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Effectiveness of the ECB Programme of Asset Purchases: Where Do We Stand?

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IMPRESSUM

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Effectiveness of the ECB Programme of Asset Purchases: Where Do We Stand?

In-Depth Analysis

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Abstract

The ECB has engaged in several forms of unconventional monetary policy since 2007. This report documents empirically that the implemented measures were effective. In a counterfactual analysis, the report simulates the effects of an unconventional monetary policy shock of -10 basis points to euro area sovereign yields, consistent with the effect of the first announcement of the Expanded Asset Purchase Programme (EAPP). The simulation shows that the surprise expansion led to significant increases of output, prices, and inflation expectations, as well as to a drop in the unemployment rate. The shock is transmitted to the economy through lower public and private interest rates, and an increase in bank credit to the private sector. The results also suggest that the effects of unconventional monetary policy interventions do not differ much from those of conventional policy measures.

Executive Summary

- Since 2007, the European Central Bank (ECB) has employed a wide variety of non-standard policy measures to calm financial markets, stabilize the macro-economy, and bring the inflation rate to its target of close to, but below, 2%.

- In particular, in 2015 the ECB introduced an Expanded Asset Purchase Program (EAPP), which has already been extended both in duration and amount of assets purchased.

- This report uses a vector autoregressive (VAR) model to investigate empirically how the non-standard monetary policy measures employed by the ECB affect the euro area macroeconomy.

- In a counterfactual analysis, the effects of an unconventional monetary impulse that changes euro area sovereign yields by -0.1 basis points are simulated. In particular, the monetary impulse that is fed into the model is scaled so that it is consistent with the financial market impact of the initial announcement of the EAPP.

- The simulation shows that non-conventional monetary surprise expansions are effective in stimulating real activity, reducing unemployment, and increasing inflation in the euro area.

- The responses of both output and prices to the non-standard monetary expansion are sluggish, reaching their peak after about two years. This timing is similar to the one often documented for output and prices following a 'standard' (conventional) monetary policy expansion, which works through changes in the policy rate.

- The results also show that non-standard monetary policy interventions increase different measures of inflation expectations (survey data and financial market-based inflation expectations).

- Moreover, policy expansions are found to positively impact the conditions and volume of credit issued to both non-financial firms and households in the euro area.

- Further results indicate that non-standard monetary policy is transmitted to the real economy through changes in public and private interest rates of different maturities, as well as higher stock market returns. In contrast, on average the euro is not found to depreciate against the US dollar after a policy expansion.

- Overall, the estimations show that ECB non-standard monetary policy can be effective in stimulating the euro area economy. Regarding the most recent extensions of the EAPP, however, results must be treated with caution, given that the announcements of the extensions have not eased financial markets conditions as much as the initial EAPP announcement.

1 Introduction

Since the onset of the financial crisis in 2007, the European Central Bank (ECB) has engaged in a wide variety of non-standard monetary policy measures. These include, for instance, enlarging the pool of assets accepted as collateral for refinancing operations and liquidity provision to banks with longer maturities. In the light of an overall subdued outlook for inflation and credit dynamics, in September 2014 the ECB announced an Asset-Backed Securities Purchase Program (ABSPP) and a third Covered Bond Purchase Program (CBPP3). Further, in January 2015 it introduced the Expanded Asset Purchase Program (EAPP). The EAPP encompasses both the ABSPP and CBPP3, but adds the purchase of secondary market sovereign bonds. Less than a year after its introduction, the programme's duration was extended from September 2016, the previously announced minimum end-date, to March 2017, or beyond, if necessary. From March 2015 through March 2016, every month €60 billion public and private sector securities were purchased under this program; from April 2016 onwards, monthly purchases increased to €80 billion.

The announcement and introduction of these unconventional monetary policy measures, in particular that of the EAPP, has resulted in an intense debate. Given the slow recovery of lending and credit in the euro area, doubts regarding the effectiveness of the ECB's measures in stimulating the real economy have been raised. Moreover, it is uncertain through which channels unconventional monetary policy affects the real economy. In comparison to conventional monetary policy measures that mainly work through the interest rate channel, unconventional monetary policy tools are expected to impact the economy through various additional channels, including the banks' balance sheet channel, the credit channel, and the exchange rate channel.

The following report assesses empirically how the ECB's unconventional monetary policy measures affect the macro-economy in the euro area. Moreover, it evaluates through which channels unconventional monetary policy interventions are transmitted to the real economy. For this purpose, a structural vector autoregressive model (SVAR) is employed. Given the small number of policy actions specifically related to the EAPP, the SVAR model is identified using data covering all unconventional policy interventions since 2007. The estimated SVAR model is then used to perform a counterfactual analysis. Specifically, a hypothetical unconventional monetary policy shock is fed into the model; how this shock propagates through the euro area economy, holding constant the other driving forces of the model-economy, is analysed. The hypothetical shock is scaled such that it lowers the two-year yield on euro area government bonds (excluding Germany) by 10 basis points. This initial impact is similar to the change in the estimated announcement effect of the first announcement of the EAPP (about 0.08 percentage points).

2 Existing evidence on non-standard monetary policy

Previous studies analysing the macroeconomic effects of unconventional monetary policy, in particularly large scale asset purchasing programmes like quantitative easing (QE), focus mostly on US and UK evidence, where the measures were introduced earlier than in the euro area. These studies show that QE significantly lowered sovereign and corporate bond yields on the days when the measures were announced by central banks. Moreover, QE is often found to

stimulate both output and prices. There is, however, considerable variation in the existing estimates of the magnitude of the macroeconomic effects.

For the euro area, existing studies mainly focus on how non-standard monetary policy measures affect financial markets. These studies analyse the effect of long-term refinancing operations (LTROs) on credit conditions, the impact of the securities market program (SMP) on bond yields, or the general consequences of the announcement of outright monetary transactions (OMT) on euro area financial markets. The announcements of OMT, for instance, reduced sovereign bond yields significantly for most member countries. Similarly, the SMP lowered yields on sovereign bonds, particularly for those countries covered by the program, generating large declines in yields on the days in which the information about the program was disclosed. LTROs, in turn, seem to have unlocked the bank lending channel and stimulated credit growth.

Regarding the macroeconomic effects of unconventional monetary policy, Boeckx et al. (2014) and Gambacorta et al. (2014) show that unexpected ECB balance sheet enlargements positively impact economic activity and prices in the euro area. By construction, these estimates exclude ECB policies that are not associated with shifts in the balance sheet. In particular, they do not take into account the effects that function only through policy announcements like e.g. forward guidance or the announcement of OMT.

Focusing on the more recent programmes and, in particular, on their effects on inflation expectations, Briciu and Lisi (2015) analyse the impact of unconventional monetary policy announcements on various economic and financial variables through January 2015. Using an event study design, they find that central bank announcements on the SMP, CBPP2 and EAPP contributed to higher long-term inflation expectations. On the other hand, a study by Van den End and Pattipeilohy (2015) finds no significant effect on inflation expectations in the euro area of the policies implemented through December 2014. However, the latter paper also analyses only the impact of actual changes in balance sheet size or composition, thereby disregarding the effects of policy announcements. Thus, the estimates may underestimate the total effect of ECB monetary policy on inflation expectations.

3 Macroeconometric Approach

To take into account that communication is typically considered to be a main policy tool of central banks, this report assesses the effectiveness of ECB policies by focussing on the macroeconomic effects of monetary policy announcements. In particular, it uses the unexpected changes in sovereign bond yields on those days when the ECB communicated its unconventional policies to the public, and assesses how these movements in government bond yields affect financial markets and the macro-economy.

The macroeconometric approach employed to analyse the effectiveness of unconventional monetary policy by the ECB follows Gertler and Karadi (2015). It uses a vector autoregressive model (VAR) for the euro area. In its benchmark specification, the model contains six variables: (1) the average two-year yield on euro area government bonds excluding Germany as a

measure for monetary policy stance[1]; (2) a measure of implied stock market volatility (the VStoxx index); (3) the volume of credit to non-financial firms; (4) the index of consumer prices; (5) real GDP; and (6) the unemployment rate.

To separate the different driving forces of the variables included in the model and to isolate the effect of unconventional monetary policy, it is necessary to construct a measure for the unexpected component of unconventional monetary policy (monetary policy shock). For this, the study builds on Altavilla et al. (2014) and extracts the average surprise variation in government bond yields on the days when the ECB announced changes in monetary policy.[2] Specifically, it uses a panel model covering bond yield spreads of Italy, Spain, Portugal, and Ireland to Germany with maturities of two, five, and ten years. All in all, the study considers 34 announcements occurring between August 2007 and March 2016. A list of the announcements and further details are provided in Table 1. They refer to all non-standard policy measures that the ECB employed from the beginning of the global financial crisis in 2007 through March 2016. These measures include liquidity and funding operations (like LTROs), the SMP, the OMT, as well as forward guidance and credit easing. Importantly, they contain all the announcements regarding the asset purchase programmes, but they are not confined to these measures.[3]

Once a measure for the surprise component of unconventional monetary policy announcements is estimated, it is used to recover the structural monetary policy shocks that drive the variables included in the vector autoregressive model, following Stock and Watson (2012) and Mertens and Ravn (2013). This approach allows for isolating the impact of a monetary policy shock on the endogenous variables, holding constant the other driving forces of the variables. To improve the accuracy of the estimation, the study follows Rogers et al. (2015) and computes estimates directly using daily data for the variables available on a daily frequency, rather than on a monthly frequency.

[1] Because they were treated as a safe haven asset during the euro crisis (Altavilla et al., 2014, Fratzscher et al., 2014), German bonds are excluded. Compared to the short-term interest rates usually used in VAR studies on conventional monetary policy, government bond rates with longer maturity are more likely to reflect unconventional monetary policy innovations, as these measures are specifically aimed at influencing expectations and, thus, yields over longer horizons. Moreover, short-term interest rates, like the Eonia or the Euribor, have been constrained by the zero lower bound in recent years.

[2] To control for other factors that could influence the daily evolution of spreads, economic data releases of 139 macroeconomic indicators for the euro area as a whole, for the individual member countries, the UK, and the US, are also controlled for.

[3] Using only announcements regarding the latest asset purchase programmes would not yield a sufficient number of observations to estimate the structural VAR model.

Table 1: Dates of the ECB monetary policy announcements considered

Date	Policy Announcement
22.08.2007	Supplementary liquidity-providing longer-term refinancing operation (LTRO) with a maturity of three months
28.03.2008	LTROs with a maturity of six months
29.09.2008	Special-term refinancing operation
08.10.2008	Fixed rate tender procedure with full allotment on the main refinancing operation (MROs)
15.10.2008	Expansion of the list of assets eligible as collateral in Eurosystem credit operations
07.05.2009	LTROs with a maturity of one year
04.06.2009	Details on purchase program for covered bonds (CBPP)
03.12.2009	Phasing out of 6-month LTROs, indexation of new 1-year LTROs
04.03.2010	Phasing out of 3-month LTROs, indexation of 6-month LTROs
10.05.2010	Securities Markets Program (SMP)
28.07.2010	Review of risk control measures in collateral framework
03.03.2011	Further LTROs
09.06.2011	MROs as fixed-rate tender procedures with full allotment (FRFA) for as long as necessary, at least until October 2011
04.08.2011	Further LTROs with a maturity of three and six months
08.08.2011	ECB will actively implement its Securities Market Program
06.10.2011	New covered bond purchase program (CBPP2)
08.12.2011	Two additional LTROs with a maturity of three months
21.12.2011	Results of first 3-year LTRO
09.02.2012	ECB's Governing Council approves eligibility criteria for additional credit claims
28.02.2012	Results of second 3-year LTRO
06.06.2012	FRFA on MROs as long as necessary, and at least until January 2013
26.07.2012	"Whatever it takes" speech by ECB President Mario Draghi in London
02.08.2012	Outright Monetary Transactions program (OMT)
06.09.2012	Technical features of OMT
06.12.2012	FRFA on MROs as long as necessary, and at least until July 2013
22.03.2013	Collateral rule changes for some uncovered government-guaranteed bank bonds
02.05.2013	FRFA on MROs as long as necessary, and at least until July 2014
04.07.2013	Open-ended forward guidance: The Governing Council expects the key ECB interest rates to remain at present or lower levels for an extended period of time
08.11.2013	FRFA on MROs as long as necessary, and at least until July 2015
05.06.2014	Targeted longer-term refinancing operations (TLTROs)
03.07.2014	Details on TLTROs published
22.01.2015	Expanded asset purchase program
03.12.2015	Duration of Expanded asset purchase program extended (among others)
16.03.2016	Monthly purchases under Expanded asset purchase program increased (among others)

4 Empirical Results

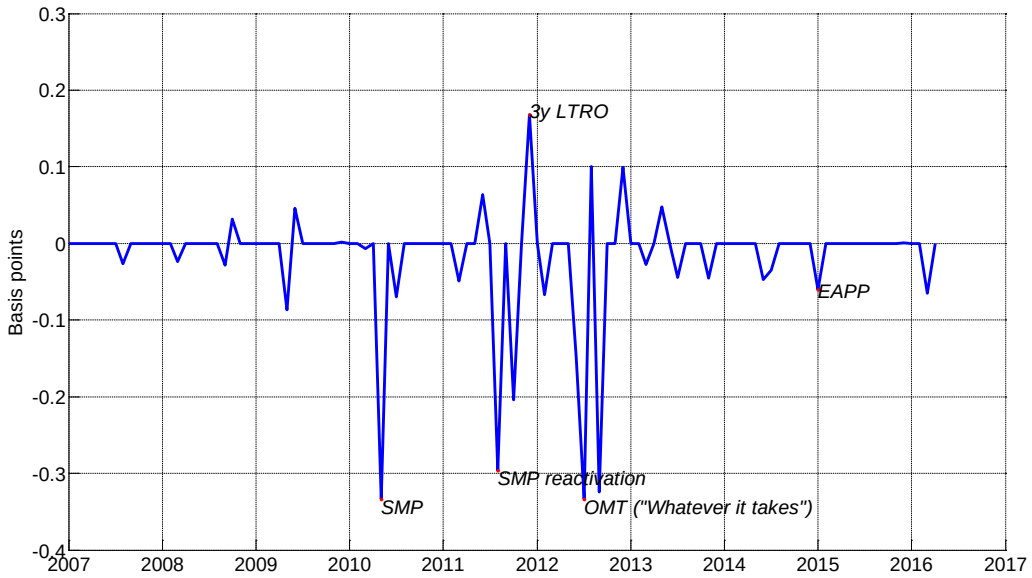
4.1 Surprise component of unconventional monetary policy announcements

Figure 1 displays the magnitude of the common effects that the various announced monetary policy measures exerted on the sovereign bond yield spreads of the four considered countries. They serve as a measure of the unexpected components of the unconventional monetary policy announcements. A monetary expansion is associated with falling yield spreads, measured in basis points. An announcement that is associated with increasing spreads reflects monetary policy news that is less expansionary than what was expected by market participants.

It shows that the Securities Markets Programme, as well as the 'whatever it takes' speech by ECB president Mario Draghi in London, led to strong decreases in bond spreads. On the other hand, the announcement of the 3-year LTROs came short of market expectations. Here, market participants expected a reactivation of the Securities Market Programme and were disappointed by the announcement of the 3-year LTROs. The first announcement of the EAPP programme constituted an expansionary surprise. However, the figure also shows that the effect on spreads was considerably smaller than the major announcements during the euro area sovereign debt crisis.

Figure 1: Surprise component of unconventional monetary policy announcements

(Basis point changes of bond yield spreads)



***Source*:** Own calculations.

Finally, it should be noted that these estimates are only an approximation of the true underlying exogenous changes in monetary policy. The effect of the latter is retrieved in the next subsections using the methodology of external instruments. This step of the empirical analysis does not distinguish between these different types of policy announcements. Instead, announcements regarding all different types of non-standard monetary policy measures are

pooled and the average reaction of the euro area economy to a hypothetical 'average' unconventional monetary policy shock is analysed.

4.2 Effectiveness of non-conventional policy

The effectiveness and transmission of the policies analysed is discussed by means of estimated impulse response functions to an unconventional monetary policy innovation. The idea of these impulse functions is to feed the estimated model with a hypothetical monetary policy shock and to see how this shock propagates through the economy, holding constant the other driving forces of the variables. The hypothetical shock is scaled such that it lowers the two-year yield on euro area government bonds (excluding Germany) by 10 basis points. This initial impact is similar to the change in the estimated announcement effect of the first announcement of the EAPP (see Figure 1).

The report first addresses the question of whether non-standard policies are effective in the euro area with regard to the stimulation of output, the price level, the credit volume to non-financial corporations, as well as to the decrease of the unemployment rate. Figure 2 reports the first set of results. The solid line shows the point estimate and the dotted lines depict the 90 percent confidence intervals. The latter are used to evaluate whether the point estimate is statistically significantly different from zero.

The top left panel shows that the two-year rate drops on impact. This impact effect holds by construction, given that the shock is scaled to lower the two-year rate by 10 basis points. The estimates show, however, that for about one year, the two-year rate remains below the level where it would have been without the surprise monetary expansion. It then slightly overshoots, before finally returning to the trend. The next panel shows that the monetary impulse leads to a significant and prolonged reduction in uncertainty on financial markets, as measured by the VStoxx. Moreover, the volume of credit to non-financial corporations gradually increases, reaching a peak after three years. This overall change in financial conditions is associated with a gradual increase in prices as well as in the real GDP, with output peaking after 18 months, slightly earlier than prices. The responses of output and inflation are mirrored in the unemployment rate, which reaches its minimum after approximately two years, before returning to trend.

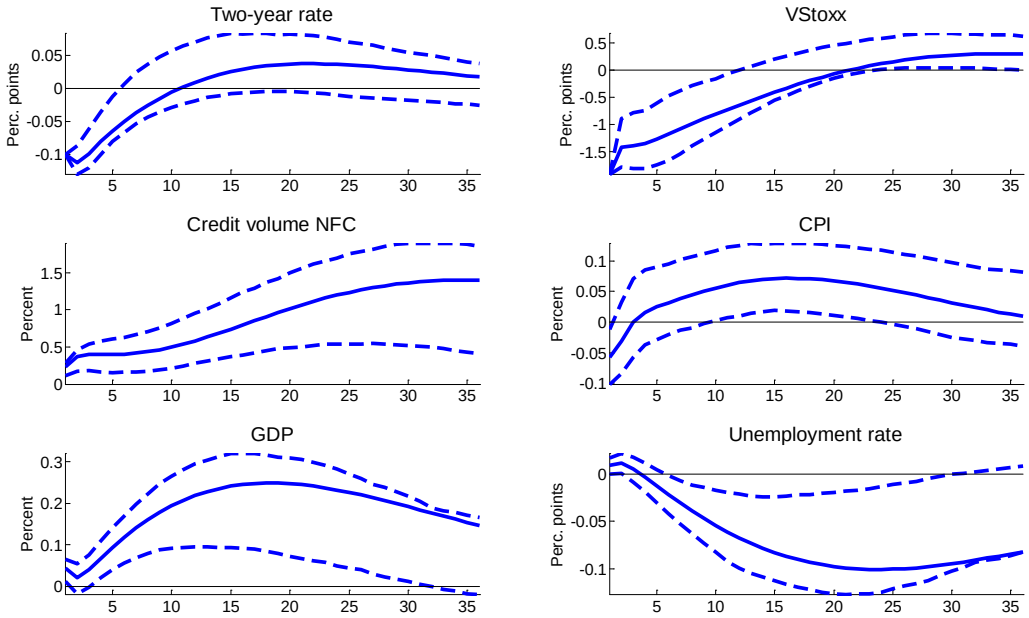
All in all, the simulation shows that, on average, the unconventional policy measures employed by the ECB can significantly stimulate the macro-economy. In particular, a shock that lowers the two-year rate by 10 basis points leads to a peak increase of GDP and inflation of 0.2 percent and 0.05 percent, respectively. The unemployment rate drops by about one-tenth of a percentage point.

While these results generally confirm previous estimates of the effectiveness of unconventional monetary policy, there are several interesting differences. Specifically, the above-mentioned studies that measure the stance of monetary policy using central bank balance sheets rather than government bond yields typically find that output and prices respond more quickly, peak earlier (after about six months), and reach their maximum simultaneously. Instead, the results in this report show a more sluggish response of both variables, peaking only after roughly two years, and with output leading prices. Interestingly, the output and price dynamics implied by

the estimates provided here are more similar to the behaviour of these variables following a 'standard' (conventional) monetary policy shock that works through changes in the policy rate. As such, the results lend some support to the idea that unconventional monetary policy can have similar effects as conventional interventions via changes in the policy rate.

Figure 2: Macroeconomic effects of ECB policy in the euro area

(In percent / percentage points deviations from trend)



***Source*:** Own calculations. Solid lines are point estimates; dashed lines are 90 % confidence intervals.

4.3 Effects on prices and inflation expectations

The primary mandate of the ECB is the maintenance of price stability over the medium term, which is quantified as a year-on-year increase in the Harmonized Index of Consumer Prices (HICP) of close to, but below, 2%. Figure 2 shows that the ECB expansionary unconventional monetary policy impacts the euro area price level positively in the medium term. To further assess this finding, the study next evaluates the effects of unconventional monetary policy innovations on core consumer prices and on several measures of inflation expectations in the euro area. The assessment of the effects on inflation expectations is of particular importance, given that the ECB aims at firmly anchoring inflation expectations. Inflation expectations are crucial for effective monetary policy, as anchored expectations indicate public trust in the central bank's commitment to price stability. Moreover, anchored inflation expectations avoid self-fulfilling expectations of increasing or decreasing inflation.

The core price level, depicted in the upper left panel, is found to increase gradually and peak after approximately two years. The response of core inflation qualitatively mirrors the development of headline inflation after the unconventional monetary innovation. However, the

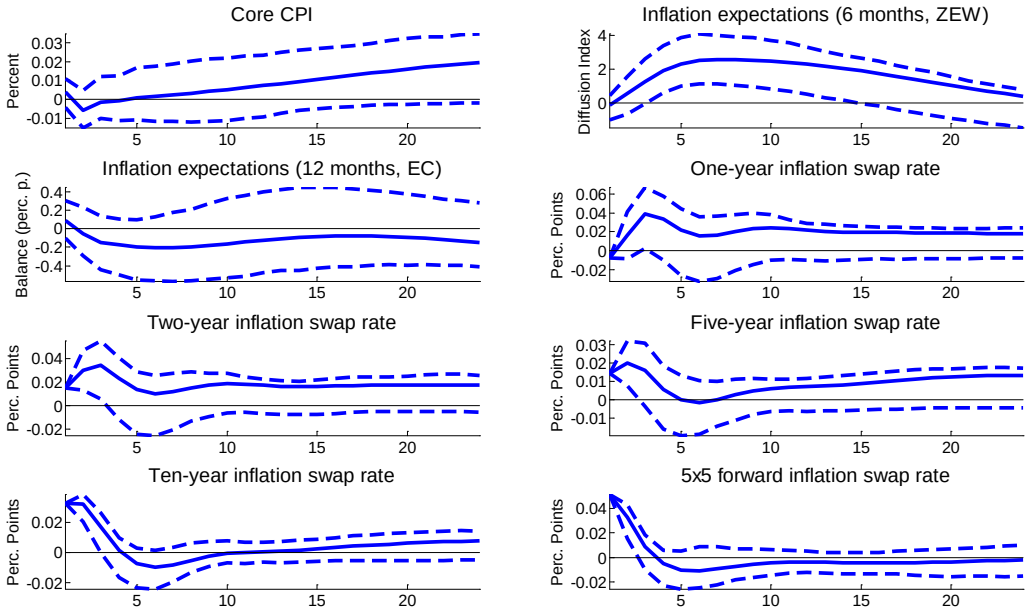
effects are quantitatively smaller, not statistically significant, and materialize with a lag of up to one year, reflecting the higher degree of stickiness in core consumer prices.

The next two panels show the responses of two survey-based measures of inflation expectations. The first is a survey conducted by the Centre for European Economic Research (ZEW) of financial market experts. The experts are asked for a qualitative assessment of their inflation expectations for the euro area over the next six months. The figure shows that, as headline prices increase, the difference between the share of analysts who expect a rising inflation rate and the share who anticipate a falling inflation rate widens significantly, by about two percentage points five months after the monetary policy intervention. The second measure of inflation expectations is taken from the European Commission consumer survey. It provides a qualitative assessment of respondents' expectations about the development of consumer prices over the following twelve months. According to this measure, there is no statistically significant relation between ECB unconventional monetary policy and inflation expectations.

As the two survey-based react differently, the behaviour of financial market-based measures of inflation expectations are also analysed. The figure shows that all inflation swap rates increase in response to the expansionary policy shock. As expected, swap rates for shorter maturities increase by more than those for longer maturities and the effects last longer. From the impulse response of the five and ten-year swap rates, the five-year, five-year forward swap rate can be computed, which has been one of the ECB's preferred measures of inflation expectations in recent years. This indicator increases significantly on impact, by about five basis points, and for about two months. All in all, the results suggest that ECB unconventional monetary policy increased inflation expectations in the euro area, but, quantitatively, to only a rather modest extent.

Figure 3: Effects of ECB policy on inflation in the euro area

(In percent / percentage points deviations from trend)



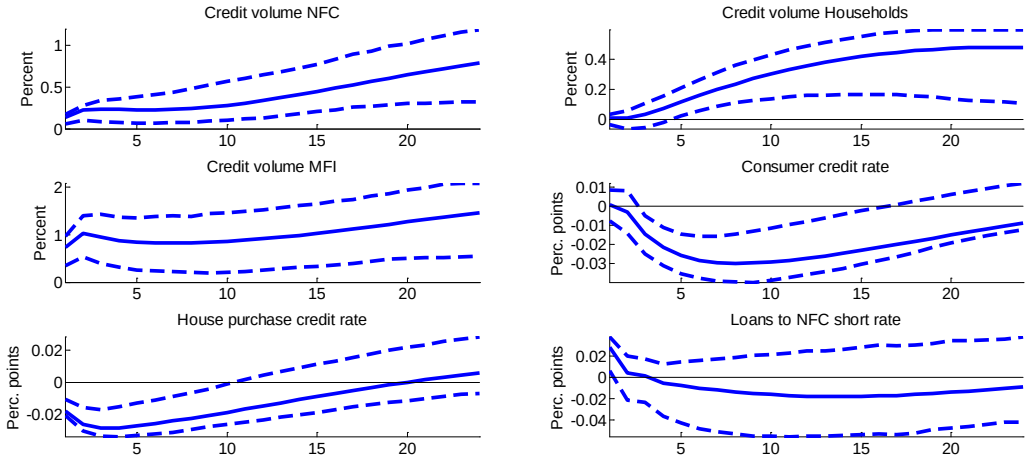
***Source*:** Own calculations. Solid lines are point estimates; dashed lines are 90 % confidence intervals.

4.4 Effects on credit volume and credit conditions

Next, the report evaluates in detail how unconventional monetary policy measures impact credit developments in the euro area. For comparison, the response of credit volume to non-financial corporations from the baseline specification in Figure 2 is repeated in the upper left panel. The remaining panels show the dynamics of further credit variables that replace this variable in the VAR specification. Credit volume to households, depicted in the upper right panel, is found to increase significantly about six month after the impulse and for two years. Consistent with previous evidence by Boeckx et al. (2014), the peak in credit to households is earlier than that of credit to non-financial corporations and considerably lower. In contrast, there is an immediate and long-lasting jump in credit to monetary and financial institutions (middle left panel). Lastly, except for the rate on loans to non-financial corporations, the increase in credit volume is matched by lower credit costs. The consumer credit rate and the mortgage rate decline by approximately three basis points several months after the shock and only slowly return to trend. Overall, the results suggest that unconventional monetary policy by the ECB eases credit conditions and boosts credit volume in the euro area. These effects are economically relevant. However, it takes about two years for peak effects to materialize.

Figure 4: Effects of ECB policy on credit in the euro area

(In percent / percentage points deviations from trend)



***Source*:** Own calculations. Solid lines are point estimates; dashed lines are 90 % confidence intervals.

4.5 Effects on the exchange rate and interest rates

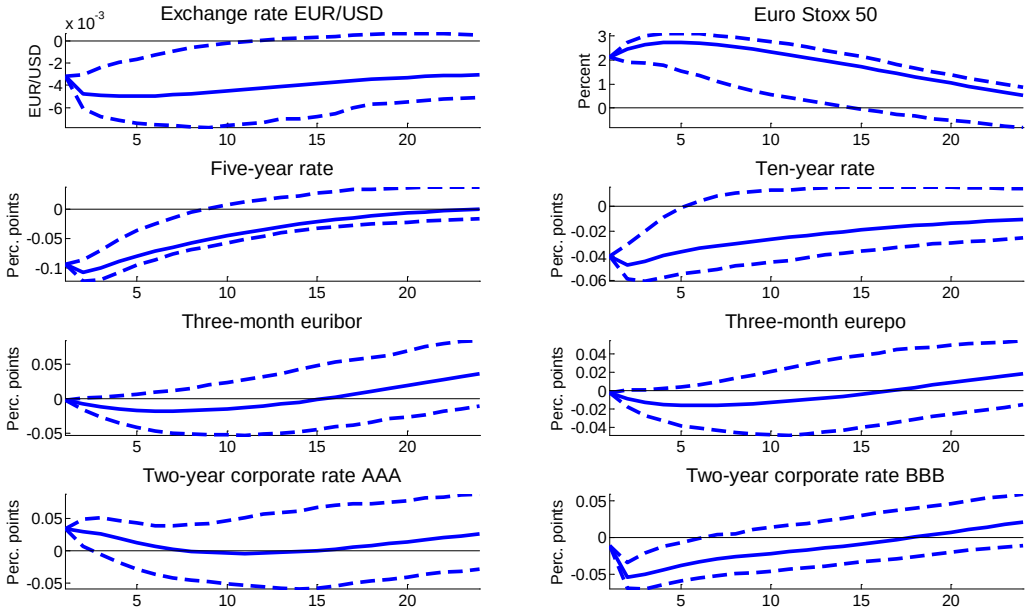
Lastly, the report further examines through which channels the unconventional monetary policy surprises are transmitted to economic activity, prices, and credit volumes. First, the top left panel shows the effect of the policy interventions on the EUR/USD exchange rate, as exchange rate depreciation is often believed to be an important channel through which expansionary monetary policy stimulates the real economy. However, in line with the results of Rogers et al. (2015), the impulse responses show that, on average, an expansionary unconventional monetary policy impulse leads to an appreciation of the euro. This finding can be explained by the fact that the estimates reflect the average effect of the unconventional monetary policy

measures adopted since 2007, and hence those measures that were also taken during the European debt crisis. Thus, the effect on the exchange rate seems to reflect a reduction in break-up premia that led to an appreciation of the euro. The effect is relatively small. Conversely, there is a strong and long-lasting effect on equity prices. The Euro Stoxx 50 increases by nearly two percent on impact and remains above trend for about two years. This potentially stimulates the real economy through wealth effects, but also through reduced costs of equity financing for corporations.

Next, the responses of several bond yields and interest rates are analysed to assess how different financial market segments are affected by the policy surprises. The second row shows the effect on average government bond yields in the euro area (without Germany) for five-year and ten-year maturity, i.e. rates with longer maturity than the two-year rate in the baseline specification. Both rates decline significantly on impact, before slowly returning to their initial levels. Compared to the effect on the two-year rate, the impact effects are smaller, but the effects are more persistent for longer maturities. The third row shows the responses of the Eurepo and the Euribor, two short-term interest rates strongly influenced by ECB conventional monetary policy. Neither rate responds significantly to the monetary innovation, suggesting that the monetary policy actions identified in the VAR framework are orthogonal to conventional policy rate changes by the ECB, hence supporting the claim that the model identifies unconventional policy actions. Finally, the last row shows the response of two corporate bond yields with different credit ratings in order to analyse the impact of unconventional monetary policy on corporate financing costs in the capital markets. For the corporate bonds with AAA rating there is a short-lived increase in two-year yields, while the two-year yield on corporate bonds with a BBB rating drops for several months. Whereas the latter response is as expected and can affect the real economy through the easing of financing conditions for corporates, the former seems to reflect a reduction in safe haven demand, as the expansionary policy shock reduces risk aversion and uncertainty in financial markets.

Figure 5: Transmission channels ECB policy in the euro area

(In percent / percentage points deviations from trend)



***Source*:** Own calculations. Solid lines are point estimates, dashed lines are 90 % confidence intervals.

5 Conclusions

The unconventional monetary policy expansions implemented by the ECB and other central banks have triggered an extensive public debate on the effectiveness and transmission of such policies. As a relatively unprecedented period for the conduct of monetary policy, considerable uncertainty exists about the ability of such monetary policy actions to stimulate the economy, exert upward pressure on inflation expectations, and help the euro area exit a long period of unsatisfactory growth.

This report first discusses recent empirical research on the effectiveness and transmission of unconventional monetary policy by the ECB. Then, compared to the existing literature, the empirical analysis gives particular emphasis to the announcements of the monetary interventions, rather than to the actual implementations of such measures through variations in the ECB balance sheet. Given the important role played by communication in the ability of monetary policy to impact agents' behaviours and, ultimately, the real economy, the analysis of announcements of unconventional monetary policy should play an important part in the empirical analysis of the effectiveness of such policies.

The report finds that, on average, the unconventional monetary policy interventions were effective both at stimulating the real economy and at exerting upward pressure on inflation and several measures of inflation expectations. It finds that the effects do not differ substantially from what the literature already documents for the period of conventional monetary policy. It also shows that the stimuli are transmitted to the real economy mainly through variations in public and private interest rates and credit volumes.

However, a word of caution: the results should not be necessarily interpreted as supporting the recent extension of the asset purchasing program. Sovereign bond yields in the euro area are currently lower than they were during most of the analysed sample period. Thus, there is potentially less room for beneficial macroeconomic effects from non-standard monetary policy measures, as the room for lowering bond yields further is potentially smaller.

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