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Article

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ECB Policies Effective in the Euro Area and Germany

By Malte Rieth, Michele Piffer and Michael Hachula

The European Central Bank has engaged in a wide range of non-standard monetary policy measures since 2007. Each new tool was accompanied by an intense public debate on its effectiveness. This study evaluates the average effect of these measures on the macro-economy. The estimates show that unexpected changes in monetary policy that lower euro-area sovereign bond yields lead to a significant rise in real GDP, consumer prices, inflation expectations, and credit volume in the euro area. The effects on the German economy are very similar. All in all, the evaluation shows that non-standard monetary policy shocks are effective and contribute to fulfilling the central bank's mandate.

Since the onset of the financial crisis in 2007, the European Central Bank (ECB) has engaged in a wide range of non-standard monetary policy measures. These include, for instance, an enlargement of the pool of assets accepted as collateral for refinancing operations and a provision of liquidity to banks at longer maturities than before the crisis. Most recently, the ECB introduced an asset purchase program, which it then extended in December 2015, less than a year after its introduction.

Announcements of each of the new monetary stimulus measures have been accompanied by an intense public and academic debate on associated costs and benefits.¹ On the one hand, supporters of the ECB policy argue that non-standard monetary policy tools are successful in calming financial markets and in improving credit and economic conditions. Critics, on the other hand, doubt the effectiveness of these measures and stress the potential risks, such as a deterioration in financial stability or a widening of the income distribution.²

This study assesses how the ECB's non-standard monetary policy measures can affect the macroeconomy. Since criticism on the effectiveness of these policies has been coming from Germany in particular, we investigate the consequences of the monetary interventions not only for the euro area in general, but also specifically for Germany.

Previous evidence on non-standard monetary policy

The available studies that have analyzed the effects of non-standard monetary policy, particularly quantitative easing (QE) in the US and the UK, show that QE significantly low-

¹ See, for example, Bernoth, K., König, P., Raab, C., Fratzscher, M. (2015): Uncharted Territory: Large-Scale Asset Purchases by the European Central Bank, DIW Economic Bulletin 13/2015, 189–198.

² See Delivrias, A. (2015): The ECB's Quantitative Easing – Early results and possible risks, European Parliamentary Research Service, PE 572.

Box

Macroeconometric approach

The macroeconometric approach we employ here follows Gertler and Karadi (2015). We use a vector autoregressive model that includes six variables for the euro area: the two-year yield on

government bonds of euro area member countries excluding Germany, a measure of stock market volatility, the volume of credit to non-financial firms, the index of consumer prices, real GDP and the unemployment rate. The model can be written as

$$Y_t = c + A_1 Y_{t-1} + A_2 Y_{t-2} + u_t$$

We use this vector autoregressive model to study the impact of a monetary intervention on the entire system of variables considered.

To separate the different driving forces of the variables included in the model, we need to construct a measure that is correlated with unexpected variations in monetary policy. To construct such a measure, we build on Altavilla, Giannone, and Lenza (2014) and extract the surprise variations in government bond yields on the days in which the European Central Bank announced shifts in monetary policy. All in all, we consider 32 policy announcements that occurred between August 2007 and May 2015. (A list with details on each announcement is given in Table 1.) We then make use of a panel model to extract the common unexpected variation in spreads vis-à-vis Germany of government bond yields of different countries and maturities. In particular, we use bond yields for Italy, Spain, Portugal, and Ireland on maturities two, five, and ten years. The model used is

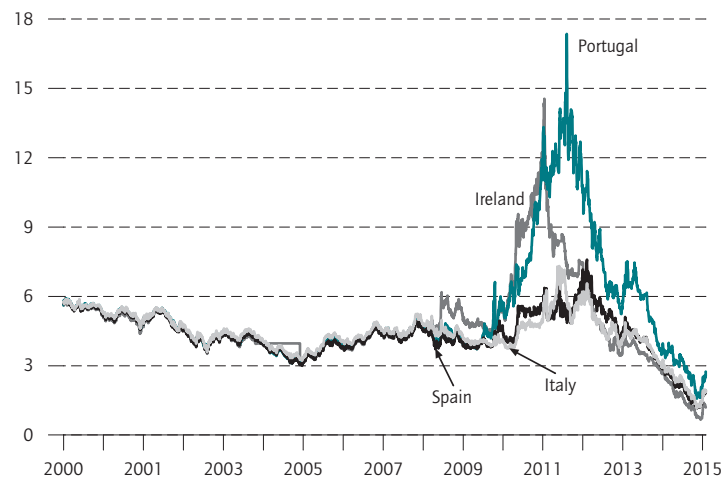
$$x_{ijt} = \alpha + \beta x_{ijt-1} + \sum_a \gamma_a D_{at} + \sum_n \delta_n z_{nt} + \eta_{ijt}$$

where the variable z_{nt} is the surprise component in economic data releases of 139 macroeconomic indicators for the euro area

Figure 1

Yields on 10 year government bonds

Percent per year



Source: Datastream.

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ered sovereign and corporate bond yields on the days that measures were announced by central banks. Moreover, QE is often found to stimulate both output and inflation. There is, however, considerable variation in the existing estimates of the magnitude of the macroeconomic effects.³

For the euro area, most studies focus on selected programs and only on the financial market effects of non-standard monetary policy—for example, on the effect of long-term refinancing operations (LTROs) on credit conditions, the impact of the securities market program (SMP) on bond yields, or the consequences of the announcement of outright monetary transactions (OMT) on euro area finan-

cial markets more generally. The announcements of OMT, for instance, significantly reduced sovereign bond yields in most member countries.⁴ Similarly, the SMP lowered yields on sovereign bonds, particularly for those countries that were covered by the program, with large declines in yields on days information on the program was disclosed.⁵ LTROs, in turn, seem to have unlocked the bank lending channel and stimulated credit growth.⁶

³ See Bernoth, K., König, P., Raab, C. (2015): Large-Scale Asset Purchases by Central Banks II: Empirical Evidence, DIW Roundup 61.

⁴ See Altavilla, C., Giannone, D., Lenza, M. (2014): The financial and macro-economic effects of OMT announcements, ECB working paper No. 1707.

⁵ See Eser, F., Schwaab, B. (2016): Evaluating the impact of unconventional monetary policy measures: Empirical evidence from the ECB's Securities Markets Programme, *Journal of Financial Economics*, 119, 147–167.

⁶ See Darracq Paries, M. and R. De Santis (2015): A non-standard monetary policy shock: the ECB's 3-year LTROs and the shift in credit supply, *Journal of International Money and Finance* 54 (2015): 1–34.

as a whole, the individual member countries, the UK, and the US. We include them to control for other factors that could influence the daily evolution of spreads.

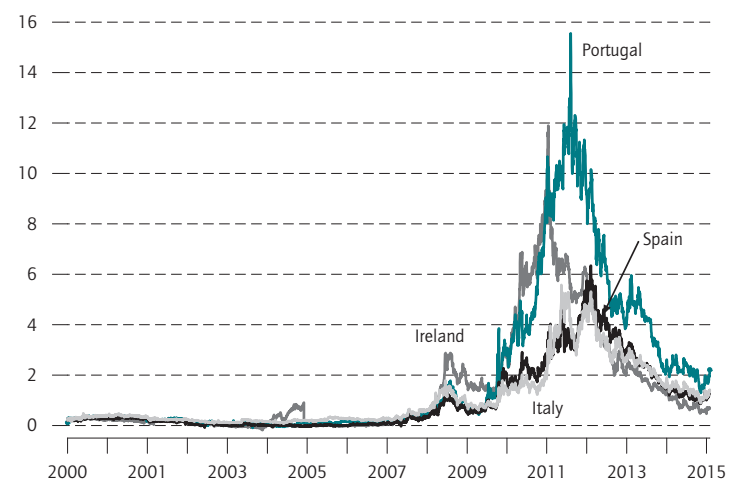
The yields on the ten-year maturity used in the estimation are shown in Figure (see Figure 1). The yields on the other maturities used here look very similar. From this figure, we see very clearly that prior to the run-up to the euro debt crisis, yields moved closely together. Starting from the euro crisis, a divergence is clearly visible, with progressive increases in yields initially for Ireland, then for Portugal. A progressive reduction in the differences across yields is instead visible after 2013. Figure (see Figure 2) shows the variation in spreads rather than in yields. We see that the initial decrease in yields between the year 2000 and the euro crisis had been met with generally constant spreads, and that spreads behaved similarly to yields during the crisis.

The estimation delivers a measure of exogenous variations of monetary policy. We then make use of this estimated measure to recover the structural monetary policy shock that drives the variables included in the vector autoregressive model, following Stock and Watson (2012) and Merten and Ravn (2013). This approach exploits the explanatory power that the estimated exogenous monetary interventions have on the residual part of the variables in the vector autoregressive model, and allows 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, we follow Rogers, Scotti, and Wright (2015)

and compute estimates directly using daily data for the variables available on a daily frequency, rather than on a monthly frequency.

Figure 2

Spreads on 10 year government bonds vis-à-vis Germany Percentage points



Sources: Datastream; calculations of DIW Berlin.

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Boeckx et al. (2014) and Gambacorta et al. (2014) show that unexpected ECB balance sheet enlargements have a positive impact on economic activity and prices in the euro area.⁷ 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 through policy announcements. Communication, however, is typically considered a main pol-

icy tool of central banks.⁸ In our empirical assessment of the effectiveness of ECB policies, we therefore use the unexpected changes in sovereign bond yields on those days when the ECB communicated its policy to the public, and assess how these movements in government bond yields affect financial markets and the macroeconomy (see Box 1).

Non-standard policies are effective ...

We consider non-standard policy measures that the ECB employed from the beginning of the global finan-

⁷ See Boeckx, J., Dossche, M., Peersman, G. (2014): Effectiveness and Transmission of the ECB's Balance Sheet Policies, CESifo Working Paper No. 4907, and similar earlier studies from Peersman, G. (2011): Macroeconomic Effects of Unconventional Monetary Policy in the Euro area, ECB Working Paper No. 1397, and Gambacorta, L., Hoffmann, B., Peersman, G. (2014): The Effectiveness of Unconventional Monetary Policy at the Zero Lower Bound: A Cross-Country Analysis, *Journal of Money, Credit and Banking*, 46, 615–642.

⁸ See Blinder, A., Ehrmann, M., Fratzscher, M., De Haan, J., Jansen, D. (2008): Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence, *Journal of Economic Literature*, 46(4), 910–945.

cial crisis in 2007 until May 2015 (see Table). These measures include liquidity and funding operations (like LTROs) and measures of quantitative easing (like SMP, OMT, and the extended asset purchase program), as well as forward guidance and credit easing. We do not distinguish between these different policies. Instead,

we pool them and analyze the average reaction of the euro area and German economy to these non-standard measures.

We discuss the effectiveness of the policies by means of estimated impulse response functions to a non-standard 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. We scale the hypothetical shock such that it lowers the two-year yield on euro-area government bonds (excluding Germany) by 0.25 percentage points.⁹

... in the euro area

We first study whether non-standard policies are effective in the euro area as a whole, and then consider the case of Germany. Figure 1 reports the results for the euro area benchmark specification. The solid green line shows the point estimate, while the black lines and shaded areas depict the 90 percent confidence bands, which 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, before slightly overshooting and then returning to the level where it would have been without the surprise expansion. This leads to a significant and prolonged reduction in uncertainty on financial markets, as measured by the VStoxx.¹⁰ The volume of credit to non-financial corporations gradually increases and reaches 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 different non-standard measures of the ECB can lead to a significant stimulation of the macroeconomy.

While our results generally confirm previous estimates of the effectiveness of non-standard monetary policy, there are several interesting differences. Specifically, the above-

Table

Dates of the ECB monetary policy announcements considered in the analysis

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

Source: DIW Berlin.

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The ECB has announced a number of different non-standard policy measures between 2007 and 2015.

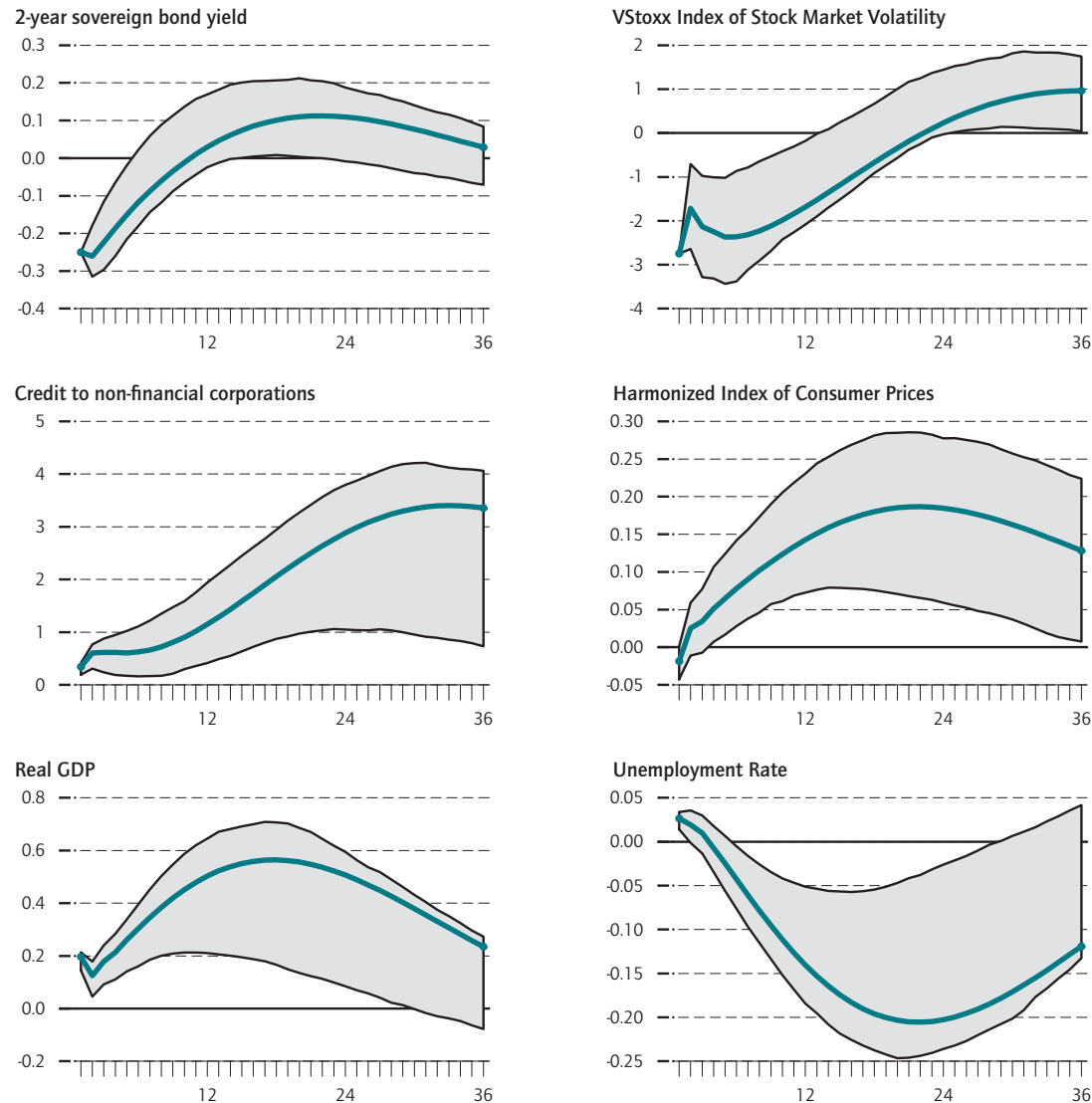
⁹ The two-year yield is computed as a GDP-weighted average of bond yields for the following countries: Austria, Belgium, Finland, France, Ireland, Italy, Netherlands, Portugal, and Spain. Germany is excluded, as German bonds played a particular role as a safe haven asset during the euro crisis. They are analyzed separately in the section on Germany.

¹⁰ The VStoxx is an index based on Euro Stoxx 50 realtime options prices and is designed to capture market expectations of near-term up to long-term financial market volatility. In the literature, the VStoxx and similar measures are often used as a measure for financial market risk aversion and uncertainty. See, for instance, Bekaert, G., Hoerova, M., Lo Duca, M., (2013): Risk, Uncertainty and Monetary Policy, *Journal of Monetary Economics*, 60(7), 771-788.

Figure 1

Macroeconomic effects of ECB policy in the euro area

In percent / percentage points deviations from trend¹



¹ Green solid lines are point estimates, black lines and shaded areas are 90 % confidence bands.

Source: calculations of DIW Berlin.

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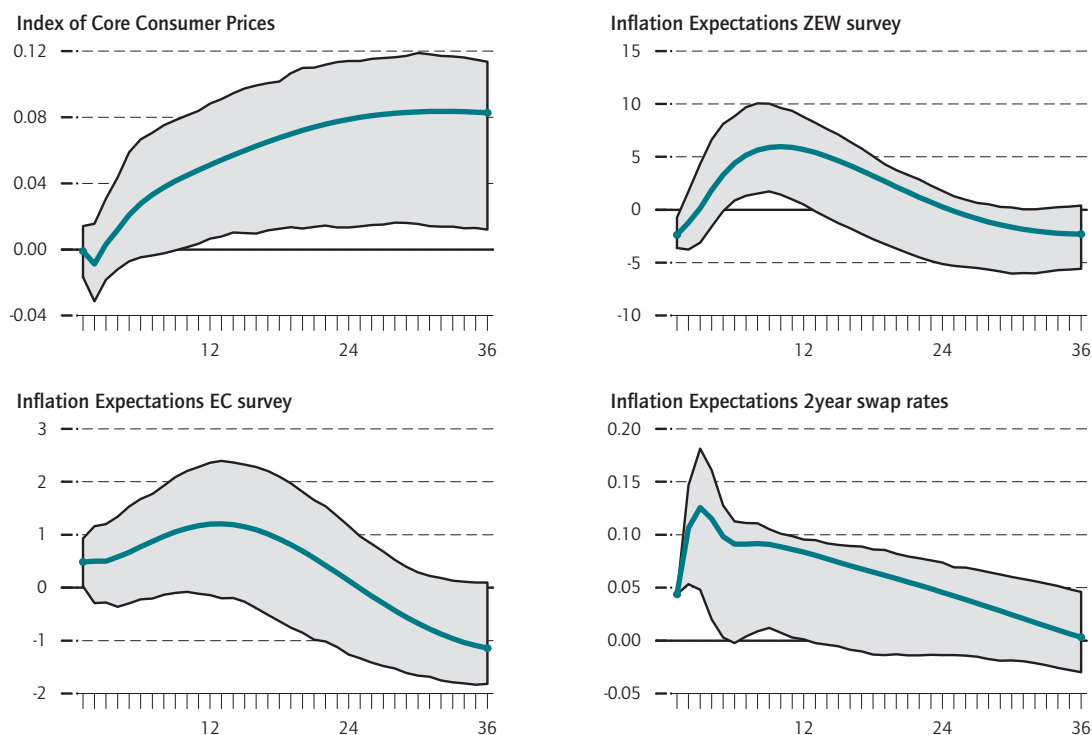
An unexpected monetary expansion decreases government yields, stock market volatility and the unemployment rate, and increases credit, prices and real GDP.

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, we find 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 our

estimates are more similar to the behavior of these variables following a “standard” (conventional) monetary policy shock that works through changes in the policy rate.¹¹

¹¹ See, for example, Gertler, M., Karadi, P. (2015): Monetary policy surprises, credit costs, and economic activity, *American Economic Journal: Macroeconomics*, 7(1), 44–76.

Figure 2

Effects of ECB policy on euro area inflation expectationsIn percent / percentage points deviations from trend¹

¹ Green solid lines are point estimates, black lines and shaded areas are 90 % confidence bands.

Source: calculations of DIW Berlin.

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An unexpected monetary expansion increases inflation expectations.

As the primary mandate of the ECB is to stabilize inflation, and since inflation expectations play a crucial role for actual inflation, we next evaluate the effects of non-standard monetary policy innovations on core consumer prices and several measures of inflation expectations.¹² Figure 2 shows the impulse response functions. Core prices increase gradually and peak after approximately two years. The increase is both statistically and economically significant.

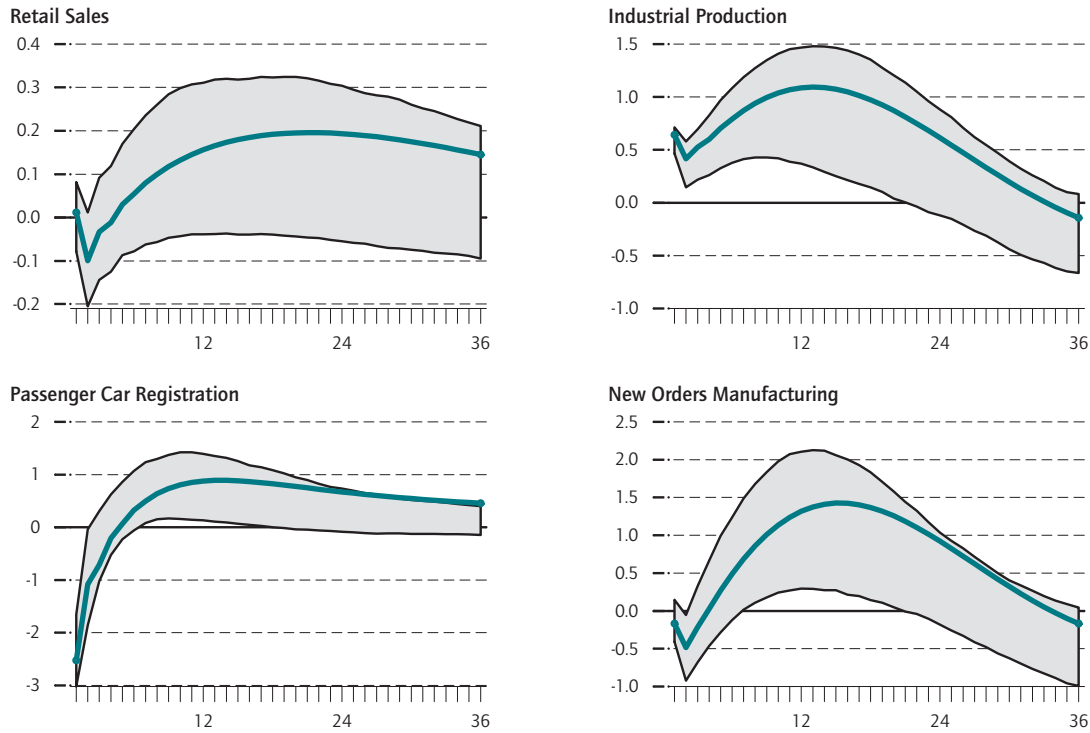
The next two panels show the responses of two survey-based measures of inflation expectations. The first one is a survey conducted by the Centre for European Economic Research (ZEW) among financial market experts. The experts are asked for a qualitative assessment of their inflation expectations for the euro area over the next six months.

The figure shows that, as headline and core 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 five percentage points five months after the monetary policy shock.

The second measure of inflation expectations is taken from the European Commission consumer survey. It gives a qualitative assessment of respondents' expectations about the development of consumer prices over the following twelve months. While inflation expectations increase on impact and for about one year according to this measure, the increase is not statistically significant. We also analyze the behavior of a financial market-based measure of inflation expectations following the shock, namely, of the euro inflation-linked swap rate with two-year maturity. The impulse response shows that the swap rate increases significantly, indicating an increase in inflation expectations.

¹² We add each variable to the benchmark six-variable VAR model, one at a time, and combine the responses of the marginal variables into one graph.

Figure 3

Effects of ECB policy on euro area real activityIn percent / percentage points deviations from trend¹

¹ Green solid lines are point estimates, black lines and shaded areas are 90 % confidence bands.

Source: calculations of DIW Berlin.

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An unexpected monetary expansion increases real activity.

As a final step in the evaluation of the effectiveness of non-standard monetary policy, we investigate the impact on several alternative measures of economic activity.¹³ Figure 3 reports impulse responses of retail sales, industrial production, car registrations, and new orders. Except for the first measure, all activity indicators increase significantly, either on impact or some months after the monetary surprise. The strongest response is found for new orders and industrial production, even exceeding the peak response of GDP.

As a word of caution, however, 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 on a low-

er level than they have been during most of the analyzed sample period. Thus there is potentially less room for beneficial macroeconomic effects from non-standard monetary policy measures through lowering bond yields further.

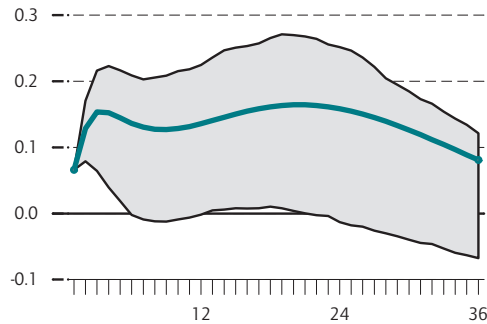
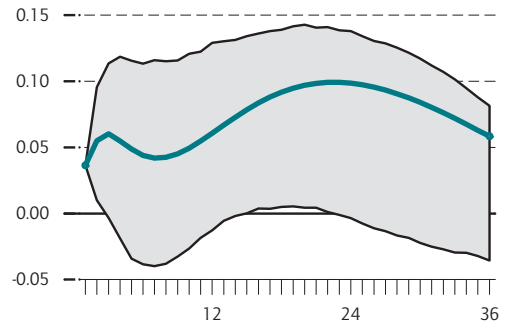
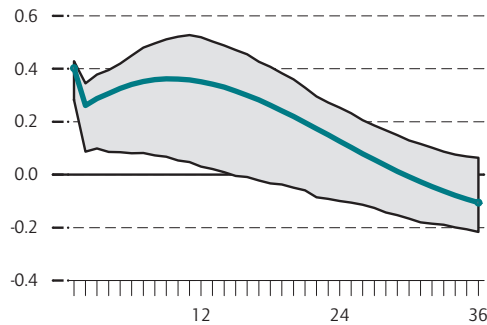
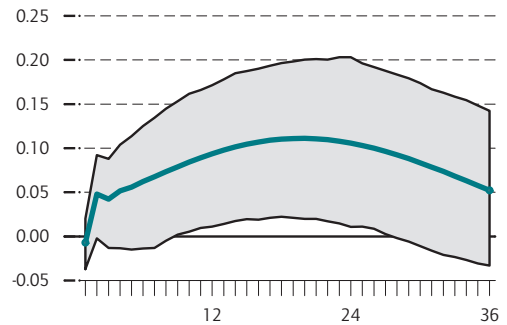
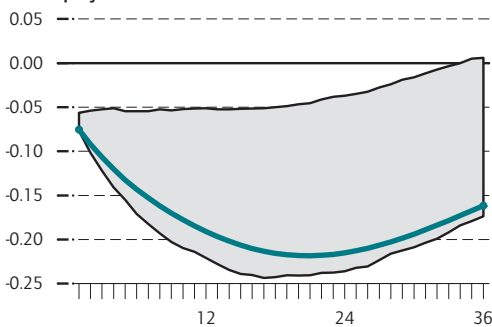
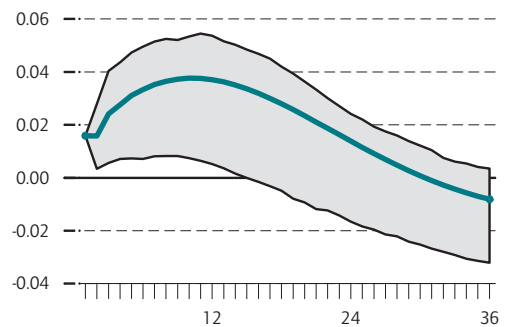
... and in Germany

We now investigate the effects of the ECB non-standard monetary policy measures on Germany's macroeconomy. The results are shown in Figure 4.¹⁴ Contrary to the average two-year yield in the euro area, German sovereign bond yields increase in response to the monetary expansion. The two-year yield rises by 0.1 percentage points and for roughly six months. The reaction of the

¹³ As the measures of economic activity are a proxy for real GDP, we do not add them as a seventh variable to the baseline model, but instead replace GDP.

¹⁴ As before, we compute the impulse responses of the variables for Germany by adding them as a seventh variable to the euro area baseline model.

Figure 4

Macroeconomic effects of ECB policy in GermanyIn percent / percentage points deviations from trend¹**2-year sovereign bond yield****5-year sovereign bond yield****Real GDP****Consumer Price Index****Unemployment Rate****Stock Price Index**

¹ Green solid lines are point estimates, black lines and shaded areas are 90 % confidence bands.

Source: calculations of DIW Berlin.

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In Germany, an unexpected monetary expansion decreases the unemployment rate and increases government yields, prices and real GDP.

five-year yield is about half as large and less significant. This positive (rather than negative) reaction of German Bund yields to the surprise expansion can be explained by a flight-to-safety phenomenon. Particularly during the height of the euro-area debt crisis, German government bonds were seen as a safe haven for financial investors. As the non-standard monetary policy innovations of the

ECB reduced financial market uncertainty, the demand for safe-haven assets declined.

Remarkably, despite the increase in sovereign bond yields, the responses of the other variables show that the German economy does profit from the monetary stimulus. Real GDP increases significantly on impact and

for roughly two years, and a similar response can be observed for the price level. The increase in real output is accompanied by a decrease in the unemployment rate, which falls by up to 0.2 percentage points. The last panel shows that stock prices in Germany also increase after the policy innovation, indicating that financial markets do not perceive the non-standard expansion as harmful for the growth prospects of German companies.

Conclusion

This study estimates the effects of non-standard ECB policy on the macroeconomy in the euro area and in Germany. For the euro area, it shows that unexpected monetary expansions, associated with a decline in sovereign bond yields, lead to a rise in real GDP and prices.

Importantly, inflation expectations also increase. Moreover, financial market uncertainty decreases and the volume of credit to non-financial corporations rises. These results suggest that the ECB's non-standard monetary policy measures have supported the real economy and prices in the euro area over the past few years.

The reaction of the macroeconomy in Germany is qualitatively similar to that of the euro area. Even though sovereign yields tend to increase in response to the expansionary surprises, prices and output rise, and the unemployment rate falls. Overall, the results indicate that the German economy profited from the monetary interventions, possibly due to its close financial and economic ties with the rest of the euro area.

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