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**Transmission Channels of
Unconventional Monetary Policy
in the Euro-area: Where Do We Stand?**

**Monetary Dialogue
November 2016**

In-Depth Analysis





DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Transmission channels of unconventional monetary policy in the euro area: where do we stand?

Monetary Dialogue 28 November 2016

COMPILATION OF NOTES

Abstract

To ease credit and financing conditions for firms and households, in recent years the ECB has taken a number of unconventional (non-standard) monetary policy measures. These measures include the provision of liquidity through the direct purchase of private and government assets (direct quantitative easing), the purchase of commercial paper, corporate bonds and asset-backed securities to address liquidity shortages and spreads in certain market segments (direct credit easing), the flattening of the yield curve by lending to banks at longer maturities (indirect quantitative/credit easing) and, finally, the commitment to keep long interest rates low over an extended period (forward guidance). Taking stock of available empirical evidence, the notes in this compilation provide an assessment of these measures. The notes have been requested by the Committee on Economic and Monetary Affairs as an input for the November 2016 session of the Monetary Dialogue.

This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

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INTRODUCTION

The process through which monetary policy decisions affect the economy in general and the price level in particular has changed with the adoption of unconventional monetary policy. Conventional monetary policy mainly acts by affecting interest rates across different maturities. In other words, in normal times the central bank is neither involved in direct lending to the private sector or the government, nor in outright purchases of private and/or public assets.

But in exceptional circumstances, unconventional monetary policy tools may be necessary to achieve the central bank's inflation objective either because the policy rate is close to its effective lower bound (zero) or because the monetary policy transmission process is significantly impaired. Unconventional measures can be defined as those policies that directly target the cost and availability of external finance to banks, households and non-financial companies. These measures can include the allocation of central bank liquidity, loans, purchases of fixed-income securities or equity and forward guidance.

Taking stock of available empirical evidence, the note in this compilation review and assess the effectiveness of the various forms of unconventional monetary policy measures adopted by the ECB:

- i) direct quantitative easing (provision of liquidity through the direct purchase of private and government assets);
- ii) direct credit easing (the purchase of commercial paper, corporate bonds and asset-backed securities to address liquidity shortages and spreads in certain market segments through),
- iii) indirect quantitative/credit easing (affecting the yield spectrum by lending to banks at longer maturities);
- iv) forward guidance on interest rates (commitment to keep interest rates on long term-bond low over an extended period).

The notes have been requested by the Committee on Economic and Monetary Affairs as an input for the November 2016 session of the Monetary Dialogue. The main conclusions and policy options are summarised below.

Salomon Fiedler *et al.*, (Kiel Institute for the World Economy, University of Notre Dame) assess the effectiveness of unconventional monetary policy measures based on a review of the empirical literature and on theoretical considerations. The effectiveness of these measures depends on the specific circumstances when they are implemented. Therefore, they also discuss whether the effectiveness of unconventional monetary policy may change over time, taking into account that the available empirical literature on this issue is still limited at this time. In this regard, the paper highlights potential risks and side effects associated with unconventional monetary policy, focusing on those side effects that currently may directly counteract the expected impact of monetary policy on output and inflation in the euro area.

According to **Andrews Hughes Hallet** (University of St Andrews) the experience of those central banks which have tried Quantitative Easing (asset purchase) policies (the US Federal Reserve, Bank of England, Bank of Japan) is fairly uniform: small but significant increases in GDP of ¼%-½% each year; and 10-year interest rates lower by ¼%-¾%. The impact on prices and inflation has been negligible (<0.1%) in each case.

The ECB's asset purchase programme is too young to allow a final assessment of its impact and effectiveness. But the results so far in the Euro zone are broadly the same as elsewhere, if a little weaker: output growth around 0.3% on average and inflation at -0.05%, from January 2015 to mid 2016.

This weakening of QE effects over time, QE fatigue, is a common feature due to the diminishing quality of assets and decreased scope for QE interventions around the zero interest rate lower bound. The stabilising effects of better liquidity provision remain. Indirect easing via official financing and/or credit easing provides an additional channel. This enhances policy impact by reducing risk premia by region, as well as stabilising the financial position of key non-financial sectors. Evidence suggests this may have a larger effect than direct QE.

Forward guidance is the second type of unconventional policy. It is useful in this case because it can enhance the impact of QE by emphasising the credibility and durability of the expansion. Evidence on the size of this effect however is mixed, and the more extravagant theoretical claims are misplaced.

The difficulty faced by unconventional monetary policy is a breakdown in transmission between increased liquidity/cheap credit and loans, investment and spending. This is caused by debt deleveraging, superimposed austerity, risk aversion, poor incentives in a weak recovery, the risk of non-performing loans, and poorly timed bank regulation. In terms of policy implications, there is the need to actively repair these transmissions, strengthen the policy pass-through, and offset private sector deleveraging.

NOTES

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Transmission channels of unconventional monetary policy in the euro area: where do we stand?

Salomon FIEDLER, Isabel HANISCH,
Nils JANNSEN, Maik WOLTERS

IN-DEPTH ANALYSIS

Abstract

The ECB has adopted a variety of different unconventional monetary policy measures since the Global Financial Crisis. In this Briefing Paper, we assess the effectiveness of unconventional monetary policy measures based on a review of the empirical literature and on theoretical considerations. The effectiveness of these measures depends on the specific circumstances when they are implemented. Therefore, we also discuss whether the effectiveness of unconventional monetary policy may change over time, taking into account that the available empirical literature on this issue is still limited at this time. In this regard, we also discuss potential risks and side effects associated with unconventional monetary policy, focusing on those side effects that currently may directly counteract the expected impact of monetary policy on output and inflation in the euro area.

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EXECUTIVE SUMMARY

- The ECB has adopted a series of unconventional monetary policy measures since the Global Financial Crisis. These unconventional monetary policy measures include forward guidance and balance sheet measures. Currently, balance sheet measures are the most important monetary policy tool of the ECB to further loosen monetary policy. Balance sheet measures include liquidity provisions, asset purchases in specific market segments to improve the functioning of these market segments, and large-scale asset purchase programmes.
- From a theoretical perspective there are several transmission channels by which these unconventional monetary policy measures are transmitted to financial markets and finally stimulate economic growth and inflation. From an empirical perspective, it is very difficult to estimate the effectiveness of unconventional monetary policy measures because experience with these measures are limited and the identification of causal relationships is difficult. Therefore, it is reasonable to base an empirical assessment of the effectiveness on many empirical studies using a variety of approaches and to also take theoretical considerations into account.
- There is a broad consensus in the empirical literature that unconventional monetary policy measures can have a significant impact on financial markets. Unconventional monetary policy measures usually lead to a decline in long-term interest rates, in risk premia, and to an increase in asset prices. However, the estimated size of effects varies considerably across studies.
- There is also a consensus in the empirical literature that unconventional monetary policy can stimulate economic activity. However, it is more difficult to gauge the effects on economic activity than on financial markets and the results of different studies range from very low to very large effects.
- With regard to the comparison of the effectiveness of different unconventional monetary policy measures the literature is inconclusive. One reason for this is that the effectiveness of these measures depends on the specific circumstances when they are implemented. Overall, the results point to a higher potential of balance sheet measures compared to forward guidance. The announcement of the OMT programme, if interpreted as forward guidance, is an exception as it had a large impact on government bond yields and risk premia. However, this programme cannot be repeatedly used to stimulate economic activity and inflation.
- There are theoretical arguments as to why the effectiveness of very expansionary monetary policy in general and of unconventional monetary policy more specifically is decreasing over time. This question has not been fully addressed in the empirical literature because the limited experiences make it difficult to account for time varying effects. The available empirical evidence and theoretical considerations favour the view that the effectiveness of very expansionary monetary policy and of unconventional monetary policy is decreasing over time. In general, monetary policy seems to be more effective in the acute phase of a financial crisis and less effective in its aftermath.
- One reason why the effects of very expansionary monetary policy may decline over time is that very low real interest rates contribute to the misallocation of resources and thereby dampen productivity. Moreover, the longer very expansionary monetary policy is in place, the more it weighs on the profitability of banks and thereby weakens the financial health of the banking sector. Given that monetary policy has now already been very expansionary for about 10 years and given that there are also several other risks associated with it, such as excessive risk-taking in the financial sector, boom-and-bust cycles, delay of structural reforms, or risks for central bank independence, it seems questionable whether a further easing of monetary policy would be effective in stimulating economic activity.

1. INTRODUCTION¹

In normal times central banks usually conduct their monetary policy by adjusting the short-term interest rate to achieve their targets. With the onset of the Global Financial Crisis central banks, including the European Central Bank (ECB), have faced new challenges that they were unable to address with conventional monetary policy but that have called for so-called unconventional monetary policy. One of these challenges was that the short-term interest rates quickly approached the effective lower bound where further interest rate reductions are complicated, among other things, by the possibility for market participants to hold cash. Furthermore, central banks also faced other challenges that potentially impair transmission channels of monetary policy, such as financial market tensions or—for the ECB—financial market fragmentation across euro area Member States.

There is a number of different unconventional monetary policy measures that central banks have adopted. These measures can be differentiated between forward guidance and balance sheet measures. Balance sheet measures can be further differentiated between (i) direct quantitative easing (large-scale purchases of government or private assets), (ii) direct credit easing (purchases of assets in specific market segments), and (iii) indirect quantitative or credit easing (lending to banks at longer maturities). Quantitative Easing (QE) includes all measures related to direct quantitative easing and direct credit easing. In reality, it is not always possible to neatly sort all unconventional monetary policy measures into the different categories described above. For example, a large-scale asset purchase programme can be interpreted both as direct quantitative easing and as forward guidance (as it can be interpreted as a commitment by the central bank to keep interest rates low for an extended period of time).

In this Briefing Paper, we assess the effectiveness of unconventional monetary policy in the euro area by reviewing the relevant theoretical and empirical literature. We start by describing the unconventional monetary policy measures that have been adopted by the ECB since the Global Financial Crisis (Section 2). Next, we give a summary of empirical methods that have been used in the literature to identify the impact of unconventional monetary policy on financial markets and on economic activity, including a discussion about the problems with identifying this impact and the shortcomings of these methods (Section 3). Based on this summary, we provide an extensive review of the available literature on the impact of unconventional monetary policy measures. Even though we focus on the impact in the euro area, we also take into account the literature that deals with the impact in the United States, the United Kingdom, and Japan because there is considerable uncertainty when estimating the impact of unconventional monetary policy (due to the relatively short experience with this policy) and because some of the relevant measures have been adopted by the ECB only recently (so that empirical evidence on the effectiveness of these measures is scarce) while they were implemented earlier by other central banks. While we aim to summarize the most relevant contributions to this large and growing body of literature, we place a special focus on the literature that deals with the euro area (Section 4). In the next Section, we discuss whether the effectiveness of unconventional monetary policy may decrease over time (Section 5). In this regard, we also provide a short summary of potential risks and side effects of unconventional monetary policy and whether these risks and side effects may increase over time (Section 6). Finally, we provide a summary of our results (Section 7). In the Appendix, we supply an overview of the potential transmission channels of unconventional monetary policy from a theoretical perspective.

¹ The authors thank Josefine Quast for excellent research assistance and Stefan Reitz and Mewael F. Tesfaselassie for helpful comments and suggestions.

2. UNCONVENTIONAL MONETARY POLICY OF THE ECB

In the wake of the Global Financial Crisis, the ECB adopted a range of unconventional policies including forward guidance and a series of different balance sheet policies. At the beginning of the Global Financial Crisis it adopted mainly indirect quantitative and credit easing measures. Later on it also adopted direct credit easing measures, and finally direct quantitative easing measures. In doing so, it deviated somewhat from the unconventional monetary policies adopted by other central banks, such as the Federal Reserve and the Bank of England that put a stronger focus on direct quantitative easing much earlier. Although the tools utilized differed, in the aftermath of the Global Financial Crisis the aim of all central banks was at the beginning to alleviate financial market stress and later on to stimulate economic activity. The ECB later also tried to contain the sovereign debt crisis in several euro area countries.

Beginning in 2008, the ECB adopted, as shown in Figure 1, several indirect quantitative and credit easing measures, including new refinancing operations under tender rules of a fixed rate and full allotment (FRFA). Later on, the central bank offered refinancing over longer periods of time (Long-Term Refinancing Operations, LTRO). Furthermore, requirements for accepted collateral became progressively less stringent. Finally, the ECB began to try to expand bank lending by attaching certain provisions to its longer-term refinancing operations (Targeted Longer-Term Refinancing Operations, TLTRO).² These policy measures were designed to provide liquidity and funding to the markets. However, they also contain some of the other aspects of unconventional policy: longer term refinancing operations are, as they allow banks to lock in current low interest rates, a way for the central bank to show its commitment to future low interest rates. In addition, the ECB eased monetary policy further by loosening collateral requirements³ for specific securities with the aim of mitigating risk premia for these securities.⁴

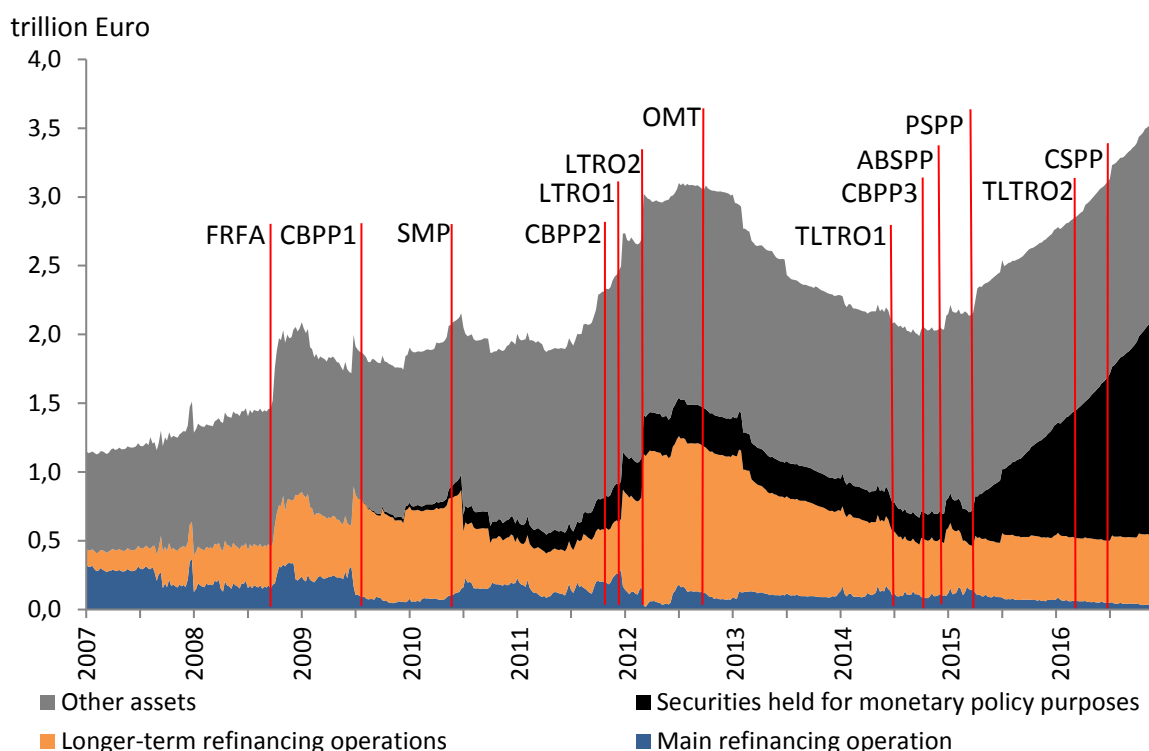
Since 2009 the ECB started to adopt direct credit easing measures that included interventions in specific markets, namely covered bonds (Covered Bond Purchase Programme, CBPP), debt of distressed sovereigns (Securities Markets Programme, SMP), and asset-backed securities (Asset-Backed Securities Purchase Programme, ABSPP). These direct credit easing measures only moderately contributed to an increase in the ECB's balance sheet because the volume of these measure is usually relatively small. Since 2015, the ECB also adopted direct quantitative easing measures by implementing the Expanded Asset Purchase Programme (EAPP) that includes the purchase of government bonds in proportion to the respective countries' share in ECB capital (Public Sector Purchase Programme, PSPP). Since 2016, selected corporate bonds (Corporate Sector Purchase Programme, CSPP) have also been included in the EAPP.⁵ With the adoption of the EAPP, the balance sheet of the ECB started to increase again after it had decreased as the volume of the refinancing operations receded in 2013 and 2014.

² These TLTROs (from 2014 on) have led to a smaller increase in the central bank's balance sheet than the earlier LTROs (implemented in 2011 and 2012). This could be due to a number of reasons, including lower liquidity demand outside acute crisis phases or changes in the interest rate environment.

³ Including, but not limited to, the extensive utilization of the so-called Emergency Liquidity Assistance (ELA) instrument.

⁴ A different line of central bank actions concerned foreign exchange markets. For example, starting with the Fed in 2007, the ECB successively entered swap agreements with other major central banks around the world. This had the effect, that if a bank can obtain funding in at least one currency it can meet obligations in the other ones as well (reducing currency mismatch risks). This helps keeping banks liquid even if interbank foreign exchange markets freeze up in a crisis due to mistrust arising from asymmetric information about individual solvency.

⁵ The EAPP also includes the CBPP and the ABSPP.

Figure 1: Eurosystem Balance Sheet Assets

Notes: "Securities held for monetary policy purposes" includes asset purchase programmes, "Longer-term refinancing operations" includes standard 3-month operations as well as non-standard LTRO and TLTRO, "Main refinancing operations" are standard operations which can be modified (e.g. by FRFA, lower collateral requirements).

Sources: ECB Eurosystem balance sheet, ECB, own calculations.

While many of the measures described above can also be interpreted as a form of implicit forward guidance as they provide information about the future path of the ECB's monetary policy, the ECB has also adopted explicit forward guidance. In 2013 it started to communicate to the public its expectations about future monetary policy, including the notion that fixed rate full allotment refinancing would continue and interest rates would be kept low for an extended period of time. The most important forward guidance provided by the ECB was President Mario Draghi's 2012 "whatever it takes"-speech and the announcement of the Outright Monetary Transactions (OMT) programme.⁶ Although never utilized it signalled a commitment by the ECB to preserve countries' membership in the single currency area by, if necessary, intervening in their sovereign debt markets. OMT was therefore a mixture of forward guidance (explaining how the central bank reaction would look like if some future conditions were to arise) and an intervention in specific markets (influencing the risk premia of certain instruments by, inter alia, reducing the risk of redenomination).

⁶ The OMT programme reduced uncertainty for market participants by providing information about the central banks intentions conditional on future developments. Therefore, we discuss OMT as forward guidance in this Section. When we provide a review of the empirical literature (Section 5), we follow the literature and discuss it as a balance sheet measure when it is analysed together with balance sheet measures and as forward guidance when it is analysed individually.

3. EMPIRICAL IDENTIFICATION OF THE EFFECTS OF UNCONVENTIONAL MONETARY POLICY

In the empirical literature, there are two canonical approaches for evaluating the effects of unconventional monetary policies: event studies and vector autoregressive models (VAR models). Recently, hybrid approaches have also been applied. Event studies typically consider announcement effects, i.e. the effect of the announcement of unconventional monetary policy measures. Since event studies usually rely on high frequency data (daily, intra-daily), this restricts the analysis to the effects on variables with the same frequency, primarily financial market variables, such as interest rates, the yield curve, or asset prices. In contrast, VAR models are also used to estimate effects on lower frequency variables, such as output and inflation, which are usually in the main interest of central banks. However, compared to event studies it is more challenging to identify causal relationships in VAR models. In addition, mixtures of both approaches have been used, namely VAR models that focus on the announcement effects of QE programmes (e.g., Weale and Wieladek 2016) and studies that in a first step identify the effects of announcements on financial market variables using an event-study approach and, in a second step, take these identified effects to estimate the impacts on output and inflation using either a theoretical or an empirical model (e.g., Gertler and Karadi 2015). The latter approach may suffer from the fact that in the second step typically models are used that assume that the relationship between financial variables and economic activity is constant over time while in reality this relationship may vary, in particular in extraordinary times, in which unconventional monetary policy measures are usually adopted.

3.1 Event studies

Event studies analyse whether the announcement of news about unconventional monetary policy measures changes financial market expectations, leading to changes in financial market variables. To identify the impact of announcements of unconventional monetary policy measures, the effects on interest rates or other financial market variables are measured within a small time window around the announcement. The time window is chosen to be sufficiently large to capture the complete effect of an announcement and sufficiently small to avoid other new information to have an impact (Gagnon et al. 2010). Moreover, control variables that account for such new information can be included in the model. The dependent variables in event studies are usually the changes of interest rates or asset returns on the day of the announcement. Using such a short time window is appropriate when markets are efficient insofar as that all financial market variables immediately adjust when the announcement of an unconventional monetary policy measure takes place.⁷ Further, it assumes that the announcement is the sole driver of changes of financial market variables in this time window. Moreover, this method assumes that the changes of financial market variables at the time of the announcement did not trigger or affect the announcement. Given these assumptions, event-studies are able to identify a causal effect of an announcement of an unconventional monetary policy measure on financial market variables (Gertler and Karadi 2013).

The event study approach is a very useful tool to evaluate the effects of the announcement of unconventional monetary policy measures on financial market variables, in particular because the identification of the causal relationship is relatively straightforward. Moreover, it is possible to differentiate between different forms of unconventional monetary policy measures or even between each individual measure. However, this approach has also important limitations. One of the most important limitations is that this approach does

⁷ However, Fratzscher et al. (2016) argue that for a number of reasons that is not necessarily the case.

neither take into account the impact of a measure that has been partly or completely expected by financial markets nor the impact of the implementation of a measure.⁸ Therefore, event studies capture only the surprise component (the unexpected part) of a measure and it is hardly possible to relate this surprise component to the overall volume of a policy measure. As a consequence, the effectiveness of a measure (relative to its volume) can hardly be assessed and the effectiveness of different measures (relative to their volumes) cannot be compared. Another limitation is that with this approach the direct effects on output and inflation, which are usually the main concern of central banks, cannot be determined because the causal identification of the impact of unconventional monetary policy only works at a high frequency at which output and inflation data are not available. Another caveat is that conclusions about the length and the persistence of the effects can be drawn only under very strong assumptions, such as the efficient market hypothesis. Finally, the effects of different announcements made on the same day are very hard to disentangle and the overall number of observations available for estimation is limited, increasing the estimation uncertainty.

3.2 VAR models

VAR models estimate systematic dynamic correlations between the relevant macroeconomic variables and policy instruments. To estimate the effects of unconventional monetary policy, typically the volume of the balance sheet of a central bank is included as the policy instrument. By imposing restrictions on the relationships between the variables in the VAR model, unconventional monetary policy shocks (or balance sheet shocks) can be identified. These shocks are used to assess the causal relationship between unconventional monetary policy measures and the relevant macroeconomic variables. The restrictions usually stem from economic theory and can include restrictions on the dynamic relationship between the variables. For example, it is usually assumed that a balance sheet shock (or more generally a monetary policy shock) does not have a contemporaneous impact on output and inflation because it takes time for monetary policy to work through the economy before finally impacting these variables.

VAR models are the most popular method to study the effects of conventional monetary policy (see, e.g., Bernanke and Blinder 1992, Bernanke and Mihov 1995, Christiano et al. 1999 or Peersman and Smets 2001) and there is a consensus in the literature on the effects of monetary policy on output or inflation. An advantage of using VAR models for estimating the impact of unconventional monetary policy is that they could directly tie in with the existing literature on monetary policy. Furthermore, the effects on output and inflation can be directly estimated. Moreover, it is possible to estimate the effectiveness of unconventional monetary policy measures relative to its volume because the estimated impact is related to the volume of a measure (e.g., the change in the balance sheet). A disadvantage of VAR models is that the identification of causal relationships of unconventional monetary policy is challenging because due to the limited time period during which such policy has been used by central banks only short samples are available for estimation. Therefore, it is also difficult to compare the effectiveness of different unconventional monetary measures. Moreover, while the VAR estimation includes an identification of monetary policy shocks, i.e. it yields estimates of the surprise effect of monetary policy (i.e., when and to which extent monetary policy measures were not anticipated by market participants), the reliability of the effects of unconventional monetary policy estimated in VARs depends on the correct estimation of the timing and the size of such surprise effects. Generally, it is difficult to distinguish monetary policy shocks from other shocks (like demand shocks) and the identifying assumptions are disputable. Further,

⁸ Recently, event study approaches have been augmented with the aim to take also the impact of the implementation of measures into account (see e.g. Fratzscher et al. 2016).

the frequency of data used in VARs is usually monthly or quarterly, so that it is difficult to correctly identify the timing and the size of anticipation effects of financial markets that take place on a daily or even intra-daily frequency.

4. EFFECTIVENESS OF UNCONVENTIONAL MONETARY POLICY MEASURES – A REVIEW OF THE LITERATURE

The empirical literature on the effectiveness of unconventional monetary policy focuses either on the effectiveness of balance sheet measures (Section 4.1) or on forward guidance (Section 4.2). The literature on the effectiveness of balance sheet measures can be further differentiated into the literature that estimates the effects on financial markets and on economic activity, with the former usually being based on event studies and the latter on VAR models. The literature that compares the effectiveness of different balance sheet measures is relatively scarce and usually evaluates the effects of these measures on financial market variables.

4.1 Balance sheet measures

Effects on financial markets

In the literature, there is a broad consensus that expansive balance sheet measures lead to a drop in long-term yields and a boost in asset prices. Many of these studies focus on the impact of QE programmes on financial markets in the US. The meta study by Williams (2014) based on papers that analyse US data shows that overall the size of the effects of monetary policy on long-term yields is very uncertain. Summarizing results from 14 papers, a QE programme comprising \$1 trillion in asset purchases are found to lower 10-year treasury yields by between 30 and 300 basis points. However, the average effect is a reduction of only about 40 basis points because the study finding a 300 basis point reduction is a severe outlier. Comparing a reduction of long-term yields by 40 basis points via QE programmes to conventional monetary policy, similar effects could be reached by lowering the short-term policy rate by about 1.5 to 1.75 percentage points (Chung et al. 2012, Gürkaynak et al. 2005). Studies for Japan (Ugai 2007) and for the United Kingdom (Joyce et al. 2012) also find that balance sheet measures lead to a decline in long-term yields.⁹

For the euro area, there are several studies that qualitatively support the results for the US, Japan, and the UK. For the euro area, the studies also put a focus on differences in the impact between different Member States of the euro area and on government bond spreads across countries. Fratzscher et al. (2016) evaluate the impact of the ECB's unconventional monetary policy measures on financial markets by using an event study approach with daily data from 2007 to 2012 and controlling for a large number of news shocks to distinguish financial market movements caused by ECB policy from other causes. Their results show that the announcement of ECB policy measures had a significant impact on financial market variables. Equity prices increased in all countries of the euro area following the announcement of the OMT and SMP programmes. Reductions in bond yields were concentrated in the "periphery" countries, while yields in the "core" countries even slightly increased so that bond spreads between the "periphery" and the "core" euro area countries decreased.¹⁰ The OMT related announcements in July and September 2012, for example, led to a cumulated 74 basis points decline in 10-year government bond yields in Italy and Spain and the SMP-related announcements in May 2010 and August 2011 to a 121 basis points reduction. Using confidential actual intervention data on ECB policy actions until mid-2014, Gibson et al. (2016) show that also the implementation of unconventional monetary policy measures of the ECB led to a decrease in sovereign spreads and alleviated financial stress. However, they find that the quantitative effects of these measures were modest, though

⁹ For a more detailed description on the earlier results on the effectiveness of Quantitative Easing, see Gern et al. (2015).

¹⁰ The "periphery" countries considered in their sample are Italy and Spain and the "core" countries are Austria, Finland, Germany, and the Netherlands.

statistically significant. For example, sovereign bonds purchases under the SMP programme in a given month scaled to a volume of €1 billion have an average effect on sovereign bond spreads of Greece, Ireland, Italy, Portugal and Spain vs. Germany of only 3 to 22 basis points.

Briciu and Lisi (2015) expand the sample of Fratzscher et al. (2016) until 2015 to include the announcement of the EAPP. They broadly confirm the findings by Fratzscher et al. (2016). The size of the impact, however, differs considerably across the different programmes. In tendency, following policy announcements bond yields decreased in periphery countries and increased in core countries. For example, policy announcements led to decreases of up to 66 basis points of 10-year government bond yields in Italy and Spain. While yields for Italy and Spain decreased following most announcements, there were, however, also increases of up to 40 basis points following specific policy measures. For Germany, yields increased by up to 34 basis points following most announcements, but there were also some decreases of up to 17 basis points. Andrade et al. (2016) focus on the effects of the ECB's EAPP, but do not consider earlier unconventional policy measures of the ECB. Overall, like Briciu and Lisi (2015), they find significant persistent announcement effects of the EAPP on sovereign yields and an increase in share prices of banks with a high portfolio share of sovereign bonds. While the announcement effects are significant, they find almost no additional implementation effects. The authors use a general equilibrium model and compare the effects of the EAPP to conventional monetary policy measures. They conclude that the EAPP has an effect similar to a 100 basis point interest rate cut.

Falagiarda and Reitz (2015) focus specifically on the effects on sovereign bond spreads within the euro area by analysing more than fifty announcements of the ECB (press conferences, press releases and speeches) between January 2008 and September 2012. They find that the ECB's announcements reduced long-term bond yield spreads relative to Germany in all GIIPS countries, except of Greece.¹¹ Szczerbowicz (2015) measures the impact of the ECB's unconventional monetary policies on bank and government borrowing costs. The borrowing conditions for banks are measured by money-market spreads (short-term funding) and covered bond spreads (longer-term funding). Government borrowing costs are approximated by sovereign bond spreads. She uses an event study approach and daily data from 2007 until 2012. She classifies seven categories of unconventional monetary policy news according to ECB press releases and show that SMP, OMT, and covered bond purchase programmes were most effective in lowering borrowing costs for banks and governments if there is high sovereign risk, while exceptional liquidity measures (in particular long-term refinancing operations) reduce money market tensions. Further, she finds spillover effects to other asset classes.

Summing up the findings of the various studies, unconventional monetary policy had significant effects on a broad range of financial market variables. In the euro area these effects were on average stronger for "periphery" countries leading to a decline in intra euro area government bond spreads. However, the size of the estimated effects considerably depends on with the different programmes analysed.

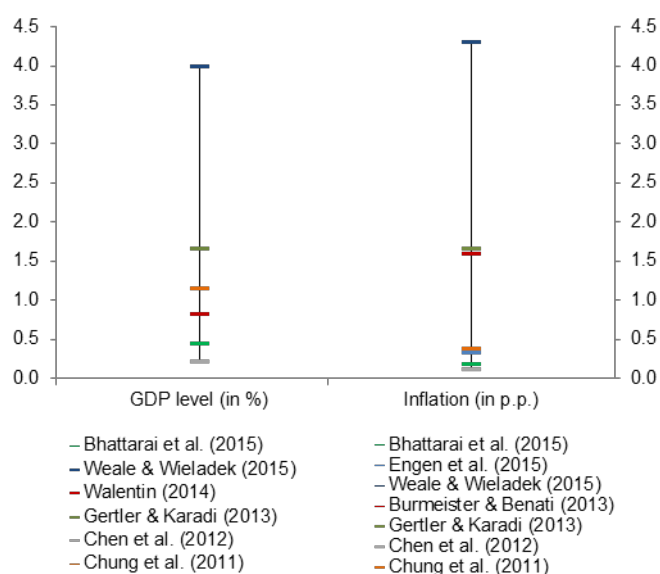
Effects on economic activity

There is a broad consensus in the literature that QE programmes have not only positive effects on financial market variables, but also on output and inflation. However, the size of the estimated effects varies considerably across studies. Looking at studies focusing on the US, for example, the peak effects of QE programmes scaled to \$1 trillion on GDP range between 0.2 and 4 percent. Similarly, the effects on inflation range from values close to 0 to about 4 percentage points. However, the study by Weale and Wiedelak (2016) that finds

¹¹ The GIIPS countries are Greece, Ireland, Italy, Portugal, and Spain.

the largest effect is an outlier. If this study is excluded, the average peak effect is an increase of GDP by 0.9 percent and of inflation of 0.7 percentage points (Figure 2).

Figure 2: Effects of balance sheet measures on GDP and consumer price inflation in the US (in percent)



Notes: The macroeconomic impacts are scaled to USD 1 tr. of asset purchases to allow for comparison across studies. Some of the studies provide the impact only for real GDP.

Source: Studies quoted in the chart and Constancio (2015); own calculations.

For the euro area, there are fewer studies, which we will discuss in more detail. Overall results for the euro area show that qualitatively unconventional monetary policy leads to similar effects as conventional monetary policy: a temporary (hump-shaped) response of output and a lagged but permanent increase in prices. Quantitatively, studies on the euro area find a very large range of possible effects on output and inflation ranging from effects close to zero to large effects, similar to the literature based on US data.

Boeckx et al. (2016b) study the macroeconomic effects of ECB balance sheet measures for the euro area and also for individual Member States from 2007 to 2014 using VAR models. Their results show that an expansionary balance sheet shock leads to an increase in credit growth, stabilizes financial markets, and has a positive impact on output and inflation. The dynamic effects are very similar to the findings in the literature on the effects of conventional monetary policy. Furthermore, they find a currency depreciation, a decrease in money market spreads as well as lower intra-euro area sovereign bond spreads versus the benchmark country Germany. Overall, their results suggest that balance sheet policies of the ECB are also effective to counter risks to financial stability. Via a counterfactual analysis, they show that euro area output and inflation would have been more than 1 percentage point lower in 2012 without the three-year LTRO programmes.

Bernoth, Rieth, Piffer and Hachula (2016) analyse the effects of Quantitative Easing in two steps. First, using an event study approach they estimate that the announcement of the EAPP decreased sovereign bond yields in the euro area (except Germany) by 10 basis points. They then simulate the effect of such a surprise 10 basis point decrease in sovereign bond yields on real GDP, consumer prices and inflation expectations using a VAR estimated on data from mid-2007 to mid-2015. They find an increase in economic activity of up to 0.2 percent and an increase in inflation of about 0.1 percentage points. They point out that these

findings are not necessarily a good guidance for the effects of unconventional monetary policy in the future because sovereign bond yields in the euro area are currently lower than they were in the analysed sample period. Therefore, there is less scope for stimulating macroeconomic effects from unconventional monetary policy measures, as the leeway for lowering bond yields further is potentially smaller.

Using a different method, a stylized theory-based macroeconomic model, Andrade et al. (2016), find much larger effects. Their results show that the purchases announced on 22 January 2015 increased output by up to 1.1 percent and inflation by up to 40 basis points. This illustrates that results of the effects of unconventional monetary policy on output and inflation are very uncertain and dependent on the framework. According to their findings, the EAPP programme is estimated to be roughly comparable to a decrease in standard policy interest rates by 1 percentage point.

Boeckx et al. (2016a) use the local projections method to analyse whether the unconventional monetary policies of the ECB have been effective in stimulating bank lending to the private sector for the period from July 2007 to December 2014. More precisely, they estimate dynamic effects of such policies on the volume of bank lending to households and firms, as well as the corresponding lending rates. Their dataset consists of 131 individual euro area banks and their bank lending rates and the respective volume of lending, credit support policy shocks, as well as of control variables capturing the main macroeconomic, financial and monetary fluctuations. Their results show that these policies stimulated lending by banks to the private sector and find support for the "bank lending view" of monetary transmission. In particular, they conclude that the policies were most effective for small banks (size effect), banks with less liquid balance sheets (liquidity effect), banks that depend more on wholesale funding (retail effect) and low-capitalized banks (capital effect).

Overall, there is evidence that balance sheet measures are effective in stimulating output and inflation. However, the size of these effects varies considerably across studies. Different studies are hardly comparable as they use different models and simulation scenarios. The purely empirically based papers imply rather moderate effects on output and inflation, while model simulations in some cases yield quite large effects.

Do the effects between different balance sheet measures vary a great deal?

Given the huge difficulties in empirically assessing the effectiveness of unconventional monetary policy in general, it is even more challenging to compare the effectiveness of different unconventional monetary policy measures. Such a comparison is complicated by the fact that many of these different measures have been announced and implemented in overlapping time periods. If the measures worked through different transmission channels of monetary policy and could be captured via different indicator variables, an identification of the effects of different effects may be feasible in VAR models. However, many of these measures work through several and coinciding transmission channels (Table 1).¹² For example, the LTRO programme is supposed to work via at least three different transmission channels (the portfolio balance, the interest, and the bank lending channel) on output and inflation while the asset purchasing programmes with a focus on government bonds mainly work via the fiscal and portfolio balance channel. Even worse, all of the programmes also work indirectly via other transmission channels on economic activity. For example, all of the programmes may have had an impact on the exchange rate even though it was not the main purpose of these programmes to do so. Moreover, many programmes, such as the OMT programme, have reduced financial fragmentation, financial stress, or uncertainty and thereby had effects on the functioning of the transmission channels and on economic activity. Even if identification were theoretically feasible, it would be difficult to implement

¹² For a detailed description of the transmission channels of unconventional monetary policy, see Appendix A.1.

it empirically due to the short time periods in which these unconventional monetary policy measures have been adopted.

Table 1: Transmission channels of unconventional monetary policy measures and indicator variables

Transmission channel	Implemented policy	Measurement indicator
Financial markets		
Portfolio balance channel	LTROs, EAPP (e.g., CBPP, PSPP)	Asset and stock market prices, interest rates and spreads, bank and sovereign CDS, money market spreads
Interest rate channel	FRFA, LTROs	Volatility indices (e.g. CISS), money in circulation, money market spreads
Exchange rate	funding in foreign currency, swap agreements	Exchange rate movements
Direct pass-through		
Bank lending channel	FRFA, LTROs	BLS indicators, credit and loan volumes
Interlinkages to sovereign debt		
Fiscal channel	SMP, OMT, PSPP, FRFA	Sovereign spread and yield, sovereign and bank CDS

Note: Transmission channels that are within the main purpose of each of unconventional monetary policy measures. According to Boeckx et al. (2016b); Ciccarelli et al. (2013); Draghi (2014) and own considerations.

Therefore, comparisons of different unconventional monetary policy measures have so far only been conducted by means of event studies. However, as described above, event studies can only estimate the announcement effect of a measure and are therefore inappropriate to provide a comprehensive comparison of the effectiveness of different measures.

With regard to the announcements effects on government bond yields, the available studies come to different results. Briciu and Lisi (2015) find that the OMT and SMP programmes had the largest effects on government bond yields in Spain and Italy, with the effects of OMT being somewhat larger. Both programmes led, however, to a slight increase in government bond yields in Germany. Fratzscher et al. (2016) also find that the announcement of the SMP and the OMT programme had significant effects on yields in Italy and Spain, however with the effect of the SMP being somewhat larger. They also find that the announcements of both programmes led to a slight increase in yields in Germany. Regarding interest rate spreads between German government bonds and government bonds of other euro area countries, Szczerbowicz (2015) find that the SMP and the OMT programme had the largest impact in Italy and Spain as well as in the euro area as a whole compared to other programmes, such as the LTRO programme. In contrast, Falagiarda and Reitz (2015) find large effects of the LTRO programme on spreads in Italy in Spain. The SMP programme also had large effects while the impacts of the OMT announcement were smaller but still significant. Overall, there is no consensus in the literature as to which of the different unconventional monetary policy measures has had the largest impact. Reasons could be different estimation samples, categorizations of announcements, and empirical models.

One reason why the results in the literature may vary considerably—in addition to the large problems with identification of the impact of different measures and the reasons mentioned above—is that the specific circumstances when a measure is adopted probably play a crucial role for its effectiveness. For example, direct credit easing measures that target specific market segments are usually much smaller in volume than direct quantitative easing measures. However, it is reasonable to assume that they are more effective than direct quantitative easing measures when they are able to increase the functioning of a market segment. Direct quantitative easing measures are in turn probably most effective in improving broad-based financial market conditions whereas indirect credit or quantitative easing measures, such as the LTROs, might be most effective in addressing liquidity problems in the banking sector.

4.2 Forward guidance

Estimating the effectiveness of forward guidance is difficult because it is complicated to disentangle the forward guidance component from the direct effects of simultaneously announced policy measures and because central bank communications can take many different forms.¹³ The effectiveness of forward guidance depends on this communication to be credible and correctly understood by financial market participants. However, it is difficult to measure whether forward guidance is indeed perceived to be credible and correctly understood.

Theoretically, forward guidance can have a significant impact on the economy. For example, Coenen and Warne (2013) using the ECB's New Area Wide Model find that at the lower bound for nominal interest rates forward guidance can reduce the downside risks to inflation.¹⁴ However, real world advantages of forward guidance are probably lower than those predicted by standard models (for an example, see Eggertson and Woodford, 2003) since those models are very sensitive to changes in their assumptions. McKay et al. (2016) point out that the large theoretical effects of forward guidance crucially depend on the complete markets assumption in these models and are considerably reduced if this assumption is relaxed.

The empirical evidence for the impact of forward guidance is mixed. Filardo and Hofmann (2014) argue that strong conclusions cannot be drawn regarding the announcement effects of interest rate forward guidance on future rates. Although there seems to be some moderate effects, these effects vary considerably over time and regarding specific circumstances when forward guidance is adopted. Furthermore, the data are likely contaminated by concurrent announcements regarding other policy measures and the fact that expectation formation is not solely dependent on official announcements.¹⁵ They also find some evidence that while forward guidance helps reducing interest rate volatility this effect fades out relatively quickly. This would be consistent with the time inconsistency problem of a central bank being unable to credibly commit today to holding the future interest rate low longer than justified by actual output and inflation dynamics in the future. Campbell et al. (2012) are even unable to identify effects of forward guidance on inflation and unemployment forecasts that exhibit the expected sign in US data. They interpret this as evidence that the Fed was perceived to have superior information about the economic outlook than the private sector (Delphic forward guidance) and that therefore forward

¹³ For a short description of theoretical aspects of forward guidance, see Appendix A.2.

¹⁴ And indeed, if overdone, increase the upside risks.

¹⁵ Market participants may often anticipate the next actions of policy makers before they are announced. In such cases, adjustments in interest rates would take place before forward guidance becomes part of the official record.

guidance of the Fed to keep interest rates low for a longer than expected period was interpreted by financial markets as an indication for a worsened economic outlook.

With regard to the announcement of the OMT programme the studies discussed in Section 4.1 (that in addition to balance sheet measures analysed effects of the announcement of the OMT programme as well) all in all found that OMT has led to a significant decline in long-term yields and an increase in asset prices, even though there is considerable uncertainty concerning the size of the effects. Krishnamurthy et al. (2014) find that the decrease in bond yields for Italy and Spain was due to decreased default and segmentation risks whereas reduced redenomination risks may also have been a factor in Spain and Portugal. They also find considerable stock price increases across all countries. The rise in perceived commonality in default risk as the reason for lower peripheral bonds is affirmed by Saka et al. (2015). Furthermore, Acharya et al. (2015a) find that the announcement of OMT induced US money market funds to provide more unsecured lending to European Banks.

Altavilla et al. (2014) use a multi-country VAR model to analysis the effect of the OMT programme. In a first step they look at the effects of OMT announcements on the Treasury bond markets in France, Germany, Italy, and Spain and find strong effects in the peripheral countries (in line with the results of Falagiarda and Reitz, 2015). In a second step, they used these results to calibrate a scenario in an estimated multi-country VAR. This scenario analysis shows that the reduction in bond yields due to the OMT announcements is associated with a significant increase in real activity between 0.3 percent for Germany and 2 percent for Spain. In addition, consumer prices increase significantly between 0.3 percent in Germany and 2 percent in Italy. These effects appear to be very large in comparison to other studies. However, while most studies look at the effects of one-time surprise shocks, Altavilla et al. (2014) simulate a specific scenario in which bond yields of Italy and Spain are assumed to decrease over a 3-year horizon by about 2 percentage points.

However, this improvement of the financial conditions in the euro area does not necessarily have had a strong impact on real activity. Acharya et al. (2015b) use firm level micro data to retrace the effects of OMT. They find that the significant reduction in peripheral government debt yields produced windfall valuation gains especially for banks in peripheral countries (because government bonds of these countries exhibited the strongest price increases and these banks had the largest exposure to their home sovereigns). This strengthened their equity positions and ability to obtain funding, both from private sources as well as from the Eurosystem. As a result, the loan supply to private borrowers increased. However, firms used these new loans to build up cash reserves, leaving employment and investment unaffected. By looking at firms' credit servicing ability and splitting them into good and bad borrowers, Acharya et al. (2015b) found that the beneficiaries of the newly provided funding were the bad borrowers. Before OMT, all firms were financially constrained, which afterwards ceased to be true for the low quality borrowers but remained for the high quality type.

All in all, forward guidance seems to have limited effects on financial markets and on economic activity. Overall, the effects seem to have lower effects than balance sheet measures even though one should keep in mind, these measures cannot be neatly distinguished. The experience with the OMT announcement suggests that credible promises of future central bank actions can have considerable effects on financial markets. However, OMT was announced in a very specific situation and aimed at the then very high risk premia on certain securities. Less turbulent times may provide smaller opportunities for forward guidance as an effective policy instrument.

5. DOES THE EFFECTIVENESS OF UNCONVENTIONAL MEASURES DECREASE OVER TIME?

Empirical studies on the effectiveness of unconventional monetary policy measures usually estimate the average impact of these measures within a specific time period. These time periods usually start with the beginning of the Global Financial Crisis when unconventional monetary policy measures were systematically applied for the first time (with Japan being an exception). However, these studies do not assess whether the effectiveness may have changed over time, i.e. whether the effectiveness has decreased. Such an assessment is complicated by the fact that the experiences, on which empirical studies have to draw on, are very limited.

Theoretical considerations

There are several reasons why the effectiveness of monetary policy could vary over time. While some of these reasons are related to the question as to why the effectiveness of monetary policy may change over time in general, some of these reasons are related to effectiveness of monetary policy during financial crises and are therefore more relevant for the period since the Global Financial Crisis.¹⁶

There are several reasons why monetary policy could be more effective during the acute phase of financial crises but less effective in their aftermath. One reason is that in the acute phase of a financial crisis uncertainty, financial stress, and credit constraints are particularly high. To the extent that monetary policy is able to alleviate uncertainty, financial stress, and credit constraints it could have an additional stimulating effect on economic activity compared to normal times when, for example, a further reduction of uncertainty—having returned already to normal levels—is less likely to have an additional effect on economic activity.¹⁷ Indeed, there is evidence that monetary policy is able to alleviate uncertainty, financial stress, and credit constraints (Basu and Bundick 2012; Bekaert et al. 2013; Bernanke and Gertler 1995). Monetary policy could be less effective in the aftermath of financial crises because these crises are usually preceded by the build-up of large financial imbalances, such as large increases in private credit and a boom on the housing market (Jorda et al. 2015). When these imbalances are corrected in the aftermath of financial crises, which usually takes a prolonged period of time, important transmission channels (such as the credit or interest rate channel) of monetary policy may be hampered (Borio 2014).

Furthermore, monetary policy could have diametrical effects on the soundness of the financial sector, which in turn is crucial for how monetary policy is transmitted into the real economy. When monetary policy, e.g. large-scale government bond purchase programmes, leads to a decline in interest rates, the corresponding increase in asset prices (e.g., the increase in the price of government bonds) will lead to windfall profits in the banking sector and strengthen the financial soundness. For example, after the announcement of the OMT programme, banks in the GIIPS countries received large windfall profits because the prices for government bonds of these countries increased (Acharya et al. 2015b). However, when interest rates stay at very low levels for prolonged periods of time, this will lower profit opportunities related to maturity transformation in the banking sector (Borio et al. 2015).

¹⁶ One reason why the effectiveness of monetary policy could vary over the business cycle is that the effectiveness is related to capacity utilization, i.e. that monetary policy is more effective during recessions, when capacity utilization is low. While earlier empirical studies were supportive for this hypothesis (Lo and Piger 2005; Peersman and Smets 2002), more recent studies challenge the earlier findings (Caggiano et al. 2014; Tenreyro and Thwaites 2016).

¹⁷ In this regard, it is relevant that the relationship between financial stress or uncertainty and economic activity might be non-linear, i.e. financial stress or uncertainty only harm economic activity after they have passed a specific threshold. For example, van Roye (2014) finds threshold effects for the impact of financial stress on euro area GDP.

In turn, the financial health of the banking sector could worsen in the medium run. For the euro area, the latter could be particularly problematic because the financial health of the banking sector in several countries is still suffering from a large amount of non-performing loans and because interest rates have already been very low for a period of about ten years and are expected to further remain low for a prolonged period of time.

Empirical evidence

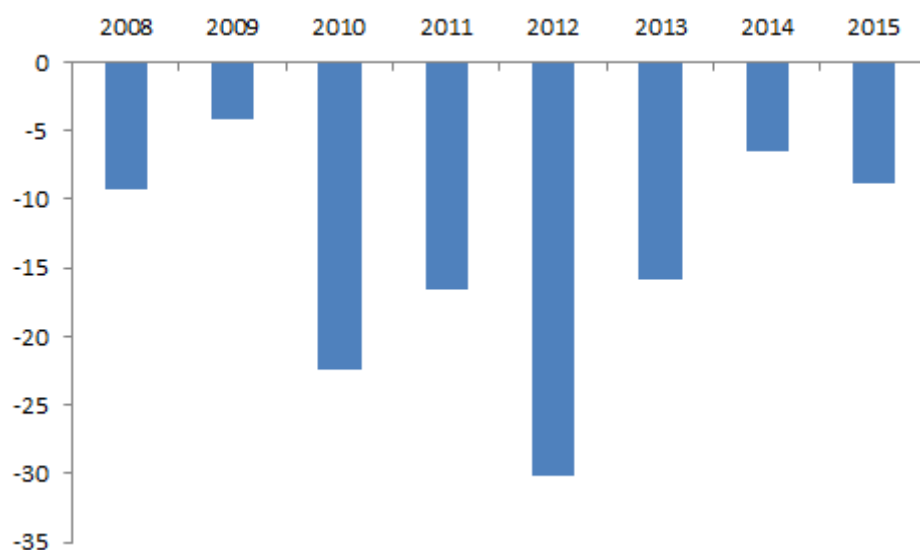
While there are theoretical arguments that the effectiveness of unconventional monetary policy has decreased over time, empirical evidence is scarce. However, there is increasing evidence that monetary policy is more effective during the acute phase of a financial crisis while it is less effective (compared to normal times) in the aftermath of financial crises. For example, Ciccarelli et al. (2013) find that monetary policy in the euro area became more effective in the period from 2007 to 2011 and Dahlhaus (2016) shows that US monetary policy is more effective when financial stress is high, which is usually the case during the acute phase of financial crises. Bech et al. (2014) find that monetary policy has no significant effects on economic activity in the aftermath of financial crises. In a comprehensive analysis Jannsen et al. (2015) find that monetary policy is more effective in the acute phase of a financial crisis while it has no significant effects on output and inflation in the aftermath of financial crises. While not all studies explicitly take unconventional monetary policy into account, Jannsen et al. (2015) use shadow interest rates as monetary policy instruments, which implicitly account for unconventional monetary policy measures (Wu and Xia 2014). In addition, Borio and Zabai (2016) conclude on the basis of a review of the empirical literature and the theoretical arguments that the effectiveness of unconventional monetary policy measures deteriorates over time.

Since there is no empirical evidence available that directly tests whether the effectiveness of unconventional monetary policy measures has decreased over time, we provide some results based on existing empirical models. Given the complexity involved in answering this empirical question, these results should only be seen as preliminary and cannot substitute for a comprehensive research agenda dealing with this topic.

Motivated by the reoccurring increase in sovereign bond spreads (versus the benchmark country Germany), an update of the event study by Falagiarda and Reitz (2015) shows that the most recent unconventional monetary policy announcements did not continue to significantly lower these spreads. This is in contrast to the findings about the acute phase of the Global Financial Crisis and the sovereign debt crises in several euro area countries (Falagiarda and Reitz 2015). We extend the study of Falagiarda and Reitz (2015), which analysed the impact of announcements by the ECB from 2008 to 2012 based on daily data, to the period from 2013 to March 2016. In the period from 2013 onwards, we identify 32 announcements, so we have a total number of 86 announcements of unconventional monetary policy measures in our sample. In contrast to Falagiarda and Reitz (2015), who analyse the impact of announcements on the spread of government bonds of the GIIPS countries compared to German government bonds, we analyse the impact on the spread of a hypothetical euro area government bond compared to German government bonds, to capture the effect for the overall euro area economy, which is relevant for the ECB. Otherwise, we use the same empirical model and estimation method as Falagiarda and Reitz (2015).¹⁸

¹⁸ We regress the first difference of the spread between a synthetic 10-year euro area government bond yield and 10-year German government bond yield on dummy variables that account for each of the announcements, its own lags and several control variables. The unconventional monetary policy dummy is equal to one on the day of an announcement and equal to zero otherwise. We include the following control variables in the regression: a euro area wide volatility measure (to control for financial stress), the total stock market index for the EU (to control for market-wide business climate changes), the TED spread (to control for perceived global credit risk).

Figure 3: Accumulated impact of announcements of unconventional monetary policy measures of the ECB on euro area government bond spreads (basis points)



Notes: Accumulated effects of the announcements for each year. Effect of the announcements of unconventional monetary policy measures of the ECB on the spread between synthetical 10-year euro area government bonds and 10-year German government bonds. Results are based on an update of Falagiarda and Reitz (2015).

Source: Thomson Financial Datastream; Falagiarda and Reitz (2015); own calculations.

We find that the announcements of unconventional monetary policy measures of the ECB on the euro area government bond spreads had the largest impact in the years 2012 and 2013. After 2013, the impact markedly declined and since 2013 no single announcement has had a significant impact on government bond spreads (Figure 3). Interestingly, the announcement of the EAPP of the ECB on 22 January 2015 did not have a significant impact on euro area government bond spreads either, indicating that this programme had been anticipated well in advance by market participants or that the programme had the same effects on government bond yields in Germany as in other euro area countries. Overall, the results indicate that the impact of announcements of unconventional policy measures of the ECB on government bond spreads has decreased over time. This lower impact of the announcements since 2013 could be due to several reasons. For example, the announcements could have been better anticipated by market participants¹⁹ (therefore the results do not indicate that the unconventional monetary policy measure per se had no effect) or the programmes announced may have had a lower volume. However, the lower impact could also be due to the fact that the spreads have become smaller since 2013 so that there was less room for the ECB to further reduce these spreads by additional measures. To the extent that government bond spreads are an indicator for uncertainty and financial market tensions, these results are line with the evidence discussed above, namely that monetary policy is more effective in periods of particularly high uncertainty and financial

The parameters are estimated using ordinary least squares with Newey/West correction of standard errors. We thank Matteo Falagiarda and Stefan Reitz for sharing their codes and data with us.

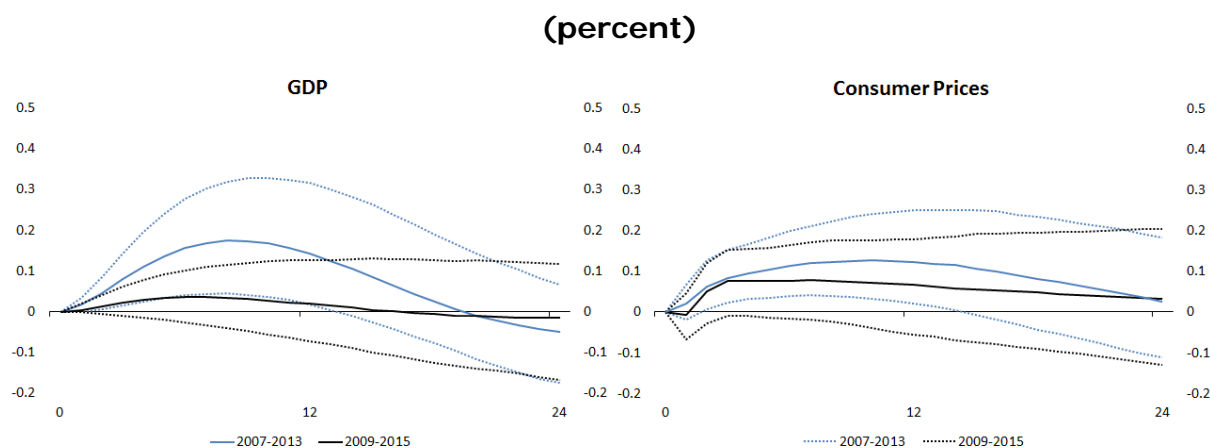
¹⁹ In this regard, one reason could be there was some uncertainty at the beginning of the sovereign debt crises in the GIIPS countries whether the ECB will intervene to reduce the government bond spreads in these countries. After the ECB intervened (e.g., via the OMT programme), this uncertainty was reduced and market participants adjusted their expectations so that recently only announcements that would deviate from this policy would have had a significant impact on government bond spreads.

market tensions (or high government bond spreads) and far less effective in the aftermath of such periods.

Boeckx et al. (2016b) estimate the impact of changes in the balance sheet of the ECB on output and inflation in the euro area in the period from 2007 to 2014 by means of a VAR model.²⁰ We extend their estimation period to the end of 2015 and estimate the impact of changes in the balance sheet for different time periods, namely for the period from 2007 to 2013 and for the period from 2009 to 2015. The period from 2007 to 2013 excludes the acute phase of the Global Financial Crisis while both estimation periods include the acute phase of the sovereign debt crises in some euro area countries. In doing so, we try to estimate time varying effects of monetary policy in the euro area. Given the arguments that monetary policy is more effective in times of high uncertainty and given that uncertainty was particularly high during the Global Financial Crisis, we would expect the effects of unconventional monetary policy measures to be lower in the period from 2009 to 2015, which excludes the acute phase of the Global Financial Crisis.

Our results show that the effects of changes in the balance sheet of the ECB on output were somewhat larger in the period from 2007 to 2013 compared to the period from 2009 to 2015. An increase in the balance sheet of one standard deviation in the period from 2007 to 2013 led to increase of GDP by about 0.1 percent (Figure 4). For the period from 2009 to 2015, we do not find a significant impact of changes in the balance sheet on output. With regard to the impact on inflation, the impact is somewhat lower and not significantly different from zero (according to the 68% confidence interval) in the period from 2009 to 2015.

²⁰ The SVAR model of Boeckx et al. (2016b) consists of macroeconomic, financial and monetary variables of relevance to the monetary policy decisions of the ECB, i.e., measures for economic activity, inflation, stock market volatility (VIX), interest rates and spreads and central bank total assets. The vector of endogenous variables contains: the log of seasonally adjusted real gross domestic product (GDP), the log of seasonally adjusted consumer prices (CPI), the log of central bank total assets, the level of financial stress, measured by the stock market volatility index (VIX), the interest spread between the interbank lending rate and the central bank policy rate, and the central bank policy rate. To identify an unconventional monetary policy shock, they use a mixture of zero and sign restrictions on the contemporaneous impact matrix to identify the exogenous shocks to the balance sheet. Specifically, Boeckx et al. (2016b) use four restrictions to identify the balance sheet shock: (i) there is only a lagged impact of the balance sheet shock on output and consumer prices, i.e. the contemporaneous impact on both variables is restricted to zero, while shocks on output and prices have a contemporaneous effect on the balance sheet. (ii) the unconventional monetary policy shock increases the balance sheet of the ECB but does not increase financial stress, which helps to disentangle such shocks from the endogenous response of the balance sheet to financial stress, (iii) an expansionary balance sheet shock does not increase the EONIA-MRO spread, (iv) the identified shocks have a zero contemporaneous impact on the MRO-rate, since the focus lies on unconventional - not conventional - monetary policy measures. The identified unconventional monetary policy shocks represent a mixture of different unconventional monetary policy measures (e.g. asset purchases, lowering collateral constraints, forward guidance) affecting the balance sheet. In the main text, we label these shocks as "changes in the balance sheet". The SVAR model is estimated with Bayesian inference using the Gibbs sampler to account for the short time horizon available for estimation. We thank Jef Boeckx, Maarten Dossche, and Gert Peersman for sharing their codes and data with us.

Figure 4: Impact of balance sheet shocks on euro area output and inflation

Notes: Monthly data. Impulse response functions to a one-standard deviation balance sheet shock on GDP and consumer prices (dotted lines: 68% confidence bands) for the euro area.

Sources: Thomson Reuters Datastream, Eurostat, ECB Statistical Data Warehouse, own calculations.

6. RISKS ASSOCIATED WITH UNCONVENTIONAL MEASURES

Monetary policy can have several side effects that are associated with economic costs or risks (White 2012). For an assessment of whether the stance of monetary policy is appropriate, these side effects should be taken into account in addition to the effectiveness of monetary policy to stabilize inflation and output. Many of these risks and side effects are not directly related to unconventional monetary policy but rather to prolonged periods of very expansionary monetary policy. In this regard, an important aspect of unconventional monetary policy is that it is usually related to longer periods of very expansionary monetary policy than conventional monetary policy because it becomes more difficult to tighten monetary policy (e.g., because it is practically not feasible for central banks to sell a large amount of assets in a relatively short period of time or because central banks do not want to deviate from their forward guidance to remain credible).²¹ Given that it seems theoretically plausible that the risks and side effects of expansionary monetary policy increase the longer it is in place, unconventional monetary policy is associated with higher risks than conventional monetary policy.

Side effects typically discussed include that expansionary monetary policy enhances risk-taking in the financial sector and thereby triggers financial imbalances that undermine financial stability (Drehmann et al. 2012; Rajan 2005, Maddaloni and Peydro 2011). In this regard, there is also empirical evidence that these risks increase the longer expansionary monetary policy is in place (Kahn 2010, Maddaloni and Peydro 2011, 2012). Moreover, expansionary monetary policy (which was also implemented with the argument that it was “to buy” time for national governments to implement structural reforms) may provide disincentives for structural reforms, e.g., because it lowers government bond yields. It also puts the independence of the ECB under threat because the more public and private debtors become accustomed to very low interest rates the more likely it becomes that an increase of interest would lead to a recurrence of the sovereign debt crises in the euro area or to large credit defaults that further weaken the financial health of the banking sector. Currently, it seems unlikely that the ECB is able to conduct its monetary policy independently of the fiscal position of the euro area Member States and of the financial health of the financial system in the near future, indicating that it has already lost some of its independence in deciding about the stance of its monetary policy.²² In this regard, the exit from the very expansionary monetary policy likewise becomes more difficult.²³

Another potential side effect that is becoming more and more relevant and that may counteract the effectiveness of monetary policy in stimulating output and inflation is that expansionary monetary policy potentially contributes to the misallocation of resources. Cetto et al. (2016) empirically show that there is a significant relationship between the real interest rate and productivity: the lower the real interest rate, the lower is productivity. They also show that the strong decline in real interest rates associated with the introduction of the euro contributed significantly to the low growth rates of productivity in Spain and Italy in

²¹ Central banks that have accumulated a large volume of assets in their balance sheet by QE programmes could tighten monetary policy also by increasing interest rates and do not have to sell large amounts of their assets. However, this could weaken the balance sheet of central banks and in turn weaken their credibility so that this form of tightening is also associated with risks (Boysen-Hogrefe et al. 2015; Boysen-Hogrefe et al. 2016).

²² The EAPP could also have an impact on how the ECB conducts its monetary policy. The ECB may try to avoid increases in the interest rates in the future even if this would be appropriate in terms its inflation target because this would lower the value of the assets in its balance sheet (or in extreme cases lead to the default of assets, such as government bonds) and could weaken the financial position of the ECB. A weaker financial position could be a threat to the independence of a central bank (Boysen-Hogrefe et al. 2015; Boysen-Hogrefe et al. 2016).

²³ For a more detailed description of these risks and side effects, see White (2012), Gern et al. (2015), or Boysen-Hogrefe et al. (2016).

the period before the Global Financial Crisis. The rationale for the impact of real interest rates on productivity is that in a low interest rate environment it becomes more likely that less productive firms attract more than proportional funding. Gopinath et al. (2015) show based on firm level data that this mechanism contributed significantly to the productivity slowdown in Spain before the Global Financial Crisis. Very low interest rates can even lead to the so-called “Zombification” of firms and banks, namely a situation when firms, which are de-facto bankrupt, get further funding because financially weak banks want to avoid writing down credits of these firms. This phenomenon has been analysed for Japan (Caballero et al. 2008, Hoshi and Kashyap 2004). With regard to the euro area, Acharya et al. (2015b) show based on firm-level data that the windfall profits for banks in the peripheral countries due to the OMT announcement have led to an increase of loans to firms with below than average credit servicing ability. Given that these firms usually were already debtors of these banks and that they had to pay lower interest rates for their new loans than firms in the core countries of the euro area with very high credit ratings, the OMT announcement probably contributed to the “Zombification” of firms in the euro area. Acharya et al. (2015b) also show that these firms did not use the additional funding for investment or job creation so that even in the short-run no stimulating effects for the economy have taken place. To the extent that such a behaviour of banks is not specific for the OMT programme but also present for other unconventional monetary policy measures or more generally for periods of very expansionary monetary policy this issue is becoming more and more relevant in the euro area and may counteract the expected stimulating effects of unconventional monetary policy on output and inflation.

7. CONCLUSIONS

The ECB has adopted a series of unconventional monetary policy measures since the Global Financial Crisis including balance sheet measures and forward guidance. Theoretically, unconventional monetary policy can affect financial markets and in turn the economy in various ways. Empirically, it is very difficult to identify and to estimate the effects of unconventional monetary policy. The impact of unconventional monetary policy on financial markets can be identified most conveniently. There is a broad consensus in the literature that unconventional monetary policy of the ECB and of other central banks has improved financial market conditions, including a decline in long-term yields and an increase in asset prices. However, there is a large uncertainty when quantifying these effects. Moreover, the impact on financial markets is not necessarily sufficient to draw conclusions for the impact on output and inflation, which are in the main interest of central banks. This is because the typical relationship between financial markets and output and inflation may be different in extraordinary times when unconventional monetary policy is most likely adopted. Therefore, identifying the effects of unconventional monetary policy on output and inflation is more demanding. In the literature that empirically analyses these effects, there is a consensus that unconventional monetary policy has a temporary positive impact on output and inflation. However, the estimated size of this impact varies considerably.

All of the empirical studies on unconventional monetary policy estimate average effects on output and inflation but do not consider that their effectiveness may vary over time. There are theoretical arguments why monetary policy becomes less effective the longer it is in place. For example, monetary policy could be effective in stimulating output and inflation in the acute phase of financial crises (e.g., when uncertainty and financial stress is high) but could be ineffective in the aftermath of financial crises when adjustments processes block monetary policy transmission channels. The available empirical literature is supportive of these arguments. This would imply that the monetary policy of ECB was most effective in the acute phase of the Global Financial Crisis and the sovereign debt crises in some euro area countries but less effective in more recent years. Moreover, the longer low interest rates are in place, the more the financial health of the banking sector could be weakened because maturity transformation becomes less profitable. Finally, there is increasing evidence that very low interest rates could contribute to the misallocation of resources, thereby weighing on productivity growth and more generally on economic activity. Overall, while there is no comprehensive empirical literature available on whether the effectiveness of unconventional monetary policy decreases over time, the available evidence seems to be supportive for this hypothesis.

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APPENDIX

APPENDIX A: TRANSMISSION CHANNELS OF UNCONVENTIONAL MONETARY POLICY

In this Appendix, we describe transmission channels of unconventional monetary policy that may help central banks to reach their targets in the short run. A description of channels that may counteract these effects even in the short run or may have negative impacts on economic activity in the longer run are described in Section 7 on the risks and side effects of unconventional monetary policy.

A.1 Balance sheet measures

QE measures can involve a variety of policy measures such as changes in the size, composition and duration of the central bank's balance sheet, respectively portfolio, or adjusting collateral requirements. Specific foreign exchange market interventions that increase the central bank's balance sheet like foreign currency swap lines between central banks can also be categorized as QE measures. Similar to standard QE measures such interventions increase liquidity in the banking system, though in this case in foreign currency denominated assets.

The aim of all these measures is an increase in aggregate demand and inflation. The transmission works through various channels, most of which aim at a further flattening of the yield curve by directly targeting medium to long-term rates. While different transmission channels can be clearly distinguished in theory, one should bear in mind that it is difficult to disentangle the different channels empirically.

Portfolio balance channel

By means of asset purchases, a central bank can reduce the supply of a particular asset on the financial market and simultaneously increase the amount of circulating money, which will lead to higher prices and lower yields on the purchased assets. As of the lower yields investors are incentivized to rebalance their portfolios by seeking for alternative assets with higher returns. Accordingly, an increased demand for substitutive assets also leads to falling prices and interest rates in other market segments and in particular in a decrease of risk premia. Hence, QE leads not only to lower interest rates in the specific market segment included in an asset purchase program of the central bank, but to generally lower interest rates.²⁴ In general, aggregate demand should increase as financing conditions improve via lower interest rates. In addition, falling interest rates make investments in domestic assets less attractive relative to foreign assets. Hence, QE triggers net capital outflows (or reduces net capital inflows) as investors move to foreign assets that yield higher returns. This leads to currency depreciation, boosts exports and dampens imports. Further, the increase in asset prices contributes directly through wealth effects and indirectly via an increase in the value of collateralizable assets to higher aggregate demand.

²⁴ However, empirically it has been shown, that in addition to a general flattening of the yield curve, the effects on the real economy depend on the type of assets purchased. For example, the US QE1 program involved large scale purchases of mortgage backed securities which stimulated the real estate sector much more than other sectors of the US economy (Di Maggio, Kermani, Palmer, 2016).

Bank lending channel

The injection of liquidity results in a rise of credit supplied by banks, reducing liquidity and term premium and, accordingly, lowering lending rates and interest rate charged by banks. The fall in bank lending rates boosts credit demand and supply. The subsequent improvement in the balance sheet position of investors and banks eases leverage constraints and allows banks to extend more credit at lower costs to the private sector leading to the bank lending channel. Further, expansionary monetary policy increases the value of outstanding bank loans through an appreciation of collateral and the expected associated repayment flows.

Better financing conditions improve growth prospects, increase profitability and mitigate default probabilities in the non-financial sector. These positive feedback effects further improve the condition of the balance sheets of investors and banks, and increase their willingness to extend new credit in a self-reinforcing positive spiral.

Fiscal Channel

Finally, if the central bank's securities purchases include government bonds – as was the case with the ECB's sovereign bond purchases – then these purchases may ease government budget constraints. Therefore, this improves the scope for implementing fiscal policy measures without raising public debt, boosting investment and aggregate demand. Further, the close linkage between sovereign debt refinancing and a country's default risk lowers sovereign bonds yields, sovereign credit default swap rates (CDS) as well as the respective spreads. In particular, sovereign bond purchases in the periphery may have induced lower sovereign bond yields and CDS rates in the respective countries and, in addition, could have led to spill-over effects to other Member States.

Expectations and confidence

Assuming the effectiveness of the introduced unconventional monetary policy measures and the intactness of the previously discussed transmission channels, the economic activity and outlook should improve as a consequence of expansionary unconventional monetary policy. Accordingly, the introduced measures should significantly stimulate GDP and induce price increases and thereby lead to higher inflation. Given that market participants adjust their expectations right away and anticipate these medium-run economic effects, one would expect inflation expectations to increase immediately, which would lead to an instantaneous reduction in the ex-ante real interest rate. Further, this could also have confidence effects by improving the economic outlook; reducing uncertainty and lowering financial market volatility, particularly in times of financial distress. Strengthened business confidence may encourage investment spending directly and may also contribute to a reduction of risk premiums. This confidence channel can affect portfolio decisions and asset prices by altering the risk appetite of investors.

A.2 Forward guidance

In general, forward guidance is defined as the central bank communicating information about its future monetary policy actions to financial market participants and the public at large. Depending on how credible this information is people will adjust their expectations and behaviour accordingly.

In practice, the concept of forward guidance encompasses a considerable range of policies. They can be categorized along several dimensions, including their aims and the means by which those are to be achieved.

First, one can broadly distinguish between “Delphic” and “Odyssean” forward guidance (Campbell et al. 2012):

- Delphic forward guidance gives the central banks assessment of the economic outlook. This form of forward guidance would only have an effect if the central bank is perceived to have better knowledge about the economy or superior forecasting ability vis-à-vis the market. Praet (2014) states that he does not believe this to be true. If he is correct and his belief is widely shared, then market actors’ economic outlook would not depend on the central banks’ forecast. This would, for example, give the ECB the ability to signal its aim to keep monetary policy loose for an extended period of time without having to fear that this would be interpreted as a negative signal for the economic outlook by financial markets, which could have contractive side effects for the economy.
- Odyssean forward guidance provides information about the metaphorical mast to which the central bank wants to tie itself. In other words, the central bank gives a signal about policy actions it will take in the future (possibly amended by some conditions that would need to be fulfilled for certain actions to be triggered). The effectiveness of this type of forward guidance crucially depends on the credibility of the central bank to follow through on its announcements. After the financial crisis, central banks increasingly attempted to use Odyssean forward guidance to provide expansionary stimuli.

Second, forward guidance can have a number of different aims:

- Forward guidance can be used to provide further stimulus to the economy when short-term interest rates have reached the effective lower bound. The rationale is that long-term interest rates today are tightly connected to the expected path of short-term interest rates such that the central bank can reduce long-term rates by committing to a lower path of the (short-term) policy rate. Since investment and the purchase of durable goods depend on the long-term financing conditions, a credible policy of this type would provide additional stimulus to the economy (Praet 2013, Filardo and Hofmann 2014).
- Furthermore, forward guidance can help the central bank to clarify its reaction function, i.e., the way it reacts to changes in the economic outlook. If successful this would, ceteris paribus, lead to a reduction in the volatility of market expectations and possibly also to lower risk premia. This would improve financing costs and provide economic stimulus at the margin (Filardo and Hofmann 2014). It would also reduce adjustment costs from unexpected changes in monetary policy.
- Even when central banks are not operating at the effective lower bound, forward guidance may sometimes prove useful if it can help repair the transmission channels of monetary policy. For example, if banks are reluctant to lend despite very low short-term rates, assurances regarding the provision of liquidity for an extended period of time may help unclog the credit channel. A special case is the fear of redenomination in a currency union: an explicit commitment to preserve the membership of all participants could reduce risk spreads, counteracting asymmetrical challenges to the transmission of monetary policy (Praet 2014).

Third, the communication about future monetary policy can take different forms:

- Central bank statements can be conditional or unconditional. Conditional forward guidance would inform the audience that the central bank intends to conduct its future monetary policy depending on developments in variables such as inflation, unemployment, or exchange rates, whereas the size and duration of unconditionally signalled policy is supposed to be unaffected by incoming data.
- Furthermore, policy makers can choose the degree of precision of their announcements. A (credible) commitment to future policy actions becomes the more

effective in reducing risk premia and providing stimulus for the economy the more information the central bank provides about their future plans and on the relevant information for their monetary policy decisions. The effectiveness regarding the reduction of risk and the provision of stimulus of a (credible) commitment to future policy actions increases when the central bank provides more information about its future policies and the economic variables it plans to take into account for upcoming decisions.

- Forward guidance does not have to come in the form of explicit statements by the central bank. Often it is provided indirectly through other monetary policy actions. For example, when a central bank conducts an unconventional asset purchasing programme, market participants may believe that the central bank's balance sheet will stay elongated for an extended period of time. Reasons for this include that if inflation and interest rates pick up again in the future, bonds bought by the central bank in times of lower rates might, unless held to maturity, only be saleable with a considerable nominal loss, something central bankers would be loath to do. Furthermore, a sudden reversal of central bank purchases could lead to considerable turbulences at least in the markets for the affected securities and underlying assets (possibly affecting the solvency of some issuers if they depend on continuous access to refinancing at favourable conditions) which policy makers would be expected to try to avoid.

NOTES

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Transmission channels of unconventional monetary policy in the euro area: where do we stand?

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IN-DEPTH ANALYSIS

Abstract

This paper reviews and updates the evidence on the impact of unconventional monetary policies in the euro area. We start with direct quantitative easing (QE), and find modest impacts on output growth and jobs consistent with a mild stimulus to recovery – but no evidence of inflation. These QE impacts appear to have weakened over time (QE fatigue) due to diminishing quality of available assets and decreased scope for QE around the zero interest rate lower bound. Indirect easing via official financing and credit easing provides an additional channel. This may be used to enhance the policy impact by reducing risk premia by region or sector, as well as stabilising the finances of key non-financial sectors. The second type of unconventional policy is forward guidance. It too can enhance the impacts of QE type policies, this time by underpinning the credibility and continuity of the expansionary monetary policies. The evidence on the size of this effect however is mixed, and some of the more extravagant claims are implausible. The difficulty with these policies, and the ultimate focus of this paper, is the weakening – if not breakdown – of the transmissions between low cost credit, and investment or consumption spending. There are many reasons for this breakdown: on the demand side, risk aversion due to a weak recovery, superimposed austerity, the desire to pay off past debt; on the supply side, incomplete pass-through in interest rates, nonperforming loans, financial regulation. What can be done to repair the transmission mechanisms? Several options are available. Coordinated fiscal policies (via GDP bonds) and bypassing the failed transmissions using the exchange rate channel look the most promising.

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EXECUTIVE SUMMARY

- Unconventional monetary policies by Central Banks are a form of expansionary policy where market interest rates are reduced differentially at different maturities – lowering them at the long rates which affect investment and household consumption decisions. They are designed to stimulate spending by increasing broad money holdings, pushing up asset prices, producing wealth effects, lowering borrowing costs, and thereby stimulating aggregate demand.
- The experience of those who have tried Quantitative Easing (asset purchase) policies (the US Federal Reserve, Bank of England, Bank of Japan) is fairly uniform: small but significant increases in GDP of $\frac{1}{4}\%$ - $\frac{1}{2}\%$ each year; and 10-year interest rates lower by $\frac{1}{4}\%$ - $\frac{3}{8}\%$. The impact on prices and inflation has been negligible ($<0.1\%$) in each case.
- The ECB's asset purchase programme is too young to allow a final assessment of its impact and effectiveness. But the results so far in the euro zone are broadly the same as elsewhere, if a little weaker: output growth around 0.3% on average and inflation at -0.05%, from January 2015 to mid 2016.
- This weakening of QE effects over time, QE fatigue, is a common feature due to the diminishing quality of assets and decreased scope for QE interventions around the zero interest rate lower bound. The stabilising effects of better liquidity provision remain.
- Indirect easing via official financing and/or credit easing provides an additional channel. This enhances policy impact by reducing risk premia by region, as well as stabilising the financial position of key non-financial sectors. Evidence suggests this may have a larger effect than direct QE.
- Forward guidance is the second type of unconventional policy. It is useful in this case because it can enhance the impact of QE by emphasising the credibility and durability of the expansion. Evidence on the size of this effect however is mixed, and the more extravagant theoretical claims are misplaced.
- The difficulty faced by unconventional monetary policy is a breakdown in transmission between increased liquidity/cheap credit and loans, investment and spending. This is caused by debt deleveraging, superimposed austerity, risk aversion, poor incentives in a weak recovery, the risk of non-performing loans, and poorly timed bank regulation.
- The policy implications: we need to actively repair these transmissions, strengthen the policy pass-through, and offset private sector deleveraging.
- Specifically: i) to focus on reducing risk premia by region or sector; ii) coordinate fiscal policies to exploit the extra fiscal space created by quantitative easing, and extend it by targeting long term bonds; iii) bypass the transmissions by reinforcing the exchange rate channel with currency interventions; iv) use the extra "monetary space" available to press for self-sustaining structural reforms; and v) use forward guidance on a wider set of indicators to underpin the credibility and continuity of the expansion.

1. LARGE-SCALE ASSET PURCHASE POLICIES: A RESTATEMENT

Unconventional monetary policies are based on the idea that the central bank can stimulate the economy when conventional monetary policy has become ineffective, by intervening to change long-term market rates. Monetary policy can lower market rates directly by undertaking large-scale asset purchases at longer maturities (quantitative easing QE; section 2); or by purchasing corporate bonds; or by direct loans to businesses and firms to lower their cost of borrowing (credit easing; section 3).

QE therefore aims to stimulate spending by increasing broad money holdings, pushing up asset prices, creating wealth and lowering borrowing costs to stimulate spending. This portfolio rebalancing process, triggered by the ECB's asset purchases, lowers the spread of long-term interest rates over short-term policy rates *and* the return on risky assets over risk-free assets. Portfolio rebalancing is the main policy transmission mechanism of concern to QE. There are others: the signalling channel (a commitment to keep future policy rates low; section 4); the liquidity-credit channel (the translation of greater liquidity into actual credit and loans; section 5); and the exchange rate channel (depreciations of the exchange rate to boost exports). Since these additional channels operate in parallel to portfolio rebalancing, they produce different cocktails of impacts to the main thrust of QE.

Yet, quantitative easing may not be sufficient to spark a recovery in output or prices in bad times. Lower interest rates at the maturities that would normally persuade businesses to invest, or consumers to buy durable goods, does not guarantee they will want to invest or consume. Faced with declining incomes and/or high levels of debt, if they are risk averse they may well prefer to conserve what resources they have to pay off past debts. The pass-through (transmission) from cheap credit to borrowing and new spending is impaired by this reluctance. Similarly banks will not wish to lend if they fear more non-performing loans, tighter regulatory constraints on lending, or austerity that limits income growth and spending. Similarly, consumers will prefer to save than spend if there are significant risks that their incomes will fall or unemployment rise because the economy fails to recover.

In other words, to revive investment or consumption, businesses and consumers have to believe in the prospect of rising incomes, rising profits and higher prices, alongside available credit, low borrowing costs and sufficient liquidity, before they will invest or consume their way out of recession and into recovery. Thus unimpaired transmission channels lie at the heart of, and are necessary for successful unconventional monetary policies.

2. HOW EFFECTIVE IS UNCONVENTIONAL MONETARY POLICY IN THE EURO AREA? THE EVIDENCE SO FAR

There have been several asset purchase programmes in recent years, principally in the US (to 2014), UK (to 2014), Japan (restarted in 2013), and in the Euro-zone (since 2015). Any assessment of how effective or successful these programmes have been must include an analysis of their impact on the designated targets of economic policy. Since the ECB's programme has been in operation only 18 months, the full impact is not yet clear. But general lessons, and a picture of the likely impacts, can be inferred from results elsewhere.

2.1 Quantitative easing by large-scale asset purchases

The basis of unconventional monetary policies is that financial markets are neither perfect nor complete. Therefore arbitrage tends to work imperfectly, depending on expected future interest rates as well as on the preference for short-term over long-term assets.

In such circumstances, monetary authorities can purchase significant quantities of Treasury securities of long maturity, or mortgage-backed securities, or corporate bonds, altering their relative supply vs. demand. This raises bond prices and lowers interest rates at that maturity. These effects then extend to other longer-term assets as investors who just sold securities to the central bank move to invest in substitutes that are closer to the asset sold than cash in order to maintain their preferred portfolio balance, thereby adding further downward pressure on interest rates along the yield curve or in neighbouring markets. Using this portfolio balance or "ripple" effect, the central bank is able to affect both the spread of long-term interest rates over policy rates (term premium) *and* the necessary return on risky assets over risk-free assets (risk premium). The monetary authorities can therefore manipulate the interest rates relevant to consumption and investment spending.

2.2 Impacts in the US and UK

The policy process described above is an example of the QE implemented by the US and UK after the financial crisis. Available data confirm the impact of this policy channel. In the US, before QE, there was an average excess term premium of almost 200 basis points for securities with a 10 year over a 9 year term. This premium then dropped by 75 basis points as a consequence of QE (Fawley and Juvenal 2012). In the UK, QE reduced the spread of corporate bonds over gilts by between 2000 (for high yield bonds) and 200 basis points (for investment-grade, non-financial bonds) after 2009, and the yield on 10-year gilts from 5% to 2% (Miles, 2012). The ripple effect to neighbouring markets, other maturities, and in particular to reducing risk premia, was therefore quite strong.

How much did those changes translate into gains in output and employment, or losses in inflation? A range of estimates for the US, reported in Williams (2011), suggest that these QE policies reduced interest rates by between 0.15% and 0.3% points in this period – which corresponds to having increased GDP by similar amounts each year. That is valuable, but not large. There was no perceptible impact on inflation, or inflation expectations, before the programme ended.

In the UK, QE is estimated to have added 3% to the level of GDP over the 6 years since 2009 compared to what would have happened otherwise, with negligible effects on inflation [0.1% or less in the US, UK, Japan]¹. Thus, real output is higher by ½% on average each year; equivalent to an extra 0.4% on the growth rate. However, unemployment typically

¹ Kapetanios *et al* (2012); Joyce *et al* (2012); Bank of England (2012).

follows output with a one to two year delay. Hence QE operations may take two years or more to achieve their full effect on the economy.²

2.3 Lessons learned from the US

The Federal Reserve in the US has conducted three rounds of QE. The first ("QE1") lasted from 2008 to 2010 and involved asset purchases of \$2.1tn; the second ("QE2", from 2010-12) added a further \$2.05tn assets initially at the rate of \$30bn a month; and the third ("QE3", 2012-14) bought assets at \$85bn a month before being tapered to \$65bn, then \$50bn a month, and terminated in late 2014.

In total, the three QE programmes amounted to \$4.5tn or 25% of GDP. This is large. But in proportion to output, it is the same as in the UK; but larger than the current programme for the euro area, which at €80bn per month in 2016 amounts to 16% of euro area GDP.

2.3.1 Financial impacts, QE fatigue? In the early stages, the emphasis was on how far QE had been able to reduce long term market interest rates. Early estimates suggested rates had fallen by between 30 and 100 basis points depending on the type of security (Gagnon *et al*, 2011). Subsequent studies of QE1 and QE2 found similar results (Williams 2011), as did the corresponding studies undertaken for the UK. Later studies from the QE2-QE3 era (Chen *et al*, 2012, for example) reduced these estimated interest rate reductions to around 30-40 basis points, or 4-9 basis points per \$100bn of asset purchases.

There are several explanations for this weakening. First, there may have been "QE fatigue" when the supply of good quality assets available for purchase began to fall. There have been instances of that: the Bank of England failed to meet its purchases target in 2016, and where the ECB was mooted to have failed to fill its quota for certain national bonds and had to buy German bonds instead. Second, repeated applications of QE inevitably create expectations of inflation which undermine the downward pressure on interest rates further along the yield curve. Third, adherence to the zero lower bound means that interest rate reductions, per unit of QE, will be smaller the lower are market interest rates at the start of the exercise (less important in times of zero or negative interest rates). Any one of these factors would lead to declining impacts as QE progresses.

A second point is that QE may have an impact on a number of other variables – the most important being on risk premia, as opposed to term premia. To the extent that QE reduces the risk premia in corporate bonds, or in bank borrowing, or on bank loans, it will have an impact on the cost of borrowing and the progress of the economy – over and above what may have been achieved in underlying market-wide interest rates. Many think that this is the major advantage of QE (Gagnon *et al*, 2011) and that QE operations should be matched to the interest rates you wish to reduce (LeRoy and Lucotte, 2016).

This point obviously reflects the liquidity provision aspect of QE, and QE's ability to stabilise fragile, dysfunctional financial markets. But it also raises the question: which assets should the ECB buy? Evidently it should buy beyond government bonds and include corporate bonds and those of the distressed governments if it wishes to have the maximum effect in lowering commercial borrowing costs, in particular real interest rates in regions or sectors where risk premia or deflation are strongest. But it should focus on a spread of bonds if the priority is to revive a deflating euro area economy.

A third point is that, by reducing market interest rates, QE will cause an economy's exchange rate to depreciate. On one hand, this is useful as it will boost net exports (so long

² The results for output (but *not* inflation) were less favourable in Japan where circumstances were different. QE has also been effective in other countries by stabilising the financial sector, and by making credit conditions and the flow of funds offered for investment more reliable.

as other economies do not use QE too) and add to the recovery. On the other hand, it is unhelpful because it may induce a capital outflow which will lower asset prices and raise interest rates again. These two effects will therefore tend to offset each other.

2.3.2 Macroeconomic effects: Early estimates of the output and price effects of QE operations in the US economy were optimistic: the drop in long term interest rates of $\frac{1}{2}\%$ point in QE1 was thought to raise GDP by 3% in the short run, and prices by 1%, all else equal. Later estimates from the QE2 period reduced those figures to GDP increases of 0.4%-0.5% a year over 5 years with a minimal upward impact on prices (Chen *et al* 2012), driven by a smaller fall in interest rates, about 0.2% points, spread over a longer period. These results emphasize the value of maintaining continuity and credibility in QE.

These results are in line with those found in other OECD economies. In fact, longer periods of commitment to low interest rates appears to increase the gains in GDP sharply; but at the cost of some extra inflation. That introduces a trade-off and the need for careful timing. Signalling policy intent (forward guidance) appears to be a crucial aspect of successful QE.

There is additional evidence that around half the interest rate reductions come from lower risk premia that follow from QE operations. This reduction in risk premia, then allows an additional modest but persistent increase in output due to small but lasting falls in real interest rates where they matter most – the suggestion being that risk premia reductions are necessary to achieve an enduring fall in real, as well as , interest rates.

2.4 QE impacts in the euro area

Do the results seen in the euro area so far match those in the US and UK? The ECB's asset purchasing programme appears to have had a limited impact on the Euro-zone economy, with output growth averaging at 0.3% and inflation -0.05% from late 2014 through 2015. This may be because the programme is proportionately smaller ($\frac{2}{3}$ rds of the US and UK programmes); or because long run interest rates fell by less ($\frac{1}{2}\%$ on average), having started from a lower level. Hence the logical extension to negative interest rates in 2015.

However by 2016 the impacts had become larger than this. Output growth reached 1.5%, unemployment was lower and the trade surplus rose from 1% to 2% of GDP on the back of a 25% fall in the Euro since 2014. But whether these results are due to QE directly is moot; more likely they are driven by the exchange rate channel (section 5.4) set in motion by QE.

That said, a few comments can be made on why QE programmes have had such a limited impact on the real economy. The first is that monetary policy has had to act alone; it has not been able to take advantage of fiscal expansions at the same time, or exploit lower borrowing costs either directly or by refinancing past debt. Only Italy seems have done that systematically, to be rewarded with small gains in *relative* performance. This suggests QE programmes will be more effective when conducted together with other policies (section 5).

Second, low levels of private sector lending seem to have been a problem everywhere. In surveys, 85% of the banks report QE programmes have had no effect on lending. That suggests difficulties with the transmissions between liquidity provision and credit uptake. Investment spending is still below its 2008 peak; *real* interest rates are still high; and many small businesses and consumers still prefer to pay down debt.

Third, also important, non-performing loans have increased and are now greater than 9% of GDP which makes the banks reluctant to lend. Each of these factors reduces the effectiveness of the ECB's asset purchases programme and need to be addressed.

3. INDIRECT EASING: OFFICIAL FINANCING, CREDIT EASING

According to former Fed Chairman Bernanke, we can classify unconventional policies into quantitative easing and credit easing. The former reflects monetary injections from the Fed through commercial banks; the latter where central banks provide liquidity to the economy bypassing financial intermediaries, by buying private-sector assets such as corporate bonds or residential mortgage backed securities, or by making direct loans. Included within this definition of credit easing are subsidised loans, cheap loans, funds for lending, and liquidity or credit provided directly to firms. This credit easing channel is of most value where there are liquidity restraints in the banking system which would prevent any injections of liquidity from being transformed into loans to households and firms; or where firms are credit constrained by past debt or perceptions of short term risk in their markets; or where banks or firms are likely to use the extra liquidity to pay off past debts or raise their capital or liquidity ratios as required under the financial regulations associated with Basel III, Dodd-Frank or EU banking union.

Cheap loans from the ECB via its Long Term Refinancing Operations (LTRO) programme, or liquidity support to the banking sector via the Target2 payments system in which national central banks are empowered to provide credit support to domestic banks under pressure if they are short of funds, would appear to work in a similar way as the Bank of England's "funds for lending". They both create extra liquidity at home and increase the value of the stock of home assets. That in turn reduces the *net* "foreign" liability position and leads to lower interest rates (Hughes Hallett and Martinez Oliva, 2015). Cash injections from the ESM, direct credit to firms, or asset purchases by the ECB will reinforce this effect.

Nevertheless, there are two crucial differences:

- i) Although the loans under the LTRO program were intended for domestic banks to lend on to private firms, in fact they were mostly lent on to distressed governments (to lower borrowing costs, so as to reduce the level of risk to the home banking system should there be a liquidity or solvency crisis). Because the loan contracts were not written with explicit penalty clauses, there was no mechanism to prevent this behaviour. The upshot was that a bank's extra liquidity was not lent on for investment or consumption spending. Instead the funds were used to ease or retire debt. As a result, the main impact of this policy has been via the side effects of improved liquidity and increased financial stability – and from there to lower borrowing costs, lower risk premia, less risk, and hence a gradual improvement in output and employment. The results were clear to see in the 2012-13 era when the spreads on 10 year borrowing rates over German rates fell dramatically in the distressed economies. Not all those improvements can be ascribed to the LTRO program of course, because the loans were short term and comparatively modest, and because they came just before the more general Outright Monetary Transactions (OMT) initiative which had a larger effect. But the point is nonetheless made. This kind of approach is to some extent self-limiting in that distressed banks have limited supplies of collateral or collateral of progressively diminishing quality³. It would likely suffer diminishing returns, just like QE.
- ii) Because any loans to, or implicit borrowing by home banks were made from European institutions, those loans are in effect foreign liabilities. If you are not in control of your own money supply and prices, the net foreign liability position matters. That means the capacity to earn additional "foreign" revenues to pay off the loans and interest plays a central role, which implies that either *relative* growth or the current account balance has to improve to make that happen. If that fails, repeated loans and/or liquidity injections will be necessary to keep interest rates down until the **real** exchange rate

³ Valiante (2015)

has to be forced down by enough to raise growth relative to others or to improve the trade balance. That is relatively easy when you operate your own currency; the nominal exchange rate can be forced down by printing money or buying foreign currencies. But in the Euro-zone this has to be done by structural reforms which depress domestic prices relative to Euro prices. This typically takes 6 to 10 years of recession to achieve⁴, which condemns policymakers to seek repeated loans and foreign liabilities until the process is complete. Understandably therefore, this approach has achieved little success (or popularity).

⁴ See Hughes Hallett and Martinez Oliva (2015) for example.

4. FORWARD GUIDANCE

Forward guidance, the process by which ECB policymakers try to steer economic behaviour by making announcements of intended future policies (interest rates, future QE purchases) together with an explanation or analysis of how those policies can be expected to relate to the ECB's policy objectives, is the other form of unconventional monetary policy currently used by the world's central banks.⁵ The idea is that, by announcing future policies or policy stances, the ECB can steer market expectations and hence shift economic behaviour to something consistent with the outcomes that fit with their goals for the economy.

This approach is different from normal policymaking because it depends on persuasion, public information and explanatory logic. The idea itself is well known; but the conditions under which it can be expected to work or not work, and when the policies promised will be credible, are not restrictive. To function as an effective policy strategy, the economy has to satisfy a "no unit root" condition (that the evolution of future expectations does not offset the economy's natural dynamics) and have sufficient policy instruments to reach its policy targets or have sufficient time to do so⁶. If these conditions are satisfied, there will be an equilibrium state and the promised policies will be (*ceteris paribus*) credible.

The next question is, do forward guidance policies have a significant impact in practice? This is hard to measure definitively since forward guidance is designed to make private sector *expectations* consistent with both the central bank's *intentions* for interest rates and *expected* growth and investment outcomes. There is some evidence that it has reduced the volatility of expectations. Given that, some have argued that forward guidance is best used for stabilization, especially at the zero lower bound, rather than recovery and expansion.

The literature on forward guidance is, at this point, rather limited and restricted to specific problems. A natural concern is whether forward guidance has had a perceptible impact on expectations. Some argue that it has not, at least not in four leading OECD economies. Others argue that it did in the United States when viewed over a longer period (1990–2011). Still others suggest that our standard models often overestimate the size of these impacts. Obviously the jury is still out on this issue.

More recent studies find forward guidance announcements have the power to lower interest rates, prompting consumption and output to recover, *provided* private sector expectations adjust—the more so, the longer the horizon. Nevertheless in an important qualification, the stability of the economy may be put at risk. Under moderate negative shocks, forward guidance can be used to stabilize the system. But large negative shocks (as would appear in a serious recession) may overwhelm the forward guidance system and leave us unable to stabilize the economy.

These results are pretty mixed. Another strand of the most recent literature has produced different story: that forward guidance has very large effects. Announcing a 1% reduction in interest rates for one period 5 years hence, has an impact on inflation 18 times larger than for an equal sized change in current interest rates.⁷ What is more, this factor gain increases with the horizon: pushing the announcements out increases the apparent power of forward guidance till it eventually explodes. This is not entirely plausible⁸. MacKay et al demonstrate these extreme results go away with incomplete markets, heterogeneous credit constrained firms/consumers, and uncertain information. However these results almost certainly have a

⁵ Williams (2011), MacKay et al (2016)

⁶ These results, and references for the empirical evidence in the next two paragraphs, will be found in Hughes Hallett and Acocella (2016).

⁷ For these results, see MacKay et al (2016) and the references therein.

⁸ It is equivalent to saying that King Croesus became so rich because he foresaw the era of ultra-low interest rates 2500 years later

simpler explanation. The models used have forward looking expectations, but no dynamics from past events. As a result they do not satisfy the (Blanchard-Kahn) stability condition to define an eventual equilibrium. It is fairly easy to show that, for most parameter values, they exhibit explosive or near-explosive behaviour. This line of results appears misplaced.

5. REPAIRING THE FAILED TRANSMISSION MECHANISMS

Asset purchases, liquidity provision and low borrowing costs may not be sufficient to spark a recovery in output or prices in bad times. Lower interest rates at the maturities that would normally persuade businesses to invest, or consumers to buy durable goods, do not guarantee they will necessarily do either. Faced with declining incomes and high levels of debt, they may well prefer, and have in practice preferred, to save and pay off past debts as protection against future recessions. The pass-through (transmission mechanism) from cheap credit to actual borrowing and new spending is held back by this reluctance. This is to be expected. Why would a business invest if the prospect of being able to profit from rising incomes or a recovery appears remote? Or if there are significant risks of insolvency from past debt obligations if earnings growth were to slow down? Similarly, consumers will prefer to save than spend if they think that incomes may fall or jobs will be lost because the economy fails to recover – the more so, the more they are indebted.

5.1 Why transmission mechanisms fail

Risk aversion: The experience in recent asset purchase programmes, not least in the EU, has been that businesses and consumers have been reluctant to invest or spend on the scale needed to trigger a firm recovery, despite the extra liquidity, partly because of the risk of continued stagnation and soft prices, and partly because banks fear increasing non-performing loans in an extended recession, especially in periods when bank credit is tightly regulated.⁹

In the euro area, this has happened more strongly than elsewhere because businesses, consumers and banks have been paying off past debt at a time when there were no other stimulus measures (of any kind) to counteract the deleveraging – despite the extra liquidity created by QE being available to undertake such measures. That itself would explain a good part of why the transmission mechanisms appear to have weakened and/or failed in the EU economies, compared to elsewhere. In addition, the deleveraging process typically happens in the private sector long before it takes place in the public sector (as Figure 1 in Hughes Hallett, 2016a, demonstrates). And, to make things worse, the ECB has faced the double disadvantage of austerity policies imposed on top of this deleveraging process. That has made the asset purchases programme less effective than it could otherwise have been; and has made the need to find ways to reinforce, repair, or replace damaged or ineffective transmission mechanisms a more pressing issue. Section 5.2 shows the scope to do this.

Incomplete pass-through: To summarise the effects of risk aversion. First, after a period of high debt, most consumers and investors will prefer to pay off excess debt than take on new credit. Second, low interest rates will spur refinancing rather than new borrowing. Third, rising interest rates in the US are signals of the recovery to come. By contrast, very low rates in the euro area signal very low expectations for recovery. Investment, aggregate demand and consumer spending will contract in view of the diminished prospects for higher earnings, implying a damaged policy transmission from cheap credit to spending.

Of greater concern perhaps, is the impact of changes in pass-through on the transmission mechanism. The impact of any policy change comes in two parts: first, the change in *market* rates that results from a unit change in the policy rate (the pass-through); second, the change in the economic variables that we want to influence the impact of the per unit change in market rates (the transmission). It appears both have fallen in the EU since the financial crisis. Before 2007, each 1% change in the policy rate was matched by a 1% change in market rates. But since then, market rates have changed by much less than that each time. This can happen for different reasons. In an era of low interest rates, investors may prefer

⁹ Feldstein (2016)

to invest their funds in equities. That means banks have to offer higher interest rates than before to attract the funds to lend. So the market rate falls by less than the policy rate when the latter is reduced. Or, in bad times, investors or firms prefer to hoard their excess funds rather than deposit them in banks whose financial health they distrust (risk aversion) or to avoid negative interest rates. Again, the link to market rates is broken.

The break in transmission mechanism is more easily illustrated by the difficulty of getting the banks to lend on funds deposited with them in bad times. This may be risk aversion: the banks regard their clients as too risky, either individually or generally because the economy is contracting. Or it may be because firms and consumers are paying off their debts or downsizing in a contracting economy, or because investors prefer to hoard their cash or put it into equities for a higher return rather than deposit them in a risky bank, or because the banks prefer not to lend to a risky firm or not to risk new nonperforming loans. However it happens, the requisite loans are not made, or available credit is not taken up, and the target variables are not boosted as they should be.

5.2 What can be done to repair or improve policy transmissions?

Negative Interest Rates: Negative interest rates are not usually a part of unconventional monetary policy, but they are the logical extension – especially when the need to repair ineffective transmission mechanisms becomes the central issue.

Negative interest rates come into play for one of two reasons: i) to deter capital inflows, exchange rate appreciations or a loss of competitiveness; ii) to expand expansionary monetary policies, to generate a recovery or avoid deflation. We are not concerned with the first case here, but the second leads to problems for banks, depositors and policymakers.

Drawbacks for the banks:

- a) They reduce bank profits (if the clients are not charged interest on deposits at the same time). This is now thought to be a serious threat.
- b) They induce credit contractions if the new interest payments reduce reserves below the required ratio. That would shrink the loan portfolio; the very opposite of what we need to generate a recovery. It may also discourage holding adequate reserves in the first place.
- c) Falling profits may lead to inadequate capital ratios, a safety issue.
- d) It is often unclear if negative interest rates are intended as an extension of QE, or follow from weakening market fundamentals induced by the failure to create a recovery.
- e) They encourage banks and businesses to hold their reserves or deposits in cash outside the reach of the central bank. Reserves held that way are not available to be lent out as credit for investment or consumption spending. This would be yet a further reduction in the transmission between policy and credit for new spending. Whether this actually happens or not depends on whether the negative rates are larger than storage costs plus insurance and transaction fees. So small negative rates (above $-\frac{1}{2}\%$) may not cause problems; but more negative rates can be counterproductive. The fact that big corporations are thought to hold unused cash deposits internally of at least \$1.7 trillion, two-thirds of the banking system, suggests this would be a risk that markets would take seriously.
- f) A break on large negative interest rates may emerge from private bond sales at small negative yields (like those by Henkel or Sanofi) that allow investors to park their money at lower cost. This would reduce the risks posed by negative rates.

Drawbacks for depositors (firms, investors, consumers):

- a) Negative interest rates discourage savings/deposits (so the credit expansion is smaller).

- b) They encourage banks to make loans, but imply higher risks for the banks that do so.
- c) They raise the costs for firms if they too must pay interest on their deposits, implying falling profits and an incentive to work outside the banking system – leading to reduced credit expansions.
- d) They lead to reduced spending by consumers (and firms) who have to divert greater funds to pension savings in order to maintain expected or contractual pension levels.

Drawbacks for policymakers:

- i) The risk that low/negative interest rates will leave policymakers with no space to reduce their rates further should there be another recessionary shock. This will be true so long as there is some kind of threshold below which rates cannot go without becoming ineffective – as seems likely given diminishing returns and risk factors noted.
- ii) Negative rates often have unwanted redistribution effects depending on the composition of banks and financial markets, the proportion of transactions settled by cash, whether the home currency has safe haven status, on export/import income and price elasticities, on the structure of the domestic pensions markets (state funded, pay as you go, or privately funded) and the degree of financial regulation. Banks dependent on retail deposits, facing little competitive pressure, or with poor access to liquid/deep financial markets will be more exposed to negative interest rates. Similarly economies with a low cash usage, limited safe haven/home bias effects, larger trade elasticities, or a low proportion of state and pay-as-you-go pensions, will find negative interest rates are relatively successful (have a larger impact). The outcomes in the Euro-zone are likely to be mixed: Germany, the Netherlands, and Sweden having a low cash usage, little competition in banks/financial markets, larger trade elasticities, but a safe haven status and state funded pay-as-you-go pensions will see some success. But France, Italy and peripheral economies that have the opposite structure are likely to see less success.

Negative interest rates have therefore had different effects in different places. At this point Sweden seems to have had benefited, but the Euro-zone has not. Attitudes or perceptions of risk can also play a role. In 2015, investors bought US dollars expecting the dollar to rise vis-à-vis the euro because US yields/interest rates were rising there compared to the Euro-zone. At the same time they bought riskier investments (equities, corporate bonds, household debt) elsewhere in their search for higher yields. This was especially marked for large institutional investors (pension funds, insurance companies) with future liabilities to meet.

Later, with bank profitability under threat, and no reaction from central banks, the markets began to suspect that central banks had abandoned their traditional responsibility to supply liquidity to the financial system as needed. This increased the risks to the strategy above. With the world economy slowing down, the view was that further interest rates rises were unlikely (except in the US). So many investors sold off their riskier investments to go into safer, if lower yield Treasury bonds. This led investors to purchase safe bonds in cheaper jurisdictions (Germany, UK, Japan, Canada, Switzerland) and to rises in the corresponding exchange rates. Paradoxically therefore, negative interest rates have led to lower interest rates but rising exchange rates in a flight to safety, especially where risk premia still persist by sector or region within a currency area. This, in turn, has wiped out many of the helpful exchange rate channel effects (section 5.4) just where they are needed most.

Funds for lending/term funding at the central bank: These schemes are a form of credit easing (Section 3), but with the added twist that the banks are given a direct financial incentive to lend on the extra liquidity they are provided with. In short, the accent is on persuading (“bribing”?) the banks to lend on the cheap credit rather than just using those funds to underpin the banking system and financial markets.

The Bank of England introduced its “funds for lending” scheme in 2012-15, and effectively reintroduced it as the term funding scheme in 2016. Here banks borrow directly from the central bank, either in Treasury Bills or direct loans, at below market rates. Credit based on these loans can then be extended or lent on to the private sector at market rates with the margin retained by the lender so long as the lender can demonstrate the additional credit has been used by firms/households for additional spending. If it cannot, the banks at issue are charged a penal interest rate for the original loan, rendering the whole transaction unprofitable. The catch of course is still the transmission mechanism: whether the banks can persuade firms to take up the additional credit on offer.

Helicopter money: Helicopter money is defined as money created by the central bank, but distributed as cash or liquidity to banks, firms or households directly without going through the asset markets, or as a loan, or in payment of some service – as if scattered from a helicopter on high. This money might be distributed in two ways. Newly created cash could be placed in the reserves of the commercial banks, ready for lending out. As such, no asset purchases are involved (which makes the central bank’s balance sheet look worse since there is no possibility of an exit strategy to redeem the new assets to reduce the bank’s swollen balance sheet). In other words, this approach is an extreme form of “funds for lending”, but is otherwise likely to have an impact similar to QE. However, it is also likely to suffer the same drawbacks as QE: there is no certainty that firms/household will want to borrow the new money to invest or spend, or that the banks will risk making new loans. This approach does not get round the transmission problem.

The second way to distribute the money is to make *ex-gratia* payments to the population, as a tax rebate, a rebate for some mis-selling or competition infringement, or as “cash for clunkers”. The idea is that, in the hands of consumers or firms, the money is more likely to be spent and create a boost for aggregate demand in the economy. However, even if it did, the revenues from that increased demand will likely be deposited back in the banks with no guarantee that they would be lent out again. Hence, while helicopter money may partially repair the transmission problem, it will only do so to a limited degree in the cases where serious repair is necessary.

There are other reasons why helicopter money might be ineffective. We need to get exactly the right quantity of money created – enough to create an effective stimulus, but not so much as to trigger escalating inflation expectations. With no exit strategy, this is a difficult exercise. Second, the quantity of money created needs to be determined and distributed by the central bank (even if through the agency of others) in order to ensure that favoured special interests are not favoured. Third, if the distribution is made through government accounts, financial markets may fear swollen fiscal deficits and debt. That would raise long interest rates, potentially offsetting the entire asset purchase programme. However, the main drawback is the simplest: there is still no guarantee that the new helicopter money would be spent. If consumers fear for the sustainability of the welfare system in the downturn; or if, in the absence of growth, firms prefer to pay down debt, the new money will be saved instead of spent. There is evidence that this is likely. Japan has supplemented her QE programme with helicopter fiscal expansions on several occasions, but to no obvious effect. Consumers have preferred to save the extra cash, and firms have invested abroad rather than at home. The risk therefore is that helicopter money fails to repair the transmission mechanisms to any material extent.

5.3 Coordinated fiscal stimuli

If transmission mechanisms are weak or ineffective, there is an obvious case for strengthening them by coordinating with other expansionary policies. This could be used to offset the effects of deleveraging, austerity policies, risk aversion and tighter bank regulation discussed in Section 5.1 above. Structural reform aside, which is a long term proposition

and designed to make the recovery self-sustaining rather than trigger a recovery, the natural partner is expansionary fiscal policy. Indeed Fazi (2015), for example, argues that the inability to take advantage of a coordinated package of fiscal and asset purchases is the main reason why the ECB's QE asset purchase programme has only had limited effects. It is the combination of the two which is important in this context. There are many reasons why fiscal policy has not been used, extended deficits and the sovereign debt crisis being principle among them. But these constraints do not affect all countries. It should be possible to create a coordinated package of fiscal policies to support the asset purchase programme, with Eurobonds or inter-country loans from the stronger economies to direct the spending to where it is most needed (recognising that the loans would have to be made anyway if the distressed economies were to fail to recover).

The key point here is that even countries with large fiscal imbalances could contribute to a supporting fiscal expansion by exploiting the fall in borrowing rates that QE has made possible. Refinancing debt would enable the average Euro-zone country increase its fiscal spending/reduce taxes by 0.45% of GDP as a result of the ½% interest rate fall in QE, without any increase to its debt or deficit ratio. For France the contribution might be 0.5% of GDP; for Germany 0.4% and so on. The contribution from the high debt countries could be rather higher, depending on how much QE has brought local risk premia down. For Italy, the contribution could be 0.7% and up. Only Italy and Portugal have taken advantage of this option; whereas, reversing the argument, half of the improvement in Germany's deficit ratio since 2014 actually represents fiscal stimulus withdrawn.

This idea can be made systematic, so that it operates in every policy period, by introducing GDP-linked bonds. In these bonds, interest payments are adjusted down according to an agreed formula whenever GDP growth is below trend or potential output; and up when GDP growth rises above trend (potential) output. That makes the adjustments symmetric¹⁰, with no systematic bias or loss of discipline in the long term (because it forces governments to "save for a rainy day" in good times). It also means the interest rate applied to determine repayments varies up and down as growth varies above or below its trend or potential – expanding the fiscal space available for new fiscal interventions in bad times, but requiring debt to be paid down in good times.

A formal analysis of how these bonds would work is given in Bank of England (2016), with a summary in Hughes Hallett (2016b). And the practicalities for implementation are now a matter for further research by the IMF and the G20 group of economies. However, several observations follow from the existing results: i) extra fiscal space will always open up in times of low borrowing costs, allowing additional fiscal stimulus to be applied at the cost of little or no extra debt; ii) but if these bonds are used on a case-by-case basis, they have to depend on good luck (random external events) to be effective; iii) GDP-linked bonds make the opportunity to exploit extra fiscal space *systematic* because they reduce the variability of debt for any permitted or required change in the primary deficit. Hence, what GDP bonds do is make this extra fiscal coordination automatic instead of opportunistic.

That said we must distinguish two cases: a) where interest rates and growth are negatively correlated so borrowing costs rise whenever growth falls – the conventional case for high debt countries; and b) where they are positively correlated – meaning lower interest payments and budget savings if growth falls. GDP bonds institutionalise the latter, not only for new issues but also the entire debt stock if the latter is refinanced. And the markets know in advance that this may be expected. So GDP bonds reduce the risk that debt becomes unsustainable, while connecting with additional fiscal expansions to increase the impact of

¹⁰ To avoid complications, we assume zero repayments if growth turns negative

unconventional monetary policies in bad times. This seems to be our best chance of overcoming the natural weakening of monetary transmissions in recession periods.

5.4 Is it possible to bypass ineffective transmission mechanisms?

Given that the impact of the ECB's asset purchase programmes has been rather small, but tempts pension and insurance funds to invest in risky assets, and that the transmission mechanism between asset purchases and higher investment or spending easily becomes damaged or ineffective and hard to repair, it is not surprising that many conclude that the exchange rate channel is a more effective route for QE to benefit the home economy.

The exchange rate channel operates as follows: lower asset yields in the QE economy will prompt capital outflows and hence a depreciation of the domestic currency and hence extra exports, while reducing imports from trade partners who face an appreciating currency in one of their export markets. This is clear to see in the Euro-zone. Since QE was announced in late 2014 the euro has depreciated, aided by a secular appreciation of the US dollar. This may have been the cause of the tentative upturn in growth in the Euro-area in 2015-16. In short, we can bypass damaged or ineffective transmission mechanisms by exploiting the exchange rate channel.

Most of the literature on the exchange rate channel has focussed on the damage to others. But that damage may be less than one thinks for two reasons (Hughes Hallett, 2016b). First, if QE is successful in the home economy from recession, then domestic demand will not fall as much as it might have done and the demand for imports is sustained. The impact then turns on whether the income elasticity of imports outweighs the export price elasticity. But, whether it does or not, the *net* effect will be small. Second, if falling yields at home trigger a capital outflow, the associated asset sales will depress asset prices and increase interest rates – partially offsetting the impact of the ECB's asset purchases.

Third, investors, seeing falling yields at home, will typically look for higher yields and hence more risky investments elsewhere, transferring risk to and easing monetary conditions in those economies. However Fic (2013) shows that the impact of QE has been 70% through reduced term premia, and only 30% through lower risk premia. Fourth, the benefits to the Euro-area will accrue to the more competitive economies. Successful QE programmes need to be carried out in conjunction with structural reform measures.

6. CONCLUSIONS

The ECB's asset purchases programme has been in operation since March 2015. It is too early to give a definitive judgment on its effectiveness. But the results so far are in line with those in other economies where QE has been used: a small reduction in long run interest rates, increased output growth of around 0.3%, and no inflation.

To get a perspective on the effectiveness of the ECB's programme, comparisons with QE programmes elsewhere are helpful. These comparisons suggest a major gain is the stabilisation of financial markets and lower risk premia achieved through targeted credit easing. The inevitable difficulty seems to be the weak or inoperative transmission mechanisms and debt deleveraging. To some extent this can be offset by extensive use of forward guidance and the natural exchange rate effects of unconventional monetary policies. More promising would be to repair the loss of transmission by matching unconventional monetary policies with coordinated fiscal expansions, perhaps using GDP-bonds to exploit extra fiscal space as it opens up. That strategy deserves further investigation.

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