expenditures. Such a decline in aggregate demand is problematic for debt sustainability since it leads to a combination of declining real GDP and declining prices, which deteriorates the denominator of the debt-to-GDP-ratio.

The ECB's mandate, i.e. its overriding objective to ensure price stability, does not differentiate between both forms of declining prices. Supply-side reforms, however, do not necessarily lead to an economy-wide decline in prices, but instead could trigger lower prices of some or several products. Moreover, no fundamental innovation occurred recently that justifies an economy-wide fall in prices. In contrast, there is evidence that inflation expectations became pessimistic and left their target zone. Such a fall in prices due to self-fulfilling expectations leads to a fall in prices on a

great scale and consequently requires the ECB to intervene in order to fulfill its overriding objective of ensuring price stability.

The ECB revised its monetary policy strategy at the beginning of the millennium and defined its inflation target as “[...] close to 2% over the medium term. This clarification underlines the ECB’s commitment to provide a sufficient safety margin to guard against the risks of deflation. It also addresses the issue of the possible presence of a measurement bias in the HICP and the implications of inflation differentials within the euro area“, as stated by Otmar Issing at the ECB’s press conference at 8th of May 2003. Moreover, he stated in his presentation slides: “The safety margin is sufficient to avoid any major risks of deflation. At the same time, it addresses the other factors listed above (measurement bias in the HICP; downward nominal rigidities in wages; inflation differentials within the euro area; zero lower bound on nominal interest rates/deflation risk)” (Issing, 2003).

2. Inflation Expectations Lose Their Anchor

Expansive monetary policy measures are necessary when a broadly-defined fall in prices due to self-fulfilling expectations threatens economic stability. Although the economy’s aggregate expectations are not observable empirically, surveys of market professionals provide useful information about inflation expectations. Figure 2 contains the inflation expectations from the survey of professional forecasters conducted by the ECB.

The confidence in the ECB’s monetary policy cannot directly be derived from the aggregated point estimate of the survey of professional forecasters. It can be estimated from the disaggregated forecasts, however (figure 2). For the analysis of deflationary expectations the following forecast intervals were defined:

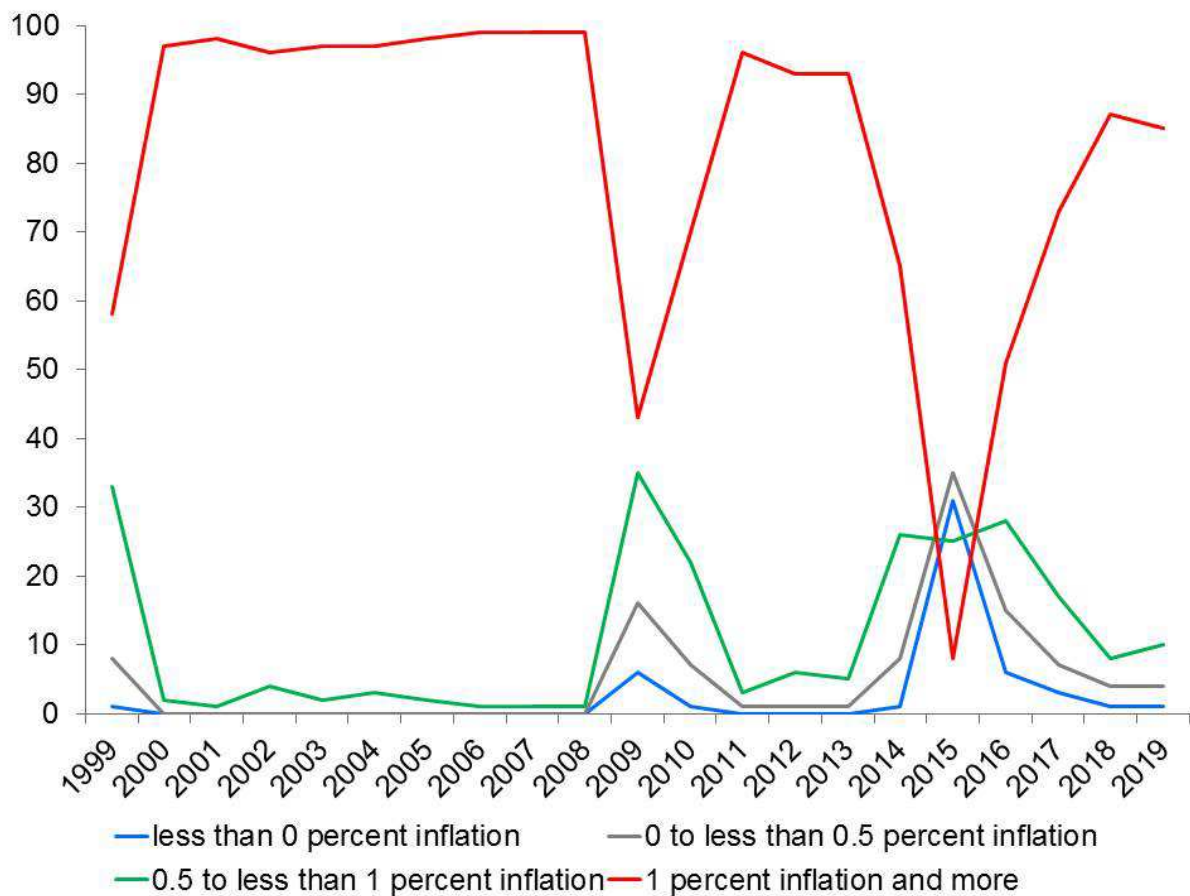
- “lower than 0 percent” as deflationary expectations;
- “from 0 percent to less than 0.5 percent” as expected low inflation;
- “0.5 percent to less than 1 percent” as expectations of inflation way below the ECB’s inflation target;
- “1 percent and more” as expectations of inflation below but near and above the ECB’s inflation target.

From figure 2 can be inferred that expectations dropped during the Global Financial Crisis in 2008 as well as in the last survey year 2014. It can be seen that the composition of individual forecasts in 2008 and 2014 differ from the one in the period from 1999 to 2007. In the pre-crisis years 1999 to 2007, however, forecasters showed confidence in the ECB’s monetary policy. This can be inferred from close to 100 per-

cent of forecasters having expected the inflation rate to be 1 percent and more for the next 12 months. Moreover, the forecasters did not show any signs of deflationary expectations or expectations of a low inflation environment. Instead they rather tended to expect the ECB to miss its target with higher rates. All in all, we can conclude that the inflation expectations were anchored in the pre-crisis years, but shifted thereafter.

Figure 2: Euro-area inflation expectations

Percentage fraction of professional forecasters who expect inflation in the following 12 months to be within the interval “less than 0 percent”, “0 percent to less than 0.5 percent”, “0.5 percent to less than 1 percent” and “1 percent and more”.



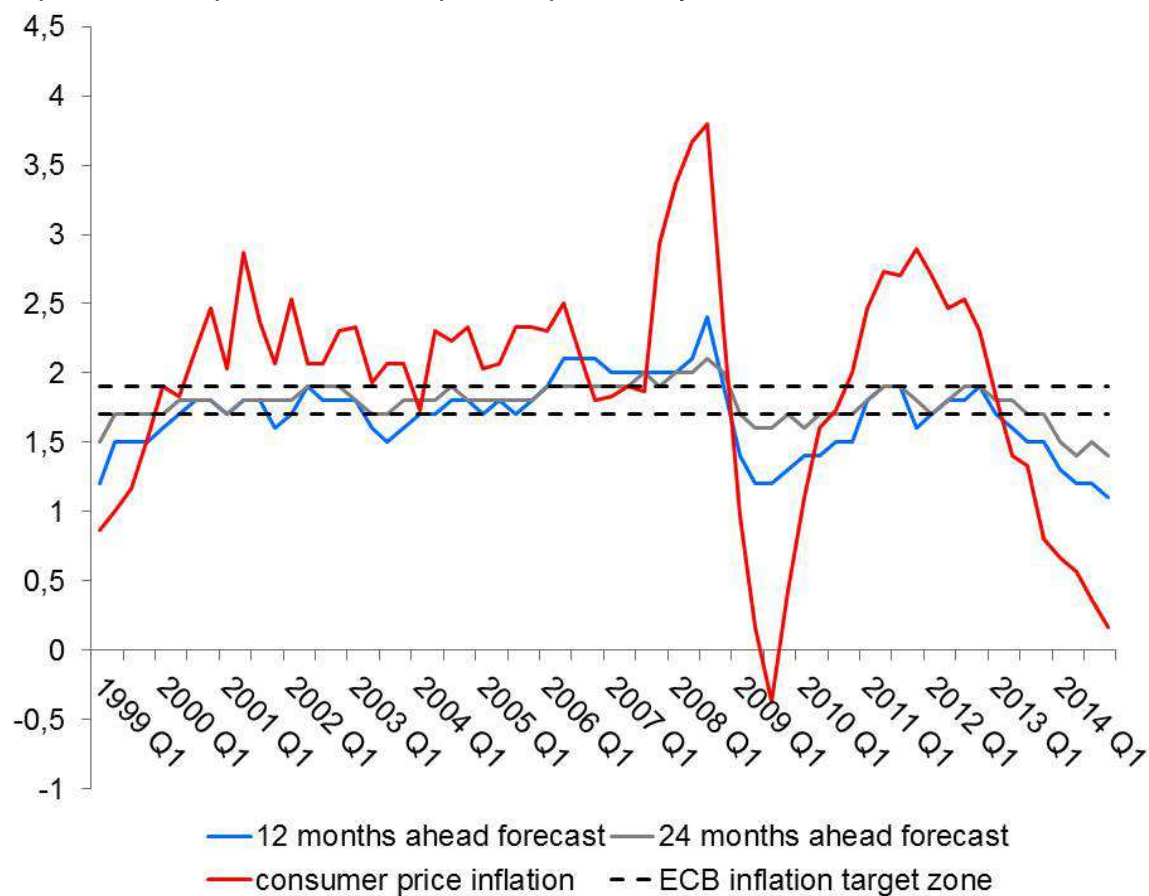
Note: until 2013: forecast horizon: 12 months, from 2014 onwards: forecast horizon: 12 months and more

Source: European Central Bank, several years

A first change in expectation formation among the forecasters occurred in 2008. Fewer forecasters expected an inflation rate of 1 percent and more for the next 12 months at that time. In the survey year 2014, a similar change in expectation formation occurred. However, fewer forecasters expected an inflation rate of 1 percent and more. The current situation is more severe since there is a sharp increase in de-

flationary expectations. While only six percent of the forecasters expected a deflation for the 12 months after 2008, 31 percent of the experts expect falling prices for the 12 months after the survey year 2014. Although there are fewer pessimistic forecasters up to 2019, six percent of the experts expect falling prices for 2016. All in all, we can conclude that inflation expectations are unanchored for the survey years 2014 and 2015. This is also demonstrated by the aggregate point forecasts in figure 3. From the unanchored inflation expectations we can infer that the ECB has to ease monetary policy in order to bring expectations back to their target value.

Figure 3: Eurozone inflation expectations and consumer price inflation
In percent compared to the respective previous year



Source: European Central Bank, several years

In addition to unanchored inflation expectations, the Eurozone harmonized index of consumer price inflation (HICP) started a persistent downward drift in the end of 2011. This process evolves undamped ever since (figure 3). Such a dynamic of actual inflation can influence inflation expectations with a time lag. Hence, market participants do not expect the ECB to fulfill its mandate for the next 24 months. Recently, Eurozone inflation became deflation and it is expected to persist on that level at least until end of 2015. Once we abstract from oil price movements and food prices and concentrate on core inflation, we will find a less severe fall. Only looking at core infla-

tion is, however, not sufficient for judging deflation risks, since special items will have lagged effects. The core inflation rate, in fact, was located at 0.6 percent in January 2015. Therefore, even without special items there is a downward pressure on prices. Moreover, there is no evidence that declining prices can be explained by productivity gains. Instead there is opposing evidence, which can be inferred from the low Euro-zone investment demand and its effect on the capital coefficient and labor productivity.

From the decline in deflationary expectations from 2015 onwards as shown in figures 2 and 3 we cannot necessarily conclude that deflationary expectations are a transitory phenomenon that renders the ECB's expansionary policy unnecessary. This has to be contrasted by the fact that the forecasts for 2015 and the following years were surveyed in October 2014. At this point, the ECB's plans for large-scale asset purchases had already been discussed in public. Therefore, we have to consider that the deflationary expectations already contained the expectation that the ECB will start QE in 2015 and that QE will show effects in 2016. Moreover, it is possible that a larger fraction of forecasters would have expected falling prices when the ECB had been silent about the launch of QE. Nevertheless, we can conclude from these numbers that inflation expectations are unanchored for the years 2014 to 2016.

3. Deflation Hazards in a Low Interest Rate Environment

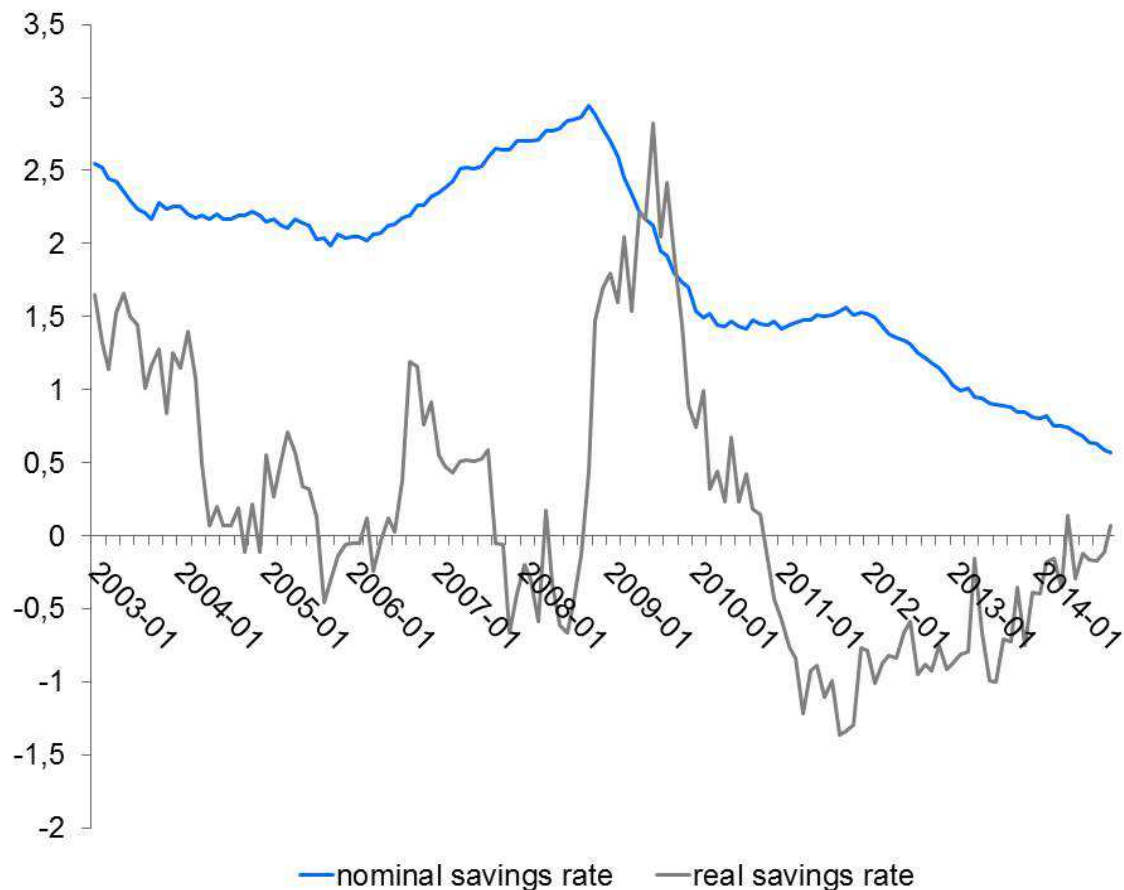
After the onset of the Global Financial Crisis in 2008 the ECB lowered its policy rate several times. Monetary policy is now challenged by a policy rate in the vicinity of the zero lower bound on interest rates. How this lower bound complicates the conduct of monetary policy can be inferred from the description of the aggregate demand relationship as it is derived in the models of Clarida et al. (1999) und Galí (2008):

$$y_t = E_t y_{t+1} - b(i_t - E_t \pi_{t+1} - r),$$

whereby y_t denotes the current output gap, E_t the expectation operator, i_t the central bank's short-term policy rate, π_t the current inflation rate, r the equilibrium real interest rate, and b is a positive coefficient. This equation explains the current output gap with the future expected output gap $E_t y_{t+1}$ and the deviation of the real central bank interest rate from the equilibrium real interest rate. Anyway, it is irrelevant for our argument here, whether expectations about future inflation $E_t \pi_{t+1}$ and about the future output gap $E_t y_{t+1}$ are formed model-consistent as assumed in the models of Clarida et al. (1999) and Galí (2008) or whether they are formed as the average market expectations of heterogeneous and bounded-rational agents as in the models of De Grauwe (2010, 2012).

More important is, that the ECB's policy rate lies in the vicinity of the zero lower bound on interest rates. From the equation can be seen that a central bank in this situation can only affect aggregate demand by managing inflation expectations as highlighted before by Bernanke et al. (2004) and Eggertson / Woodford (2003a, 2003b) in the discussion about the Federal Reserve's monetary policy near the zero lower bound. A negative effect on aggregate demand can only be avoided at the zero lower bound when deflationary expectations are hindered to exceed the value of the equilibrium real interest rate.

Figure 4: Negative real interest rates in Germany
Interest rates on bank deposits in Germany, in percent



Source: European Central Bank

Proponents of the *Savings Glut Hypothesis* (Bernanke, 2005) and proponents of the *Secular Stagnation Hypothesis* (Summers, 2014), who assume the equilibrium real interest rate to be negative, would recommend central banks in this situation to always intervene when inflation expectations become negative. One crucial argument that explains the low investment demand with the demographics of an ageing society can also be applied to the equilibrium real interest rate. Demography can have ef-

fects on the agents' discount factors that measure their time preference of consumption (Weizsäcker, 2014). In case agents weight future consumption higher than today's consumption, then the most recent real interest rate is consistent with this behavior. In theory the agent with the smallest discount factor determines the equilibrium real interest rate. At a discount factor of zero, the case in which agents are neutral between consumption today and future consumption, the equilibrium real rate is zero. A negative equilibrium real interest rate would be a plausible economic situation, due to the demographics of an ageing and declining population, as can be observed in industrialized economies.

Empirically, negative real rates are no rare events. Savers were confronted with negative real rates in the past (figure 4). The real rate on savings recently began to increase again and it is now located in the vicinity of zero. After the real rate recovered from its minimum value in 2011, monetary policy became restrictive, which will be analyzed in the subsequent paragraph.

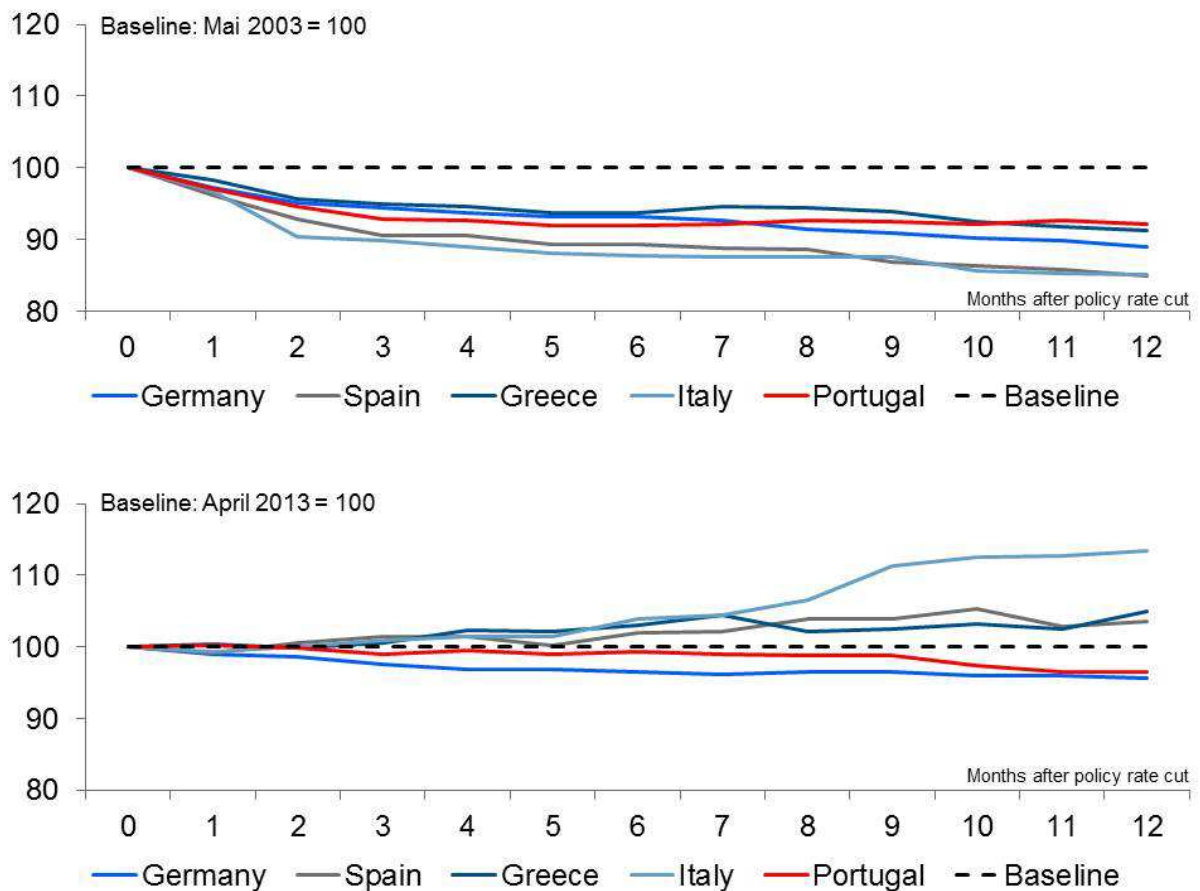
Even under positive real rates it can be necessary for a central bank to intervene when inflation expectations worsen. One reason is that the equilibrium real rate cannot be observed on markets and its estimation is covered with uncertainty. Consequently, it is always necessary to intervene from the point of view of monetary policy when inflation expectations tend to decouple from the central bank's inflation target in order to avoid negative effects on aggregate demand.

4. Necessity and Effectiveness of Quantitative Easing

The ECB's monetary policy is not only restricted by the zero lower bound on interest rates but also by an impaired monetary transmission process in the Eurozone. As a consequence, a cutting the ECB's policy rate does not translate into lower bank credit rates for non-financial corporations in all Eurozone countries, while bank credit rates decrease in a functioning interest rate channel (Demary / Matthes, 2013; EZB, 2012; Schorkopf, 2013). The impairment of the Eurozone interest rate channel of monetary transmission can be inferred from the different responses of bank credit rates for firms after approximately similar cuts in the ECB's policy rate. Comparable policy measures were conducted in June 2003 and in Mai 2013. On June 6th, 2003 the ECB cut its policy rate from 2.5 percent to 2.0 percent and left it on that level for several months. On May 8th, 2013 it conducted a similar policy measure by cutting the policy rate from 0.75 percent to 0.5 percent. It was further reduced and at 13th of November 13th, 2013 to 0.25 percent. Afterwards, the ECB's governing council left the rate at 0.25 until June 10th, 2014. Even further interest rate cuts were conducted later on. Although both time periods are only approximately comparable, the above analysis demonstrates the impact of the recently impaired transmission process (fig-

ure 5). While bank interest rates fall in response to the policy rate cut after June 2003, they evolved differently in response to a similar policy rate cut after May 2013. While interest rates in Germany and Portugal fell, they increased in Greece, Italy and Spain.

Figure 5: Response of interest rates to a cut in the ECB's policy rate
Interest rates on bank credit to non-financial corporations with a maturity between 1 and 5 years, response to a policy rate cut of 0.5 percentage points

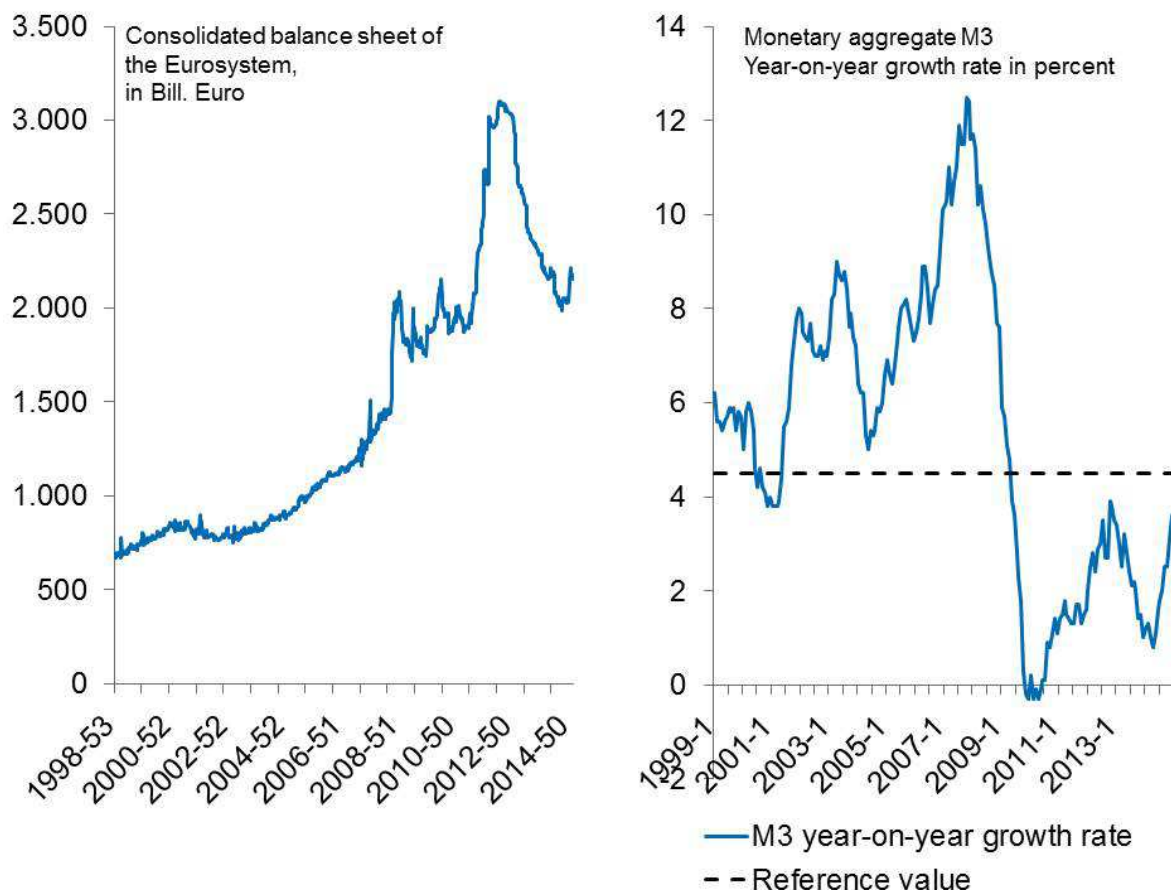


Quelle: European Central Bank, Cologne Institute for Economic Research

Despite the hugest expansion of its balance sheet and the lowest level of interest rates in the history of the ECB, its monetary policy stance cannot necessarily be defined as expansionary. In response to the global recession, the Eurosystem increased its consolidated balance sheet, in particular with two huge Long-Term Refinancing Operations (LTRO) in December 2011 and in February 2012. Thereafter, its balance sheet shrunk in 2013 as banks started to redeem their credit lines. Currently, the Eurosystem's balance sheet size corresponds to its longer term growth trend between 2005 and 2008. The ECB's balance sheet expansion, i.e. the expansion of the monetary base, however, is not reflected in the growth of the monetary aggregate

M3. Whereas the monetary base measures the amount of deposits within the banking system, the monetary aggregate M3 measures the amount of money within the economy that can be used by firms and households to make purchases. A yearly reference growth rate of M3 of 4.5 percent corresponds to an inflation rate of close to 2 percent (Neumann, 2003). From figure 6 one can infer that the yearly growth rate of M3 has been lying way below this reference value since 2009. The slow growth of M3 is a side-effect of the unfinished balance sheet recession. Since Eurozone banks have not finished their balance sheet repair processes, credit growth and thereby money growth remains low. Hence, no inflationary pressure from the monetary side could be measured up to today.

Figure 6: Monetary policy is not necessarily expansive



Source: European Central Bank

The ECB's conduct of monetary policy in the last few years was characterized by an expansion of the monetary base. The change in instruments and intermediate targets was justified because of the zero lower bound on interest rates and the break-down of the traditional interest rate channel. The first massive expansions of the monetary base resulted from the two LTRO's in December 2011 and February 2012 of which a

large part is redeemed recently. In September 2014, the ECB launched targeted LTROs (TLTROs) and in January 2015 it launched its QE program, a large-scale asset purchase program, from which an accelerated growth of its balance sheet will result.

QE works through non-traditional transmission channels. We will analyze the relevance of these transmission channels for the Eurozone in the following paragraphs. Krishnamurthy / Vissing-Jorgensen (2011) identify the following transmission channels through which QE works:

- **Liquidity channel:** The central bank increases the liquidity supply for investors by buying longer maturity bonds in exchange for liquid reserves (Krishnamurthy / Vissing-Jorgensen, 2011). The authors find empirical evidence for a declining liquidity premium in the US in response to QE which could be observed from lower yields on liquid US Treasury notes. Giavazzi / Tabellini (2015), however, assume this effect to be of minor importance for the Eurozone. From their point of view, it is not a lack of liquidity in the Eurozone that hinders credit growth but a lack of bank equity capital. Moreover, they argue that short-term interest rates are already low in the Eurozone. However, one can argue that the ECB is not restricted to buying bonds from banks but also from insurance companies and investment funds. This, in contrast, raises M3 and has the potential to increase inflationary pressures on prices.
- **Duration risk channel:** By purchasing longer term securities a central bank can reduce investors' duration risk and thereby reduce the slope of the yield curve, i.e. it reduces longer term maturity yields stronger relative to the shorter maturity yields. But it is questionable if a central bank is able to influence only special segments of the bond market or if it is able to reduce the duration risk in all segments. Krishnamurthy / Vissing-Jorgensen (2012) find empirical evidence for this transmission channel in the US. They find that longer term yields fall more compared to yields at the short end of the maturity spectrum. From this result we can infer that it is highly likely that the yield curves of Eurozone countries will also flatten when the ECB buys longer term bonds within its QE program since there is no difference in the US and Eurozone bond markets that could justify different yield curve responses.
- **Safety channel:** Institutional investors' demand for safe assets is high (Krishnamurthy / Vissing-Jorgensen, 2012). By purchasing nearly default-free assets, a central bank can lower the yields of these assets and thereby lower the

risk-free interest rate. Krishnamurthy / Vissing-Jorgensen (2012) find this transmission channel to be the dominant channel for the US. However, it is hard to transfer this result to the Eurozone since the yields on near default-free assets are already low in the Eurozone as can be seen from the yields on German sovereign bonds. Hence, this channel might be only of minor importance for the Eurozone.

- **Prepayment risk premium channel:** Mortgage backed securities contain a risk premium for the risk of an early prepayment (Gabaix et al., 2007). By purchasing these securities the central bank can reduce the prepayment risk premium relative to the risk premia on the securities in other asset market segments given these asset markets are segmented (Krishnamurthy / Vissing-Jorgensen, 2011). This transmission channel is mostly relevant for the US QE1 program. Its relevance for the Eurozone, however, cannot be deduced from the experiences in the US since the prepayment risk is different in the Eurozone countries due to different contract schemes. In Germany prepayment compensation is a commonly contracting agreement (Haas / Voigtländer, 2014). In the US, on the contrary, early prepayment can be done at zero cost for the holder.
- **Default risk channel:** Lower-grade bonds contain higher default risks compared to near default-free sovereign bonds. Following Krishnamurthy / Vissing-Jorgensen (2011), this transmission channel works indirectly since it assumes that QE boosts aggregate demand which reduces the default risks on lower-grade bonds. This, in turn, reduces the risk premia on these bonds. By reducing risk premia, QE reduces the capital cost of firms that finance their investments by issuing bonds. Krishnamurthy / Vissing-Jorgensen (2012) find empirical evidence for the default risk channel from US credit default swap data. They find that the risk premia on corporate bonds fall in response to QE. However, we cannot directly deduce the effectiveness of the default risk channel for the Eurozone from their results since the major part of Eurozone corporate finance (75 percent) works through bank credit and only 25 percent via bond issuance (Schorkopf, 2013).
- **Signaling channel:** Large scale asset purchases signal central banks willingness to keep interest rates low for a long time (Eggertson / Woodford, 2003a, 2003b). Clouse et al. (2000) assume large scale sovereign bond purchases to be an effective instrument to target the public's interest rate expectations. Krishnamurthy / Vissing-Jorgensen (2012) find empirical evidence for this channel from monthly US Federal Funds Futures Data. They find a significant

effect one day after the announcement of QE. It is likely that the signaling channel will be a major transmission channel for the ECB's QE.

- **Inflation channel:** Due to the expansion of the monetary base and a likely expansion of broader monetary aggregates, i.e. M2 and M3, QE has the potential to trigger inflationary expectations that lead to actual inflation (Krishnamurthy / Vissing-Jorgensen, 2011). Giavazzi / Tabellini (2015) expect increasing inflation expectations due to a credible announcement of QE. Krishnamurthy / Vissing-Jorgensen (2012) find empirical evidence from 10 year inflation-swap data for the US. They infer that inflation expectations increase between 36 to 95 basis points. The inflation channel is the major channel the ECB wants to target with its QE program. This channel will most likely be relevant for the Eurozone since inflation aversion is widespread in many Eurozone countries. Moreover, the aforementioned analysis of the Survey of Professional Forecasters data gave the impression that the effectiveness of QE is likely to be already contained in the forecasters' predictions, since the intention of large scale asset purchases had already been discussed before the survey took place.

Giavazzi / Tabellini (2015), moreover, expect QE to work in theory through two additional channels:

- **Exchange rate channel:** QE has the potential to depreciate the domestic currency. Giavazzi / Tabellini (2015), however, regard this channel as less relevant for the Eurozone since the Eurozone's exports to the rest of the world account of only 20 percent of the Eurozone's GDP. Moreover, the Euro has already depreciated. The exchange rate channel, however, will be relevant for countries with strong exporter companies. One has to consider here that the Eurozone's export share is much higher compared to the US share. Hence, the exchange rate channel might have a higher relevance for Europe than for the US.
- **Fiscal channel:** Buiter (2014) expects QE to reduce sovereign risk premia and thereby to improve government finance. For this channel to be effective, the ECB has to purchase longer maturity bonds like the Federal Reserve did. Under the restriction that governments will not increase their debt levels in response to QE and under the restriction that economic agents perfectly anticipate the future, agents will increase expenditures and thereby aggregate demand, since they expect a lower future interest burden for the government and thereby expect a higher future disposable income. It might be debatable, however, if perfect foresight of future events is an empirically relevant assumption

for the expectation formation of economic agents. Referring to Hayek (1945), De Grauwe (2010, 2012), highly doubt the existence of perfect foresight in expectation formation.

Summing up, our analysis came to the result that the ECB's large-scale asset purchases will work through the signaling channel, the inflation channel as well as the exchange rate channel, whereas the remaining channels will mostly be of importance for the US economy. By and large targeting these three channels is completely sufficient from the Eurozone perspective, since the ECB's main goal in the current situation – and in other situations as well – is to stabilize inflation expectations. By addressing these three channels the ECB will most likely be successful in preventing deflationary dynamics. Moreover, the US experience shows that the effects of “unconventional monetary policy” on the real economy and inflation will be limited when asset purchases are only of gradual nature. In a simulation by Engen et al. (2015) QE has the potential to increase the inflation rate to 0.5 percentage points. This result supports the ECB's decision to design QE as a large-scale program. The ECB's announcement to purchase bonds at a monthly amount of 60 billion Euros until September 2016, i.e. to purchase assets at an amount of up to 1200 billion Euros, is in line with these results and represents a strong commitment to stabilize inflation.

5. Implications for the Exit from the Low Interest Rate Environment and the Costs of Unconventional Monetary Policy

The ECB's recent monetary policy measures do not contradict an exit from the low interest rate environment. Instead, they increase the necessity of a clear exit strategy. Moreover, it is relevant for a successful exit from low interest rates to conduct such an exit in a stable macroeconomic and financial environment (Demary / Matthes, 2014).

Since an exit from low interest rates has the potential to worsen debt sustainability, lower levels of private and sovereign debt are necessary conditions for an exit. For the ECB to be able to increase its policy rate it is required that the Eurozone balance sheet recession ends successfully. Summing up, policy measures are needed that fulfill the following objectives:

1. the ongoing balance sheet repair processes should consequently be continued, i.e. the nominator of the debt-to-GDP ratio has to decline,

2. potential GDP growth has to be boosted through supply-side reforms, i.e. the denominator of the debt-to-GDP ratio has to increase,
3. deflationary dynamics must be addressed by targeted and effective monetary policy measures, i.e. a fall in the denominator of the debt-to-GDP ratio must be prevented,
4. objectives (1) to (3) have to be addressed all at once by targeted and effective policy measures.

For a smooth exit from the low interest rate environment, i.e. for an increase in the ECB's policy rate without a suppression of aggregate demand or a disruption of financial markets, objective (2) as defined above might not be sufficient. In addition to preventing a deflation the ECB has to bring inflation expectations back to their long-term value, i.e. the ECB has to bring inflation expectations back to their target zone of 1.7 percent to 1.9 percent. Stabilizing inflation expectations is important since it gives the ECB space for increasing its policy rate without causing the real rate to shoot up during the exit, which will inevitably suppress aggregate demand when deflationary expectations arise.

Because the main target of the ECB's large scale asset purchases is to stabilize inflation expectations these asset purchases are no contradiction to an exit from the low interest rate environment. The stabilization of inflation expectations will rather pave the way to start an exit from low interest rates. We argued that the ECB's large-scale asset purchases are relevant for the Eurozone not to slide into deflationary dynamics, which would increase the real debt level and thereby would worsen debt sustainability, which is not a viable alternative to QE. Stabilized expectations through QE in turn will pave the way for a successful balance sheet repair. And only a finished balance sheet recession enables a successful exit from the low interest rate environment. Moreover, one has to mention that there is no good reason why the ECB should not aim to achieve its overriding objective to ensure price stability. Failing to achieve price stability will inevitably cause long-term damages to the ECB's credibility.

Despite the high relevance of the ECB's large scale monetary policy measures and their potential to stabilize the Eurozone one has to address the costs associated with these measures. These are

- the pressure on life insurance companies through low interest rates,

- the pressure on bank's interest rate margins through a flattening of the yield curve,
- incentives for an unhealthy risk-taking due to a shortage of safe assets and its consequences for financial stability, i.e. the likely emergence of equity and real estate bubbles,
- redistributions between creditors and debtors,
- incentives for delaying reform measures, as well as
- incentives for delaying the balance sheet repair process and the resulting consequence that unprofitable business models were artificially held alive, when creditors renew credit lines in anticipation of delaying credit losses.

These risks, however, do not question the ECB's monetary policy. Moreover, they cannot and should not be addressed by the ECB. Instead, national governments have the responsibility to address and lessen these risks by means of brave reform measures. Finally, only finishing the balance sheet recession will pave the way for an exit from the low interest rate environment. The most recent reforms of the Eurozone banking sector and the setup of the banking union can be regarded as important steps to overcome the crisis and to prevent further crises. Sustainable debt is a further necessary step to ensure economic stability. In this regard, we have to be worried about any possible break-up of the Greek reform agenda by the new government. Our analysis has shown, however, that the ECB's monetary policy is only able to prevent a deflation and that it is in no way a substitute for supply-side reforms.

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