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ECB MONETARY POLICY AND THE EURO EXCHANGE RATE

by Martina Cecioni*

Abstract

The paper provides empirical evidence on the effects of ECB conventional and unconventional monetary policy on the euro exchange rate, focusing on the period from January 2013 to September 2017. Innovations to conventional and unconventional monetary policies are identified through changes in, respectively, short- and long-term interest rates immediately after Governing Council meetings. Both types of measures contributed to the depreciation of the euro from mid-2014; surprises associated with conventional measures had a stronger and more persistent effect than those associated with unconventional ones. Time-varying estimates of the effects of conventional surprises since 1999 show that the responsiveness of exchange rates to monetary news increased markedly from 2013. State-dependence analysis finds that the exchange rate became more sensitive to monetary policy when the ECB adopted a policy of negative interest rates and when conventional and unconventional monetary surprises moved in the same direction.

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1 Introduction [1]

During the years that followed the sovereign debt crisis, the euro area economy struggled with a prolonged period of low inflation. Headline inflation started to fall in mid-2013, turning negative in 2014 and threatening the achievement of the price stability objective by the ECB. With official interest rates close to their effective lower bound, the ECB had to resort to unconventional monetary policy measures, such as asset purchase programmes (APP) and forward guidance, to provide further stimulus to the euro area economy, combat the risk of deflation and support a return of inflation to its target.

One of the channels through which official rates cut and unconventional monetary policies are transmitted to economic activity and prices is the exchange rate channel.[2] Its importance has been emphasized in the case of the euro area since it is a relatively open economy when compared to other large advanced economy.[3]

This paper studies the impact of conventional and unconventional monetary policy on the euro exchange rate. The focus is on unconventional monetary measures undertaken in the post-crisis period (from January 2013 to September 2017) and on how their effects compare with those associated with conventional monetary policy both in the same period and before the crisis.[4] Differently from the Federal Reserve, which adopted the large-scale asset purchase programme after bringing the federal funds rate to its lower bound, the ECB has resorted to both conventional and unconventional tools in several instances, claiming the importance of the complementarity of the measures adopted within a policy package. While the contribution of the ECB expansionary monetary policy stance to the large depreciation of the euro since the second half of 2014 is widely acknowledged, less is known about the marginal effect of the different instruments adopted.

Monetary policy shocks are identified from daily changes in selected financial asset

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[2]See Cova and Ferrero [2015] for an assessment of the transmission channels of the ECB's asset purchase programme.

[3]In 2015 trade, measured as imports plus exports of goods and services, over GDP is about 50% in the euro area and 38, 36 and 40% respectively in U.S., Japan and China.

[4]By January 2013 the sovereign debt crisis had essentially eased (as hinted in Draghi's press conference on 10 January 2013), while the inflation outlook was starting to deteriorate. Since then, the possibility of unconventional measures for providing further stimulus to the economy was on the table (e.g., in the press conference of 4 April 2013 Draghi said that "we are thinking 360 degrees on the non-standard measures").

prices after GC meetings. This identification scheme is based on the hypothesis that only monetary news affect those prices in these days.[5] High-frequency identification of monetary policy, first pioneered by Kuttner [2001], Cochrane and Piazzesi [2002] and Gürkaynak et al. [2005] for the Federal Reserve, has recently become very common in the literature (see Nakamura and Steinsson [2013] and Gertler and Karadi [2015] for the U.S., Cesa-Bianchi et al. [2016] for the U.K. and Brand et al. [2010], Leombroni et al. [2016], Pericoli and Veronese [2017] for the euro area) as an extremely flexible approach: it imposes a minimal set of restrictions on the data, without the need to resort to multidimensional models, and it is a clean way to control for endogeneity of monetary policy to the state of the economy.

I disentangle conventional and unconventional monetary policy news using surprises on, respectively, short and long-term interest rates. I assume that conventional monetary news affect the money market interest rates up to one year, while unconventional surprises are captured by changes of 10-year interest rates that are orthogonal to conventional surprises. This distinction between conventional and unconventional surprises, similar to the one adopted by Glick and Leduc [2015] for analyzing the effects of Fed's policies on the dollar, is based on the well-known view that with unconventional tools deployed after 2013 the ECB aimed at directly influencing long-term interest rates.[6]

The paper estimates the impulse responses associated with these surprises of the euro-dollar and the euro nominal effective exchange rates by means of daily local projections (Jordá [2005]), providing insights not only on their impact on GC meeting's day but also on their persistence. The sample period is from January 1999 until September 2017, but estimates on the pre-crisis (1999-2008) and the post-crisis (2013-2017) subsamples are also provided.

The analysis finds that after 2013 both conventional and unconventional expansionary monetary policy surprises caused a significant depreciation of the euro both vis-à-vis the

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[5]This hypothesis is verified by checking that the estimated shocks are consistent with narrative evidence and that they are not affected by other macroeconomic news.

[6]The proposed measure for conventional monetary policy includes both official rates changes and forward guidance insofar as it affects expectations about official interest rates in the first year (short-term forward guidance, which was used by the ECB also before the crisis, or "short-term path surprises" in the terminology of Glick and Leduc [2015]); the proposed measure for unconventional monetary policy includes APP and forward guidance, insofar as it influences interest rates at maturity above 1-year (long-term forward guidance or "long-term path surprises"). According to this distinction announcements on APP size and modalities can also affect conventional surprises if they influence the short-term forward guidance.

dollar and in nominal effective terms, with conventional surprises having stronger and more persistent effects than unconventional ones. The reaction of exchange rates to monetary policy surprises varies over time: the responsiveness to conventional monetary surprises increased markedly since mid-2013. The paper explores the extent to which the negative interest rate policy (NIRP) adopted by the ECB since mid-2014 influenced the sensitivity of exchange rate and whether the contemporaneous use of different policy tools exerted a mutual reinforcement on the exchange rate. The results show that NIRP is associated with a stronger responsiveness to monetary news of both exchange rates. Complementarity effects are significant in the response of the nominal effective exchange rate.

Most of the empirical evidence focused on the international dimension of large-scale asset purchase programmes concentrates on the Federal Reserve policies and their effect on the dollar (e.g. Neely [2015], Glick and Leduc [2015] and Rogers et al. [2016]). The evidence on the effects of ECB unconventional monetary policy on the euro is scant. The existing literature either assesses the effects of unconventional monetary policies undertaken during the sovereign debt crisis (e.g. Fratzscher et al. [2016] and Casiraghi et al. [2016]) or it studies the impact of the APP announcement by means of event studies (e.g. Altavilla et al. [2015], Georgiadis and Grab [2015] and Bulligan and Delle Monache [2017]). Compared to the latter group of papers, this study contributes in two dimensions: by disentangling the effects of conventional and unconventional policies and by estimating the persistence of their impact.

An additional contribution is the construction of new time series for conventional and unconventional monetary surprises in the euro area. The time series currently available either do not include unconventional monetary policy measures (Brand et al. [2010] and Leombroni et al. [2016]) or do not distinguish between conventional and unconventional monetary policy (Pericoli and Veronese [2017]).

The rest of the paper is organized as follows. Section 2 describes how monetary policy surprises are constructed. Section 3 discusses the impact of conventional and unconventional monetary surprises on exchanges rates and explore the role of the NIRP and of complementarity across policy tools. Section 4 analyses the robustness of the baseline results (i) to the presence of asymmetric reactions of the exchange rate to tightening or expansionary monetary policy, (ii) to the possibility that the extracted surprises are not financial market reactions to monetary news but to the GC perceptions about the outlook for the economy (information effects). Section 5 concludes.

2 Monetary policy surprises in the euro area

I construct monetary policy surprises in the euro area from changes in several interest rates around monetary policy events, that is days in which the ECB made announcements about its monetary policy. I select 248 events between January 1999 and September 2017 (GC scheduled meetings). I exclude all decisions that were taken on unscheduled meetings, as they could reflect endogenous responses to contemporaneous events (the official interest rates cut on 17 September 2001, following the terrorist attacks in the U.S. and on 8 October 2008, after the bankrupcy of Lehman Brothers). Differently from Altavilla et al. [2015] and Bulligan and Delle Monache [2017], I do not include speeches by GC members as the extent to which monetary policy announcements are provided in those speeches is less clearcut.[7]

Surprises are daily changes in selected interest rates during these events.[8] The implicit assumptions are that in the one-day window around the monetary policy event (i) markets incorporate all the information released by the central bank, (ii) risk premia embedded in financial asset prices do not change, (iii) monetary policy does not react to financial markets on that day and (iv) no other relevant macroeconomic news affect the interest rates. To be sure that the surprises extracted from financial asset prices correspond to monetary policy news I check that they are consistent with a narrative approach to the most relevant episodes (see Appendix C) and that they are not influenced by other macroeconomic news (see Appendix B).

I identify conventional and unconventional monetary policy surprises from changes in interest rates on different segments of the term structure. The policy indicator for conventional monetary policy news is a composite measure of changes in interest rates in the money market.[9] Surprises are computed as daily changes in the first principal

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[7]A notable exception would be the 26 July 2012 speech in London by President Draghi in which he stated that the "ECB is ready to do whatever it takes to preserve the euro", but since the focus is not on the monetary policy measures undertaken during the sovereign debt crisis, I have not included it.

[8]I follow Hanson and Stein [2015] and Swanson and Williams [2014] in using daily changes as compared to changes in narrower intraday windows around monetary policy announcements as I have availability of intraday data for the euro area only in a 6-month window from early 2016. For this period the surprise component extracted from daily and intradaily data is comparable, a result that also has been found by Gürkaynak et al. [2005] for the U.S.

[9]The policy indicator is a broader concept as compared with the intermediate operational target, that is the interest rate that the central bank is steering while implementing its monetary policy (in the case of the ECB this is the overnight interest rate, Eonia). See Appendix B for discussion and robustness.

component of overnight interest rate swaps at horizons of 1, 3, 6, 9, 12 months.[10]

The choice of a policy indicator that includes rates up to the one-year horizon is common in the literature. Gürkaynak et al. [2005] emphasized that FOMC statements about future monetary policy intentions have as much effects on asset prices as actions.[11] Evidence for the euro area points to the same, even before the decline of official interest rates to their lower bound (Pericoli and Veronese [2017] and Leombroni et al. [2016]).[12]

The scale of this conventional monetary policy surprise is arbitrary, being a principal component, and I rescaled it so that its immediate effect on the 1-year overnight interest swap is equal to one basis point. Figure 1, which provides the time series of the conventional policy surprises, shows three facts. First, most of the largest surprises happened during the first years of EMU. Second, the magnitude and volatility of the surprises during the global financial crisis and the sovereign debt crisis were not bigger than in other periods. This is *prima facie* evidence that the surprises are not capturing large deviations in risk premia.[13] Third, differently from what observed in U.S. and U.K., there have been large surprises even when interest rates were close to their lower bound.[14]

During the last decade, monetary policy innovations are not entirely captured by changes in money market interest rates. The great financial crisis, the sovereign debt crisis and the effective lower bound on official interest rates caused the ECB to resort to unconventional monetary policy tools. There are two challenges in identifying the surprise component of unconventional monetary policy from financial asset prices. First, the unconventional measures undertaken by the ECB have been numerous and with differing objectives; second, the ECB adopted unconventional measures together with the

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[10]The first principal component explains 75% of the total variance and this percentage is stable across subsamples.

[11]In the terminology of Gürkaynak et al. [2005] my conventional monetary policy surprises capture both the "target" and the "path" factors.

[12]A striking example of the use of forward guidance before the crisis is the use of code words, such as "strong vigilance" by president Trichet to signal upcoming changes in official interest rates. See Appendix C.

[13]Constructing the surprises from the futures on the 3-month Euribor instead of the OIS generate larger surprises in that period, as risk premia embedded in the Euribor were very volatile at that time.

[14]For example, the deposit facility rate cut in September 2014 came as a surprise since in June, after the cut of official interest rates, the GC dropped the so-called easing bias in its forward guidance saying that "the interest rate is for all practical purposes at its lower bound". In December 2015 markets were caught by surprise by a smaller than expected interest rate cut, which was then delivered in March 2016. At that time the interest rates at the 12-month horizon however increased as Draghi sounded more cautious on further deposit facility cut.

manoeuvre of the official interest rates, so that we cannot distinguish between the two using different sample periods, as in Swanson [2017].[15]

The first issue requires one to choose the appropriate policy indicator from which extracting unconventional monetary policy surprises depending on the time period. In the most recent years, the main unconventional monetary tool has been the APP, through which the ECB aimed at reducing the long-term interest rates, by means of both a compression of term premia and a signalling that official interest rates will remain at their lower bound for an extended period of time. The selected policy indicator is thus a (synthetic) 10-year euro area government bond yields.

As a first step, I compute the first principal component of daily changes around monetary policy events in long-term interest rates (10-year interest rate swap and 10-year German, French, Italian and Spanish government bond yields).[16] Then, I keep the component that is orthogonal with the conventional monetary policy surprises (Glick and Leduc [2015]). I compute the same series since 1999, even though asset purchase programmes were not in place at that time, to check whether I identify correctly the unconventional monetary measures and not capturing the usual volatility. The one-tailed F-test that compares the variances of the unconventional monetary policy series in the subsample before the crisis (Jan. 1999-Aug. 2008) and after the crisis (Jan. 2013-Sep. 2017) suggests that the variance is higher in the post-crisis sample with a 1% significance. The unconventional surprises are then rescaled so that they correspond to a one basis point increase of the 10-year German Bund yield.

The time series of unconventional surprises (figure 2) largely match narrative evidence

[15]There are four of these episodes: (i) on 5 June 2014 the key ECB interest rates were reduced by 10 bp with the deposit facility rate lowered to negative rates for the first time and a series of Targeted Long-Term Refinancing Operations (TLTRO), as well as preparatory work for purchases in the ABS market announced; (ii) on 4 September 2014 the official rates were lowered by 10 basis points and ABS and covered bond purchase programme were announced; (iii) on 3 December 2015 the deposit facility rate was lowered by 10 basis points and and it was announced a 6-month extension of the APP; (iv) on 10 March 2016 the deposit facility rate was lowered by 10 basis points and the main refinancing and marginal lending rate by 5 basis points and the GC announced an expansion of monthly asset purchases within APP from €60 billions to €80 billions, the launch of a corporate sector purchase programme and of a new series of TLTRO.

[16]I use principal component analysis in order to have a synthetic euro-area government bond from 1999 and reduce noise form the data. The first principal component explains 67% of the variance in the full sample, 94% in the pre-crisis sample (1999-2008) and 82% in the post-crisis sample (2013-2017). See Appendix B for discussion and robustness on including the 5-year yields in the construction of the unconventional surprises.

on the release of monetary policy news, with the exception of the 3 June 2015 event (so-called *Bund tantrum*), when the long-term interest rates increased by 17 basis points, but more for technical factors in the Bund market rather than news of a tightening of the monetary policy stance. Therefore I exclude this event from the unconventional surprise series (See Appendix C).

Unconventional monetary surprises capture both news on the announcements about the asset purchase programmes and news on the explicit forward guidance, undertaken since July 2013, to the extent that it affected the expectations about future short-term interest rates beyond the 1-year horizon. Forward guidance that affects the interest rates up to 1-year is labeled conventional monetary policy, as it was in use in the period before the crisis. In interpreting the results one has to keep in mind that announcements on APP size and modalities affect also conventional surprises to the extent that they influenced the short-term forward guidance.[17]

3 The impact of monetary policy on exchange rates

3.1 Methodology

I estimate the dynamic response of exchange rates, both vis-à-vis the dollar and in nominal effective terms, to monetary policy surprises using local projection methods at daily frequency (Jordá [2005]).[18]

Local projection methods are more flexible and robust to mis-specifications as compared to VARs. They do not require to specify the dynamics of a multivariate system and estimate the impulse response function directly from a set of linear equations, instead of recovering them by iterating up to the relevant horizon the estimated VAR coefficients. Moreover, they can be adapted more easily to analyze possible non-linearity in the responses of the exchange rates (see section 3.3).[19]

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[17]Since 10 March 2016, the GC linked its forward guidance to the duration of the net asset purchase within the APP "we continue to expect [key ECB interest rates] to remain at their present levels for an extended period of time, and well past the horizon of our net asset purchases."

[18]I use the euro-dollar exchange rate quotation at 16:00 GMT and the changes of the nominal effective exchange rate of the euro vis-à-vis the currencies of the 38 most relevant trading partners, computed by the ECB. Since the nominal effective exchange rate is computed from quotations of the bilateral exchange rate at 14:00 CET and monetary policy decisions are also released during the press conference starting at 14:30 CET I consider a two-days window for the impact response. See Appendix A for data sources.

[19]For recent contribution on the use of local projections to estimate the effects of monetary policy see

I estimate the following equation for each horizon $h = 0, 1, ..., H$

$$\Delta e_{t+h} = \alpha_h + \beta_h^c cmps_t + \beta_h^u umps_t + \sum_{k=1}^{K} \gamma_{k,h}' \mathbf{x}_{t-k} + \varepsilon_{t+h}$$

where e_t is either the bilateral euro-dollar or the euro nominal effective exchange rate, $cmps_t$ and $umps_t$ are, respectively, the conventional and unconventional monetary policy surprises and $\mathbf{x}_t$ are control variables, namely the oil price in U.S. dollars, the option implied volatility of the U.S. stock market index and the 2-year and 10-year yields on U.S. Treasuries.[20]

I estimate this equation through OLS at each different horizon h, up to $H = 20$ working days. The estimated sequence of coefficients β_h^c and β_h^u are the impulse responses; each of them measures the average impact of conventional and unconventional monetary surprises on the exchange rates on h days after the shock. Leads of the dependent variable can induce serial correlation in the error terms, therefore standard errors are estimated with Newey-West with maximum autocorrelation of lag set to $H + 1$.[21]

I analyze the responsiveness of the euro exchange rates during monetary policy events in three subsamples: *full sample* (January 1999 - September 2017), *pre-crisis sample* (January 1999 - August 2008), *post-crisis sample* (January 2013 - September 2017).[22]

3.2 Baseline results

Figures 3, 4 and 5 show the impulse responses to conventional and unconventional surprises of the euro exchange rates in the three subsamples.[23]

The euro appreciates after tightening conventional monetary policy surprises. As first found by Eichenbaum and Evans [1995], the maximum appreciation does not occur

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Cesa-Bianchi et al. [2016] and Alpanda and Zubairy [2017]

[20]For robustness I also estimated a specification with lags of the surprises, which turned out not to be statistically significant. The time series of the surprises are not serially correlated (see Appendix B) but in the early years of the EMU there were GC meetings every two weeks and the surprise in previous GC falls within the H horizon of the local projections estimates potentially affecting the results.

[21]This is equivalent to estimate the H+1 equations as a system of seemingly unrelated equations and correct for the correlation across time t and horizon h by using Driscoll-Kraay standard errors.

[22]See Anzuini et al. [2016] and Rogers et al. [2016] for an analysis of the dynamics of the euro exchange rate during the sovereign debt crisis.

[23]Table 1 and 2 reports the impact effect (β_0^j) of the surprises on the euro-dollar exchange rate and the nominal effective one.

immediately after the shock but several month afterwards. [24] The effects on both exchange rates increased over time. Before the crisis the responses to conventional surprises are not statistically significant. The behaviour of the euro-dollar exchange rate in the first years of adoption of the common currency seems responsible for this results. Figure 6 shows that, excluding that period, the euro appreciated after a tightening shock. When comparing the effects over time it results that the impact of a 100 basis point increase of the 1-year rate appreciated the euro vis-à-vis the dollar (the nominal effective exchange rate) by 0.2% (0.3%) between 2002 and 2008 on the same day of the shock, while the same shock appreciated the euro-dollar by 1.2% (0.7%) between 2013 and 2017. This fact has been documented also by Ferrari et al. [2017] for a panel of currency pairs.

After 2013, when the ECB put in place measures with the deliberate intent to reduce long-term interest rates, unconventional surprises had a statistically significant impact on the value of the euro.[25] A 100 basis point drop of the 10-year Bund yield depreciated the euro-dollar by 0.5% and the nominal effective exchange rate by 0.4%.

Altavilla et al. [2015] and Bulligan and Delle Monache [2017] found that the cumulated impact of selected announcements on APP caused a 5% depreciation of the euro-dollar and about 30 bp reduction in euro-area sovereign bond yields in the one-day window, which imply larger effects than those obtained here. There are three reasons that explain the different results. First, their results are based on an event study analysis and, insofar as their events contain conventional and unconventional announcements, the results include the impact of both. Second, I selected a very conservative set of events (only the GC scheduled meeting) while they include speeches and interviews by GC members. In as much as it affected expectations about the announcements on the APP, this communication has weakened the surprise components during GC meetings. Third, they control for several macroeconomic releases in the selected events in both euro area and U.S., but do not explicitly control for the interest rates in dollar, which is an important determinant of the exchange rates especially in those years when monetary policies in the two area were starting to diverge.

After 2013 the conventional monetary surprises had a stronger and more persistent impact than unconventional ones on both exchange rates. However, the comparison could be blurred by different volatility of the surprises extracted from the short and the long-

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[24]In the full-sample case the peak of the euro-dollar is reached after about 30 months.

[25]I computed the impulse response to unconventional monetary surprises also before the crisis, even though at that time the ECB was not attempting to directly influence the long-term part of the yield curve. Not surprisingly, the responses of the exchange rates are statistically insignificant.

term part of the yield curve (a 1 bp change in short-term rate might be more frequent than a 1 bp changes in long-term rates). Figure 7 depicts the responses of the euro-dollar after having standardize the surprises so that they both have zero mean and one standard deviation, confirming that unconventional surprises had immediate impact that is less than a half of the impact of conventional ones and vanishes after few days.[26]

3.3 The role of the negative interest rate policy and the complementarity effects

In this section I explore the possible explanations for the increased sensitivity of the exchange rates to monetary policy. Figures 8 and 9 show the coefficients β_h^c and β_h^u at horizon $h = 0$ obtained from a 20-events rolling window regressions. The immediate impact of conventional monetary policy surprises increased markedly around mid-2013. At that time also the impact effect of unconventional monetary policy became positive and statistically significant.

A likely candidate to explain the higher responsiveness of the exchanges rates is the approaching of the zero lower bound and the adoption of a negative interest rates by the ECB. Ferrari et al. [2017] suggest that when interest rates are close to their lower bound a greater adjustment burden falls onto the exchange rate when there are changes to expected currency return.

The local projection method can be easily extended to estimate a state-dependent model, as it has been done by Ramey and Zubairy [2014] in studying the government spending multipliers outside and at the ZLB. I estimate the following equation for $h = 0, ..., H$ in which all the coefficients are allowed to vary according to the state of the economy.

$$
\begin{aligned}
\Delta e_{t+h} &= I_{t-1}^{NIRP} \left[\alpha_h^1 + \beta_h^{1c} cmps_t + \beta_h^{1u} umps_t + \gamma_h^1(L)' \mathbf{x}_t \right] \\
&+ (1 - I_{t-1}^{NIRP}) \left[\alpha_h^2 + \beta_h^{2c} cmps_t + \beta_h^{2u} umps_t + \gamma_h^2(L)' \mathbf{x}_t \right] + \varepsilon_{t+h}
\end{aligned}
\tag{1}
$$

where I_t^{NIRP} is a dummy variable that takes value equal to 1 when the Eonia became negative (around mid-2014). The coefficients β_h^{1j} with $j = c, u$ are the impulse responses to conventional and unconventional surprises in the case in which the economy had negative

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[26]Standardization do not change the sign of the surprises, which have mean close to zero.

interest rates (NIRP-state) when the shock hits. I estimate the state-dependent local projection for the period January 1999 - September 2017 and about 16% of the sample is in the NIRP-state.

Figures 10 and 11 show that conventional and unconventional surprises had both a different effect when the ECB adopted a negative interest rate policy. The advantage of the estimation of a state-dependent local projection is that one can test the significance of the difference of the β coefficients in the two states of the economy. An F-test on the differences at horizon $h = 0$ indicates that the response to conventional (unconventional) surprises is different across the two-state with a significativity of 5% (1%); at horizon $h = 5$, that is 5 days after the shock, the difference of coefficients across states became not statistically different from zero for unconventional surprises and it is still significant for conventional surprises.

The stronger responsiveness to conventional monetary news in post-crisis period can also be due to the complementarity of the policy tools adopted by the ECB.[27]

I test the existence of such complementarity effects of conventional and unconventional measures by means of a local projection that singles out the responses of the exchange rates in the events in which the ECB surprised the short and the long-term interest rates in the same direction between January 2013 and September 2017:

$$
\begin{aligned}
\Delta e_{t+h} &= \alpha_h + D_t^{compl} \left[\beta_h^{1c} cmps_t + \beta_h^{1u} umps_t \right] \\
&+ (1 - D_t^{compl}) \left[\beta_h^{2c} cmps_t + \beta_h^{2u} umps_t \right] + \gamma_h(L)' \mathbf{x}_t + \varepsilon_{t+h}
\end{aligned}
\tag{2}
$$

where D^{compl} is a dummy variable that takes value equal to 1 when $cmps_t$ and $umps_t$ comove positively, and 0 otherwise. In the post-crisis sample $D^{compl} = 1$ in 64% of events. For the euro-dollar there are no significant differences in the two states (figure 12), while for the nominal effective exchange rate the effect of a conventional surprise is stronger if it is accompanied by an unconventional surprise of the same sign, suggesting that there

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[27] "The ECB has deployed a set of mutually reinforcing instruments, including long-term conditional funding operations for banks, negative short-term interest rates and direct outright interventions across the yield curve. [...] For the most part, our policy instruments act as strong complements. For instance, the downward pressure that APP exerts on term premia is strengthened by the negative interest rate policy and the rate forward guidance that offers an expected horizon for continuing that policy in the near term. "Peter Praet's speech at The ECB and its Watchers XVIII Conference *Calibrating unconventional monetary policy*, 6 April 2017.

is some degree of complementarity of the two sets of policy measures (figure 13).

4 Robustness

In this section I provide some robustness checks to the baseline results. In particular, I verify (1) whether there has been asymmetric monetary policy effects on exchange rates in the post-crisis period; (2) if results are robust to the presence of central bank information effects, that is the possibility that the extracted surprises are not financial market reactions to monetary news but to the GC perceptions about the outlook for the economy.

4.1 Asymmetric effects of monetary policy

The existence of a lower bound on conventional monetary policy and the fact that during the post-crisis period the ECB monetary policy stance has been exceptionally expansionary might cast doubt on whether results are driven by the presence of some asymmetry in the response of exchange rates to tightening or expansionary surprises. While the full sample has almost an equal proportion of positive and negative monetary policy surprises, in the 2013-2017 period there are relatively more contractionary conventional surprises and more expansionary unconventional ones (see table B2 in Appendix B). Furthermore, from a policy perspective one might be interested in knowing whether the exit from conventional and unconventional expansionary monetary policy measures will have effects of the same magnitude and persistence as when those measures were adopted.

Local projections are flexible enough to test for the presence asymmetric effects of the shocks. Similarly as Tenreyro and Thwaites [2016] I estimate the following equation

$$
\begin{aligned}
\Delta e_{t+h} &= \alpha_h + \beta_h^{c+} max\left[0, cmps_t\right] + \beta_h^{c-} min\left[0, cmps_t\right] \\
&+ \beta_h^{u+} max\left[0, umps_t\right] + \beta_h^{u-} min\left[0, umps_t\right] + \gamma_h(L)' \mathbf{x}_t + \varepsilon_{t+h}
\end{aligned}
$$

Figure 14 and 15 show that there is no evidence of asymmetric effects of monetary policy on the euro-dollar in the post-crisis period. As for the responses of the nominal effective exchange rate, tightening conventional surprises have more persistent effects than expansionary ones and expansionary unconventional surprises have stronger impact effects. Overall, the uneven distribution of surprises is not driving the results on the euro-dollar and might overestimate the response of nominal effective rate to conventional and unconventional surprises found in the baseline results.

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4.2 Information effects of monetary policy

After the monetary policy meeting the Introductory Statement and the subsequent press conference by the President provide information not only about the current and future monetary policy stance but also on the GC view of the economic outlook for the euro area.[28] Nakamura and Steinsson [2013] argues that the FOMC announcements lead the private sector to update its beliefs not only about the future path of monetary policy, but also about economic fundamentals. They build a model that encompasses a "Fed information effect" and estimate that this effect is large.[29]

In this section I verify the robustness of the baseline results to the possibility that the surprises that I extracted in Section 2 are not responses to purely exogenous monetary news but markets' reactions to the GC view of the state of the economy. Following Nakamura and Steinsson [2013], in order to distinguish between monetary news and information effects I posit that the former generates a negative comovement between interest rates and stock prices, while the latter generates a positive comovement. This identification is based on the theoretical prediction that a pure tightening of monetary policy leads stock prices to fall for two reasons: higher discount rates and lower future output. Release of better than expected news about the perceived outlook for the euro area economy would instead increase both stock prices and interest rates at the time of the announcement.

I estimate the following local projection between January 2013 and September 2017

$$
\begin{aligned}
\Delta e_{t+h} \;=\;\; & \alpha_h + D_t^c \left[\beta_h^{1c} cmps_t \right] + D_t^u \left[\beta_h^{1u} umps_t \right] \\
+ \;\; & (1 - D_t^c) \left[\beta_h^{2c} cmps_t \right] + (1 - D_t^u) \left[\beta_h^{2u} umps_t \right] + \gamma_h(L)' \mathbf{x}_t + \varepsilon_{t+h}
\end{aligned}
\tag{3}
$$

where D_t^c and D_t^u are dummy variables that takes value equal to 1 respectively when $corr(cmps_t, stock_t) < 0$ and when $corr(umps_t, stock_t) < 0$. In the post-crisis sample I have 57% of events in which $D^c = 1$ and 67% in which $D_t^u = 1$.

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[28]It is difficult to argue that the central bank has more information about the state of the economy than the markets itself, but private agents might use the cenral bank view as a coordination device for their perceptions about the economic outlook.

[29]About two-third of the response of real interest rates to FOMC announcements is estimated to be a response of the natural interest rate as a result of updated beliefs by the private sector; one-third is a tightening of the real rate with respect to the natural one. Jarocinski and Karadi [2017], with a different methodology, found evidence of a smaller contribution of information shock to monetary policy surprises. For the Bank of England case see Miranda-Agrippino [2016].

Figures 16 and 17 show that the appreciation of the euro-dollar after a positive conventional and unconventional surprises are roughly of the same magnitude as in the baseline results even when taking into account only those cases in which the monetary policy surprise is negatively correlated with stock prices.

5   Conclusions

The paper provides empirical evidence regarding the effects of ECB conventional and unconventional monetary policy on the euro exchange rate vis-á-vis the dollar and in nominal effective terms, focusing on the years between 2013 and 2017 when inflation fell below the ECB's target and official interest rates were reduced to their effective lower bound.

In those years both conventional and unconventional monetary measures managed to depreciate the value of the euro. Conventional monetary policy surprises had a stronger and more persistent effect on the euro-dollar and the euro nominal effective exchange rate than unconventional ones. Comparing the response of conventional monetary policy surprises over time, I find an increased sensitivity of the exchange rates to monetary news in the recent years.

An analysis based on state-dependent local projections reveals that the decision by the ECB to lower the deposit facility rate to negative levels and the contemporaneous recourse of both conventional and unconventional tools within a policy package are plausible candidates to explain the increased responsiveness of the exchange rates. Robustness exercises signal that there are no significant differences in the responses of the euro to tightening or expansionary surprises and that the results do not change when taking into account the possibility of information effects in monetary surprises.

References

Sami Alpanda and Sarah Zubairy. Household debt overhang and transmission of monetary policy. 2017.

Carlo Altavilla, Giacomo Carboni, and Roberto Motto. Asset purchase programmes and financial markets: lessons from the euro area. Working paper series, European Central Bank, November 2015.

Alessio Anzuini, Martina Cecioni, and Stefano Neri. Determinants of the movements in the euro-dollar exchange rate during the sovereign debt crisis. Questioni di economia e finanza (occasional papers), Bank of Italy, January 2016.

Claus Brand, Daniel Buncic, and Jarkko Turunen. The Impact of ECB Monetary Policy Decisions and Communication on the Yield Curve. *Journal of the European Economic Association*, 8(6):1266–1298, 2010.

Guido Bulligan and Davide Delle Monache. Financial market effects of ECB unconventional monetary announcements. December 2017.

Marco Casiraghi, Eugenio Gaiotti, Lisa Rodano, and Alessandro Secchi. ECB Unconventional Monetary Policy and the Italian Economy during the Sovereign Debt Crisis. *International Journal of Central Banking*, 12(2):269–315, June 2016.

Ambrogio Cesa-Bianchi, Gregory Thwaites, and Alejandro Vicondoa. Monetary Policy Transmission in an Open Economy: New Data and Evidence from the United Kingdom. Discussion papers, Centre for Macroeconomics (CFM), April 2016.

John Cochrane and Monika Piazzesi. The Fed and Interest Rates - A High-Frequency Identification. *American Economic Review*, 92(2):90–95, 2002.

Pietro Cova and Giuseppe Ferrero. The Eurosystem's asset purchase programmes for monetary policy purposes. Questioni di Economia e Finanza (Occasional Papers) 270, Bank of Italy, Economic Research and International Relations Area, April 2015.

Martin Eichenbaum and Charles L. Evans. Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates. *The Quarterly Journal of Economics*, 110(4):975–100, 1995.

Massimo Ferrari, Jonathan Kearns, and Andreas Schrimpf. Monetary Policy Rising FX Impact in the era of ultra-low rates. Working papers, BIS, April 2017.

Marcel Fratzscher, Marco Lo Duca, and Roland Straub. ECB Unconventional Monetary Policy: Market Impact and International Spillovers. *IMF Economic Review*, 64(1): 36–74, May 2016.

Georgios Georgiadis and Johannes Grab. Global financial market impact of the announcement of the ECB's extended asset purchase programme. Globalization and Monetary Policy Institute Working Paper 232, Federal Reserve Bank of Dallas, March 2015.

Mark Gertler and Peter Karadi. Monetary policy surprises, credit costs, and economic activity. *American Economic Journal: Macroeconomics*, 7(1):44–76, January 2015.

Reuven Glick and Sylvain Leduc. Unconventional monetary policy and the dollar: conventional signs, unconventional magnitudes. Working Paper Series 2015-18, Federal Reserve Bank of San Francisco, November 2015.

Refet S Gürkaynak, Brian Sack, and Eric Swanson. Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements. *International Journal of Central Banking*, 1(1), May 2005.

Samuel G. Hanson and Jeremy C. Stein. Monetary policy and long-term real rates. *Journal of Financial Economics*, 115(3):429–448, 2015.

Marek Jarocinski and Peter Karadi. Central bank information shocks. February 2017.

Oscar Jordá. Estimation and Inference of Impulse Responses by Local Projections. *American Economic Review*, 95(1):161–182, March 2005.

Kenneth N. Kuttner. Monetary policy surprises and interest rates: Evidence from the Fed funds futures market. *Journal of Monetary Economics*, 47(3):523–544, June 2001.

Matteo Leombroni, Andrea Vedolin, Gyuri Venter, and Paul Wehlan. Central bank communication and the yield curve. November 2016.

Silvia Miranda-Agrippino. Unsurprising shocks: information, premia, and the monetary transmission. Bank of England working papers 626, Bank of England, 2016.

Emi Nakamura and Jón Steinsson. High Frequency Identification of Monetary Non-Neutrality: The Information Effect. Nber working papers, National Bureau of Economic Research, Inc, July 2013.

Christopher J. Neely. Unconventional monetary policy had large international effects. *Journal of Banking & Finance*, 52(C):101–111, 2015.

Marcello Pericoli and Giovanni Veronese. Monetary policy surprises over time. Temi di discussione (economic working papers), Bank of Italy, February 2017.

Valerie A. Ramey and Sarah Zubairy. Government Spending Multipliers in Good Times and in Bad: Evidence from U.S. Historical Data. NBER Working Papers 20719, National Bureau of Economic Research, Inc, November 2014.

John H. Rogers, Chiara Scotti, and Jonathan H. Wright. Unconventional Monetary Policy and International Risk Premia. International Finance Discussion Papers 1172, Board of Governors of the Federal Reserve System (U.S.), May 2016.

Chiara Scotti. Surprise and uncertainty indexes: Real-time aggregation of real-activity macro-surprises. *Journal of Monetary Economics*, 82(C):1–19, 2016.

Eric T. Swanson. Measuring the Effects of Federal Reserve Forward Guidance and Asset Purchases on Financial Markets. NBER Working Papers 23311, National Bureau of Economic Research, Inc, April 2017.

Eric T. Swanson and John C. Williams. Measuring the Effect of the Zero Lower Bound on Medium- and Longer-Term Interest Rates. *American Economic Review*, 104(10): 3154–3185, 2014.

Silvana Tenreyro and Gregory Thwaites. Pushing on a String: US Monetary Policy Is Less Powerful in Recessions. *American Economic Journal: Macroeconomics*, 8(4):43–74, October 2016.

A   Data sources

- **Euro-dollar exchange rate**: WM/Reuters closing spot rate, fixing at 16:00 in London. *Source*: Thomson Reuters.

- **Nominal effective exchange rate**: Nominal exchange rate index of the euro vis-á-vis 38 trading partners, calculated as weighted average of bilateral ECB's daily reference exchange rates with fixing at 14:00 CET. *Source*: ECB.

- **Overnight index swap**: Swap index on overnight interest rate in euro (Eonia) at 1, 2, 6, 9, 12 and 24 months. *Source*: Thomson Reuters.

- **Eonia**: Euro Interbank Offered Rate (Eonia) *Source*: ECB calculation based on European Banking Federation data.

- **Government bond yields**: 5 and 10-year benchmark index of German, French, Italian and Spanish government bond yields. *Source*: Bloomberg.

- **VIX index**: CBOE Volatility Index. *Source*: FRED Economic Data.

- **Oil price**: Crude Oil Brent, $ per barrel. *Source*: Thomson Reuters.

- **U.S. Treasuries yields**: United States Treasury Benchmark Bond 2 years and 10 years. *Source*: Thomson Reuters.

- **EA stock prices**: Euro Stoxx index. *Source*: STOXX.

- **Macroeconomic surprises**: The Citigroup Economic Surprise Index for the Eurozone and for the United States. *Source*: Citigroup Inc..

- **Initial Unemployment claims U.S.**: Weekly Initial Unemployment Claims for the U.S. *Source*: FRED Economic Data.

B Details on the construction of surprises and robustness checks

B.1 Details on the monetary policy surprises time series

Table B1 reports the summary statistics of the surprises used in the analysis of the paper ($cmps_t$ and $umps_t$) as well as other variants for robustness checks. Figure B1 reports the frequency plots of the baseline surprises in the full sample.

Table B1: Summary statistics of monetary policy surprises

	cmps	umps	umps (5&10y)	cmps (3m)	umps (3m)	cmps (2y)	umps (2y)
Obs	248	248	248	248	248	248	248
Mean	0.045	-0.002	-0.002	0.031	0.005	0.000	0.000
Max	3.909	2.276	3.386	2.388	2.467	4.357	2.719
Min	-3.535	-1.809	-2.540	-2.346	-1.505	-3.851	-2.044
St. dev.	0.772	0.604	1.028	0.439	0.61	0.949	0.841
Auto corr.	-0.041	-0.036	-0.010	-0.010	-0.049	-0.051	-0.043
Skew.	-0.236	0.518	0.536	- 0.786	0.499	0.009	0.572
Kurt.	9.561	3.958	3.513	11.964	3.797	8.160	3.408

Table B2: Sample's composition

	full sample	post-crisis
$cmps^+$	57%	65%
$cmps^-$	43%	35%
$umps^+$	50%	41%
$umps^-$	50%	59%

Figure B1: Frequency plot of monetary policy surprises

Panel A. Conventional   Panel B. Unconventional
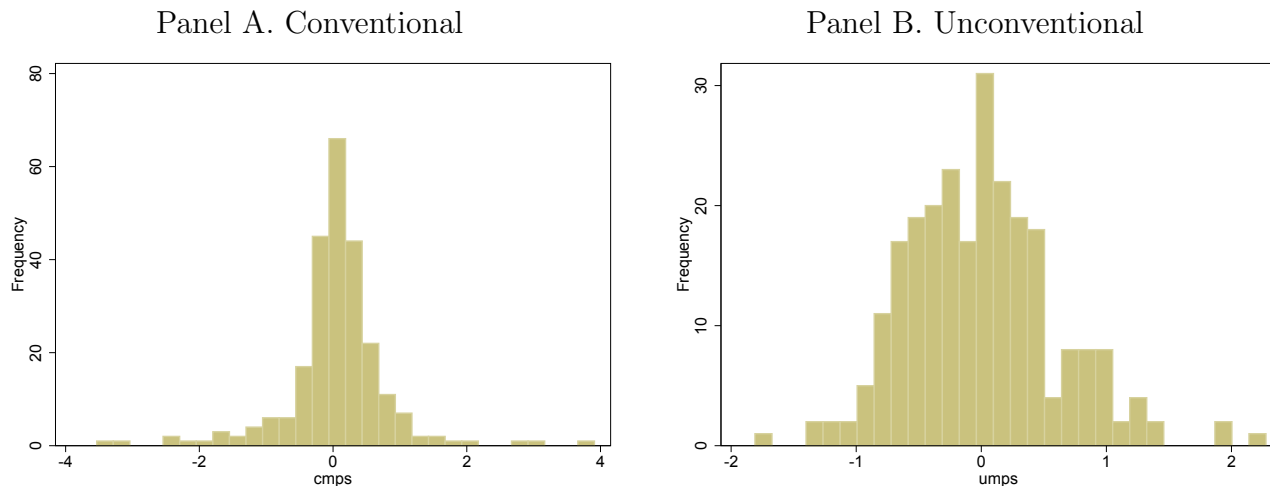
B.2 Robustness of monetary surprises to macroeconomic news

The monetary surprises are constructed based on the daily changes of selected interest rates during GC meetings. In order to claim that the changes in interest rates observed in that days is attributable only to monetary policy news and are not the results of other relevant macroeconomic news I regress the monetary surprises on several macroeconomic and financial market indicators of news in the US and in the euro area: the Citi Economic Surprise Index (CESI), the surprise index developed by Scotti [2016] and the initial unemployment claims for the U.S., whose release is at 14:30 (CET) every Thursday, in coincidence with the beginning of the ECB's press conference. Tables B3 and B4 shows that none of them affects systematically the constructed measure of monetary surprises.[30]

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[30]An alternative would have been to use these news as a control in the local projections that estimates the impact of the monetary surprises on the exchanges rates, but I would have lost some data points as the Scotti surprise index and CESI are not available before 2003.

Table B3: Controlling for the effects of other macroeconomic news (January 1999-September 2017)

	(1) cmps	(2) umps	(3) cmps	(4) umps	(5) cmps	(6) umps
news_ea	1.16e-05	8.99e-06				
	(8.63e-06)	(8.30e-06)				
news_us	9.72e-06	3.98e-06				
	(1.21e-05)	(1.17e-05)				
scotti_ea			0.00145	-0.000346		
			(0.00160)	(0.00155)		
scotti_us			0.00187	-0.000343		
			(0.00130)	(0.00126)		
ic_us					-5.72e-09	-0
					(6.27e-09)	(4.91e-09)
Constant	0.000358	-0.000231	0.000624	-0.000212	0.00250	-6.75e-06
	(0.000509)	(0.000489)	(0.000537)	(0.000520)	(0.00230)	(0.00181)
Observations	166	166	161	161	248	248
R^2	0.017	0.009	0.019	0.001	0.003	0.000

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

B.3 The choice of the policy indicators

In the analysis the policy indicator does not coincide with the policy instrument, that is the interest rate that the central bank is steering while implementing its monetary policy (in the case of the ECB this is the overnight interest rate, Eonia) as it takes into account the effects of forward guidance. In the baseline estimates the policy indicator for conventional monetary policies is the 1-year interest rate. This is a common choice in the recent literature on high-frequency identification of monetary policy shock (see for

Table B4: Controlling for the effects of other macroeconomic news (January 2013-September 2017)

	(1)	(2)	(3)	(4)	(5)	(6)
	cmps	umps	cmps	umps	cmps	umps
news_ea	8.99e-06	5.51e-06				
	(1.46e-05)	(3.08e-05)				
news_us	-1.52e-05	4.38e-05				
	(1.72e-05)	(3.63e-05)				
scotti_ea			-0.000598	0.00172		
			(0.00151)	(0.00319)		
scotti_us			1.14e-05	-0.00171		
			(0.00159)	(0.00336)		
ic_us					-2.96e-09	-3.49e-08
					(1.46e-08)	(3.06e-08)
Constant	0.000575	-0.000226	0.000732	-0.000513	0.00156	0.0101
	(0.000540)	(0.00114)	(0.000557)	(0.00117)	(0.00439)	(0.00918)
Observations	46	46	46	46	46	46
R^2	0.026	0.034	0.004	0.013	0.001	0.029

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

example Gertler and Karadi [2015] and Nakamura and Steinsson [2013]), but it is different from what it is typically done in the VAR literature as the structural monetary policy shock is an exogenous innovation to the policy instrument.

I compute the conventional monetary policy surprises also based on the overnight interest rate swap contracts up to the 3-month horizon and up to the 2-year contracts. Hanson and Stein [2015] and Swanson and Williams [2014] argue that the Federal Reserve's forward guidance strategy operates with a roughly two-year horizon. For the euro area it is less clear the relevant horizon of the forward guidance strategy. Figure B2 shows

Figure B2: Conventional monetary policy surprises with different policy indicators

Panel A: 1-year vs. 3-month   Panel B: 1-year vs. 2-year
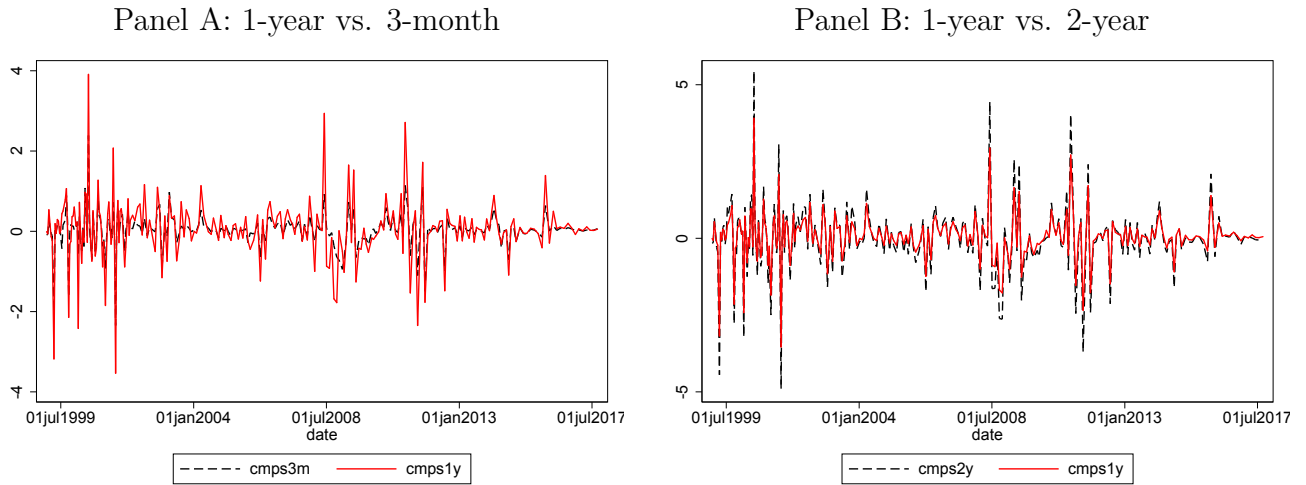
that the conventional surprises time series are not very different when changing the policy indicators.

As for the policy indicators for the unconventional monetary surprises, I also computed a time series of monetary surprises that includes both the 5-year and the 10-year interest rates. Figure B3 shows that the differences with the baseline unconventional monetary surprises are very small and the two time series almost overlaps in the post-crisis period.

Figure B3: Unconventional monetary policy surprises with 5 and 10 years interest rates
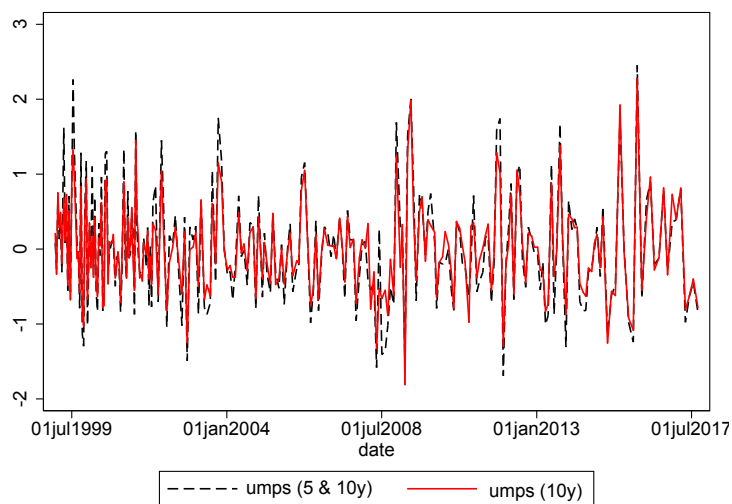
C   List of events and surprises

Table C1 shows that ECB presidents used different communication strategies. While most of the surprises when Duisenberg was president shifted the OIS curve upward at all horizons, the surprises when Trichet was president changed the slope of the OIS curve, by influencing more contracts at longer horizons.

Table C1: Examples of surprises

Duisenberg

	ois1m	ois3m	ois6m	ois9m	ois12m
8 Apr 1999	-22.5	-5.8	-18.5	-19.5	-15.5
8 Jun 2000	20	17	20	23	22.5
10 May 2001	-20	-18.5	-18.7	-17	-19.7

Trichet

	ois1m	ois3m	ois6m	ois9m	ois12m
6 Apr 2006	-1.5	-6.6	-9.2	-7.5	-6.2
5 Jun 2008	1.1	10.9	19.85	23.75	26.8
3 Mar 2011	4.15	12.2	16.4	19.6	21.6

Table C2: Ten largest conventional monetary policy surprises

date	$cmps_t$	comments
8 Jun 2000	3.9	50 bp increase of official rates; markets were expecting a 25 bp move (based on a testimony by Duisenberg in Bruxelles)
10 May 2001	-3.5	25 bp cut of official rates; start of expansionary cycle, markets were not expecting it
8 Apr 1999	-3.1	Unexpected 50 bp cut
5 Jun 2008	2.9	Trichet unexpectedy announce a rate hike in the next meeting ("in a state of hightened alertness")
3 Mar 2011	2.7	Trichet unexpectedy announce a rate hike in the next meeting ("strong vigilance is warranted")
3 Feb 2000	-2.4	Official rates increased by 25 bp; markets were expecting a stronger hike
4 Aug 2011	-2.4	No interest rates changes but very dovish tone and rumors that the ECB will soon intervene against the intensification of the sovereign debt crisis
7 Oct 1999	-2.1	No interest rates changes, but markets were expecting a tightening
11 Apr 2001	2.1	No interest rates changes, but markets were expecting a rate cut
6 Nov 2008	-1.8	50 bp cut of official rates and Trichet announced a further cut in December

Note: Surprises are in basis points and are rescaled so that they imply a 1 bp increase in the 12-month overnight interest rate.

Table C3: Ten largest unconventional monetary policy surprises

date	$umps_t$	comments
3 Dec 2015	2.3	Markets were expecting a stronger expansion of APP
3 Jun 2015	1.9	*"Bund tantrum"*; Draghi said "get used to periods of higher volatility"
5 Sep 2013	1.4	Draghi excluded changes to the qualitative forward guidance
22 Jan 2015	-1.3	Announcement of the launch of APP (size bigger than expected)
22 Oct 2015	-1.1	Draghi pre-announced an expansion of the APP in December
21 Apr 2016	1.0	Draghi ruled out other expansionary interventions and focus on the implementation of the March 2016 package
3 Sep 2015	0.9	Changes in the issue and issuer limits for PSPP eligible bonds hints at future expansion of APP
6 Jun 2013	0.9	No unconventional measures announcement, markets were expecting some form of forward guidance
4 Apr 2013	-0.8	Draghi said the ECB was considering new non-standard measures, adding "we are thinking 360 degrees on the non-standard measures"
8 Sep 2016	0.8	The ECB did not discuss any change to the APP program. Scarcity issues were mentioned

Note: Surprises are in basis points and are rescaled so that they imply a 1 bp increase in the 10-year German interest rate.

Tables and Figures

Figure 1: Conventional monetary policy surprises
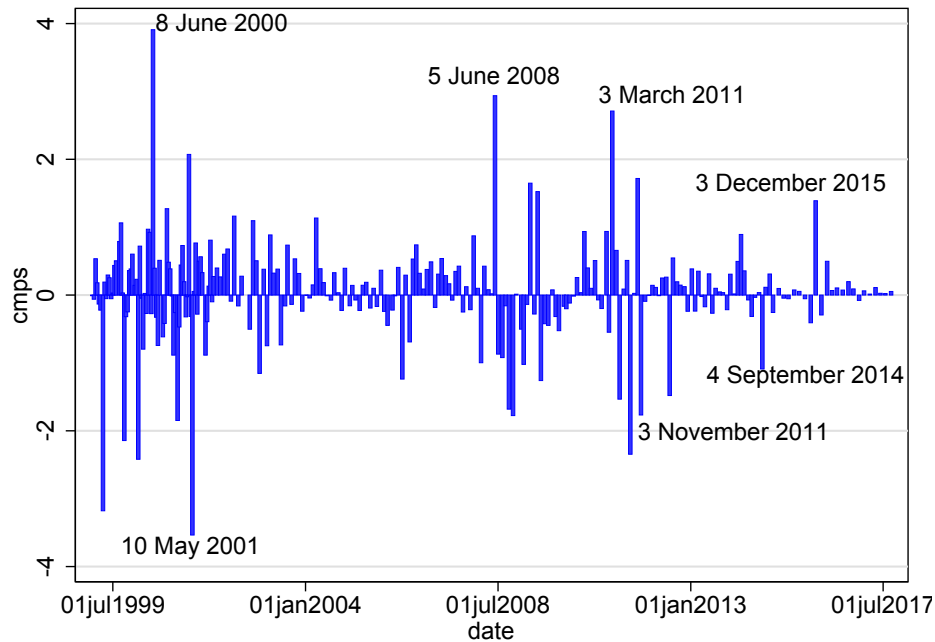
Notes: Some relevant episodes: **8 June 2000**: 50 bps increase of official interest rates (markets were expecting a 25 bp move, based on a testimony by Duisenberg in Bruxelles; **10 May 2001**: unexpected 25 bp cut of official interest rates, start of an expansionary cycle; **5 June 2008**: Trichet unexpectedly announce a rate hike in the next meeting ("in a state of hightened alertness"); **3 March 2011**: Trichet unexpectedly announced a rate hike in the next meeting("strong vigilance is warranted"); **3 November 2011**: Draghi took office and cut the official rates by 25 bps; **4 September 2014**: Draghi unexpectedly cut official interest rates by 10 bps; in June he stated instead "for all the practical purposes, we have reached the lower bound"; **3 December 2015**: 10 bp cut of the deposit facility rate, markets were expecting a 20 bps cut.

**Figure 2:** Unconventional monetary policy surprises
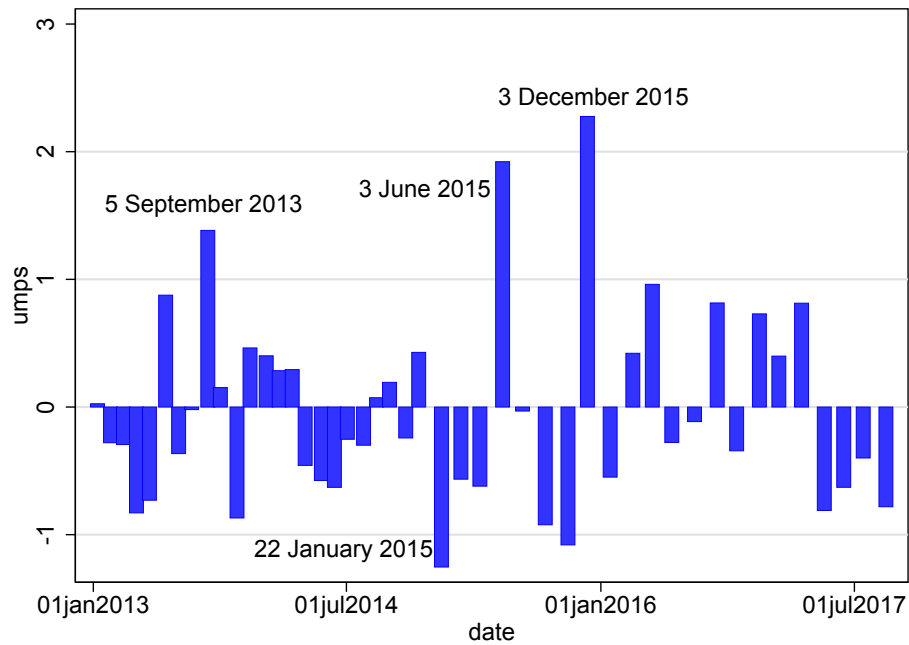
Notes: Some relevant episodes: **5 September 2013**: Draghi excluded changes to the qualitative forward guidance; **22 January 2015**: announcement of the launch of APP (size bigger than expected); **3 June 2015**: *Bund tantrum*: Draghi said "get used to volatility"; **3 March 2011**: Trichet unexpectedly announced a rate hike in the next meeting ("strong vigilance is warranted"); **3 December 2015**: Markets were expecting a stronger expansion of APP.

Figure 3: Responses of the exchange rates to monetary policy surprises (January 1999- September 2017)
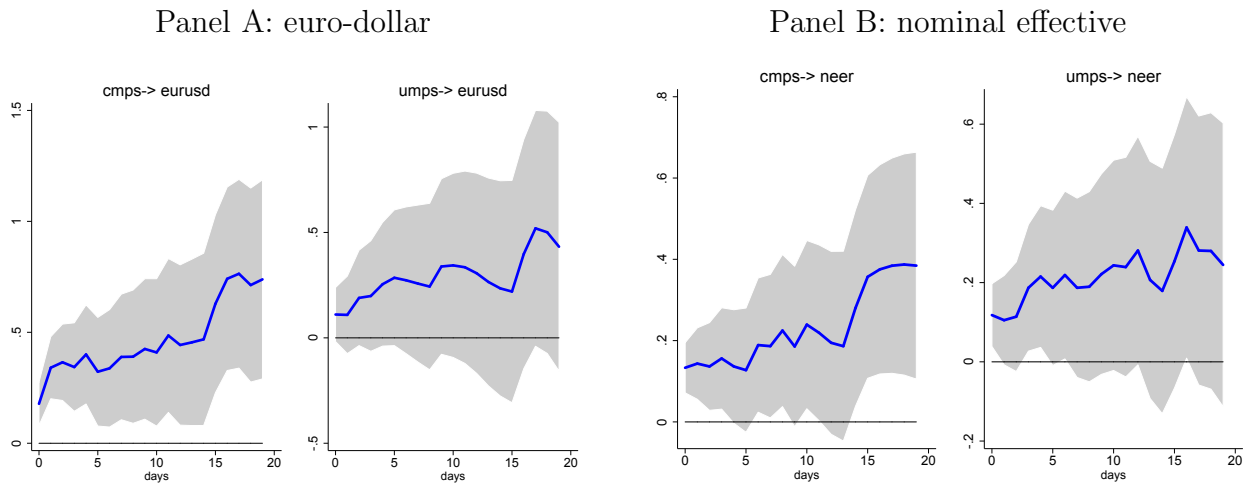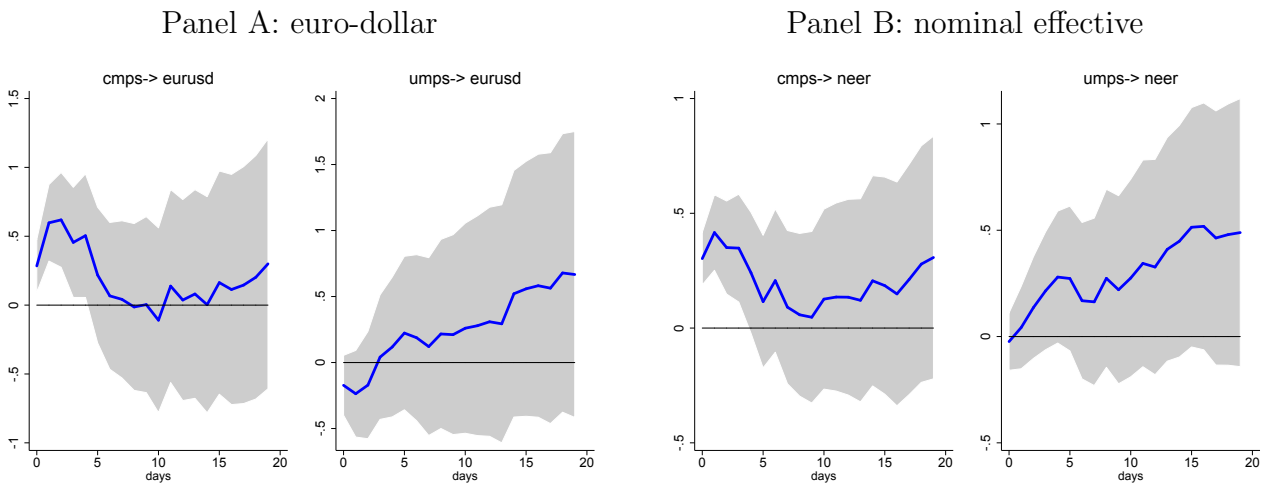
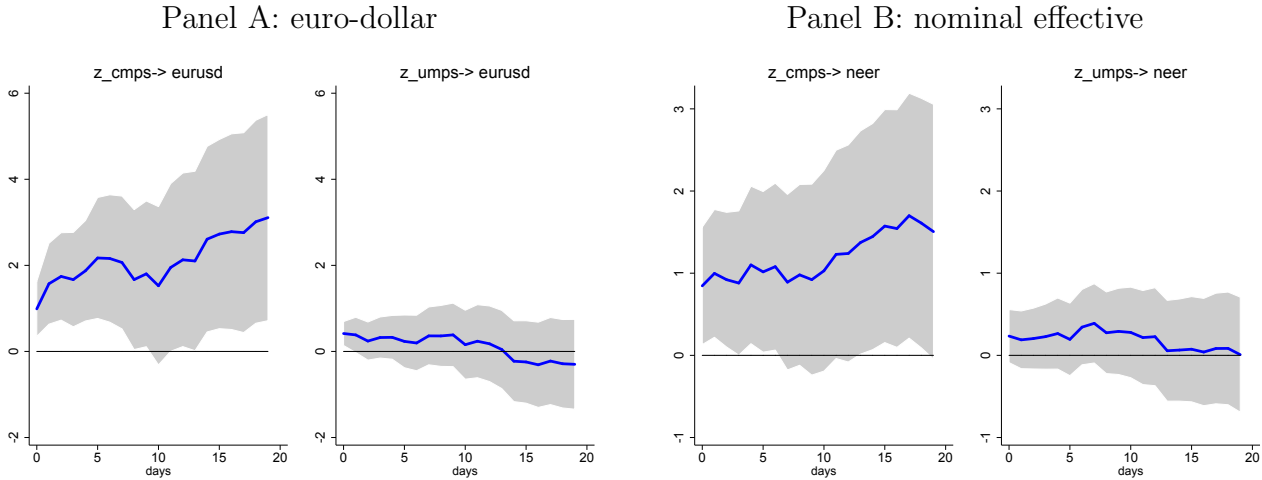Panel A: euro-dollar

Panel B: nominal effective

Notes: IRFs (cumulated) to a 1 pp contractionary surprise. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 4: Responses of the exchange rates to monetary policy surprises (January 1999- August 2008)
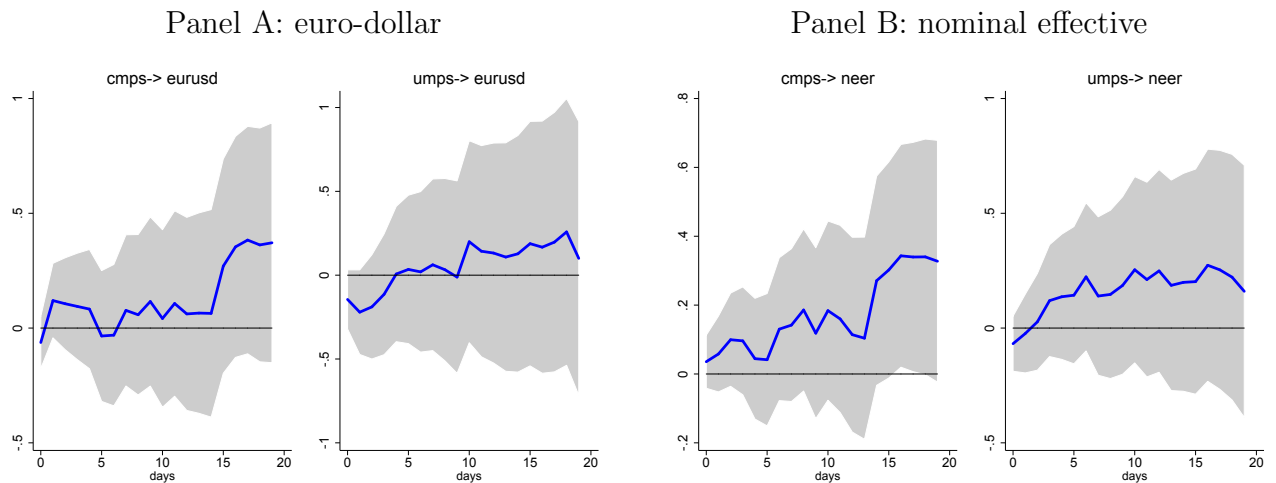
Panel A: euro-dollar

Panel B: nominal effective

Notes: IRFs (cumulated) to a 1 pp contractionary surprise. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 5: Responses of the exchange rates to monetary policy surprises (January 2013- September 2017)
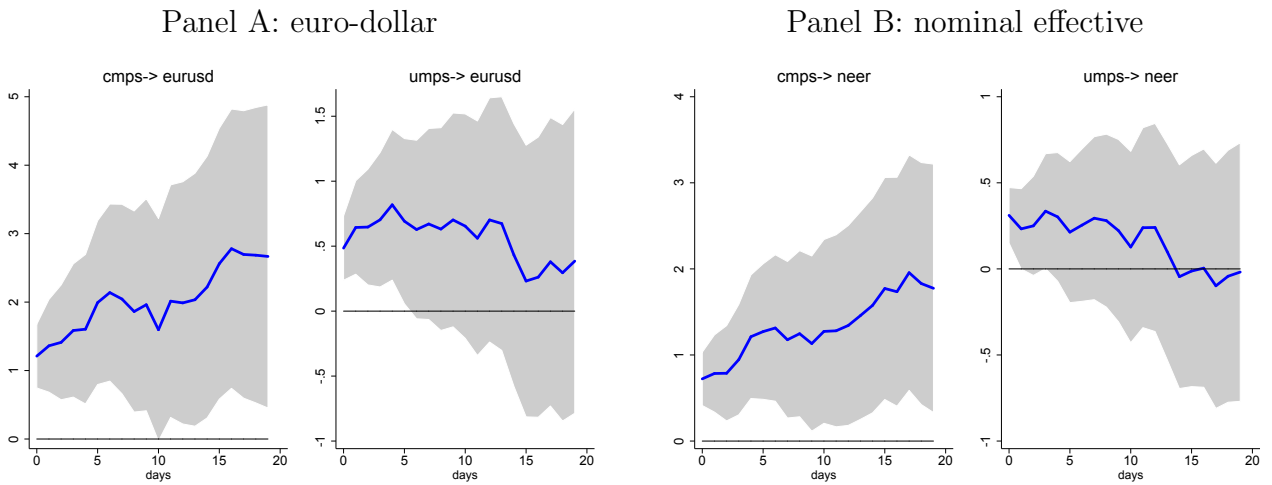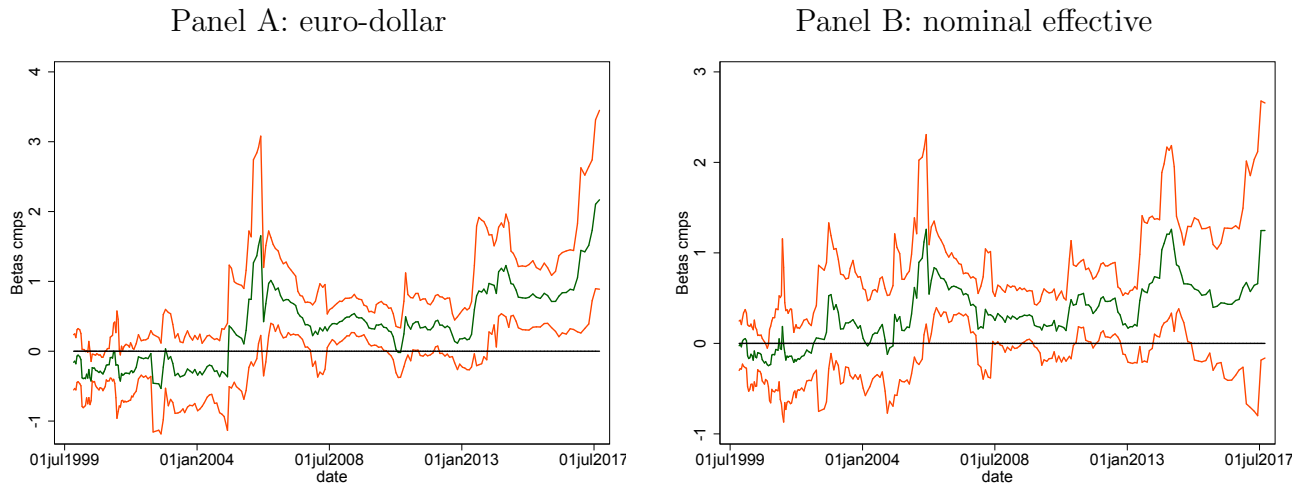
Panel A: euro-dollar

Panel B: nominal effective

Notes: IRFs (cumulated) to a 1 pp contractionary surprise. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 6: Responses of the exchange rates to monetary policy surprises (January 2002- August 2008)

Panel A: euro-dollar

Panel B: nominal effective

Notes: IRFs (cumulated) to a 1 pp contractionary surprise. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 7: Responses of the exchange rates to standardized monetary policy surprises

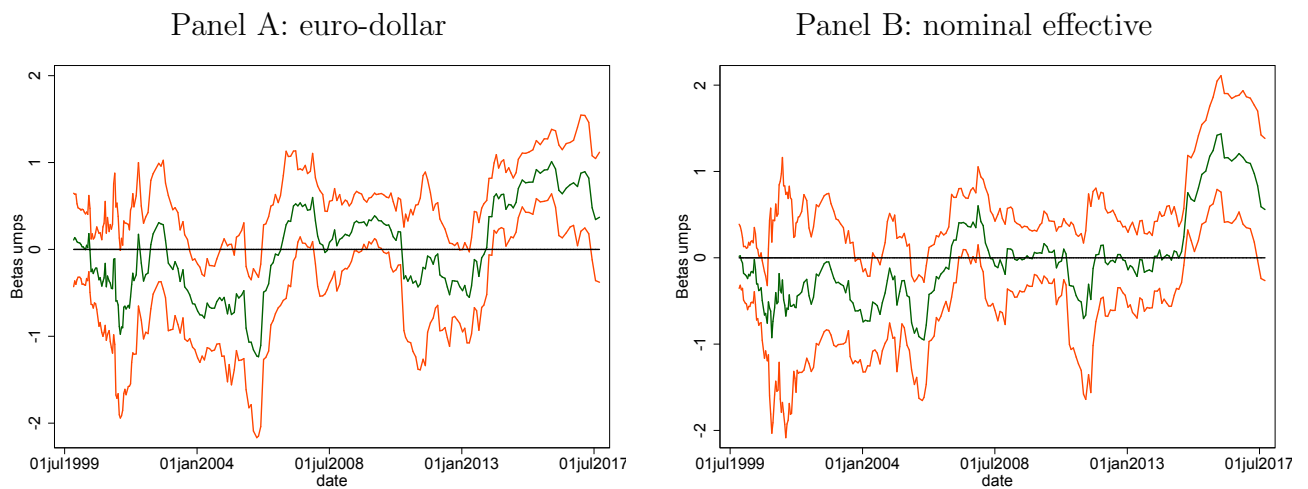Panel A: euro-dollar   Panel B: nominal effective

Notes: Sample: January 2013- September 2017. IRFs (cumulated) to a contractionary surprise of 1 standard deviation. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 8: Impact response to conventional monetary surprises over time

Panel A: euro-dollar

Panel B: nominal effective

Notes: Sample: January 1999- September 2017. Rolling estimates with a 20 events window. Green lines are point estimates; red lines indicate 95% confidence intervals. Newey-West standard errors.

Figure 9: Impact response to unconventional monetary surprises over time

Panel A: euro-dollar

Panel B: nominal effective

Notes: Sample: January 1999- September 2017. Rolling estimates with a 20 events window. Full lines are point estimates; red lines indicate 95% confidence intervals. Newey-West standard errors.
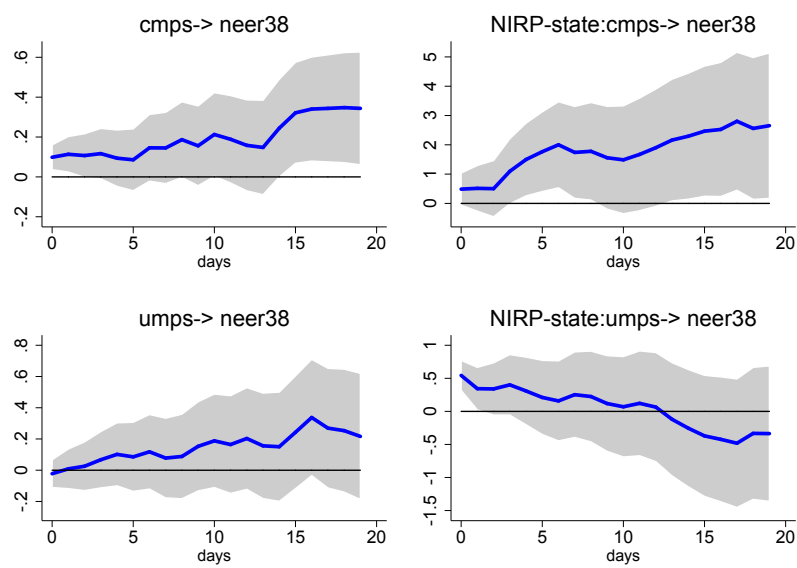
37

Figure 10: Responses of the euro-dollar in and outside the NIRP state
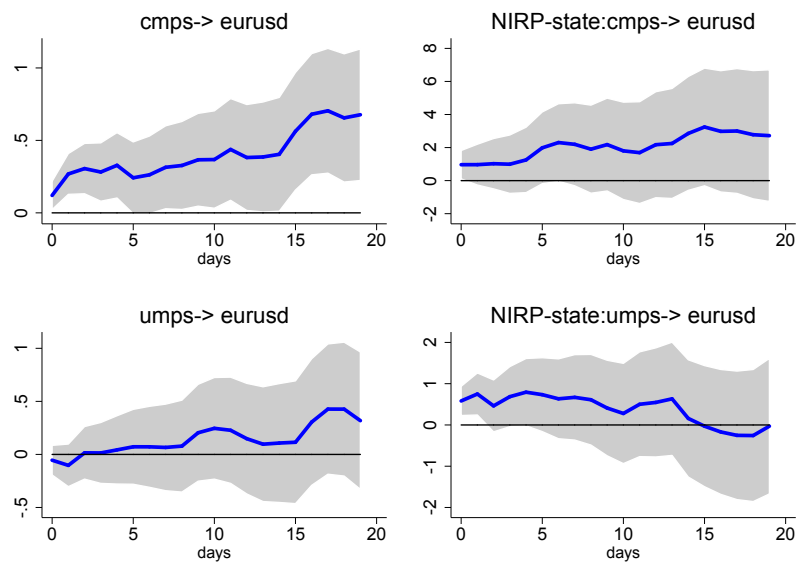
Notes: Sample: January 1999- September 2017. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.
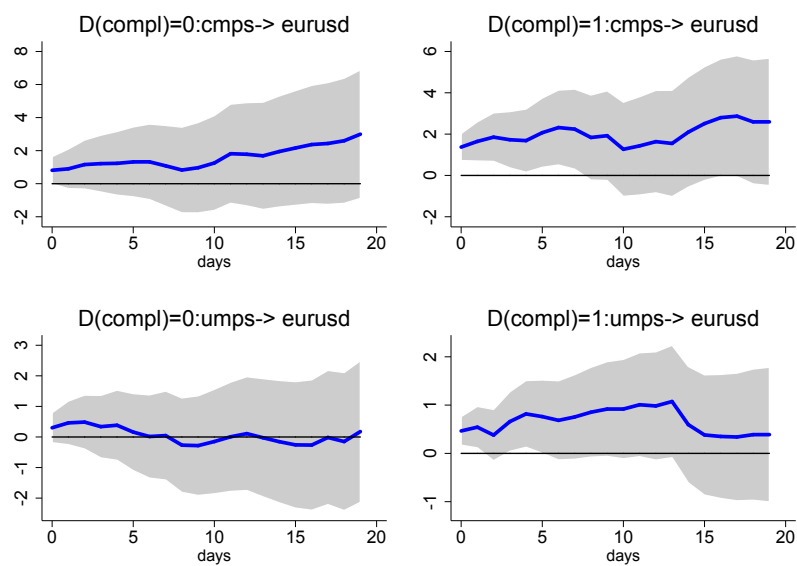
Figure 11: Responses of the nominal effective exchange rate in and outside the NIRP state
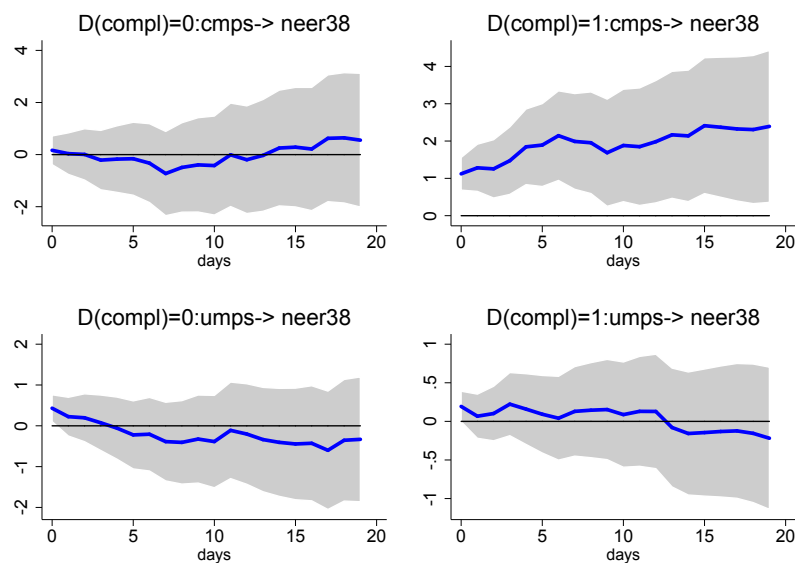
Notes: Sample: January 1999- September 2017. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 12: Complementarity effects in responses of the euro-dollar exchange rate
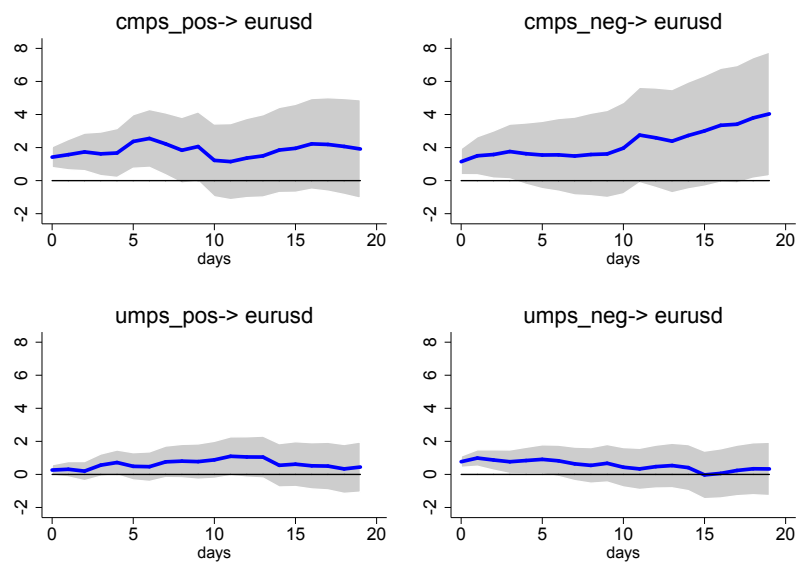

Notes: Sample: January 2013- September 2017. D(compl) = 1 if $corr(cmps_t, umps_t > 0$. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 13: Complementarity effects of the nominal effective exchange rate

Notes: Sample:January 2013- September 2017. D(compl) = 1 if $corr(cmps_t, umps_t > 0$. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 14: Asymmetric effects on the euro-dollar exchange rate

Notes: Sample: January 2013- September 2017. cmps pos if $cmps_t > 0$ cmps neg if $cmps_t < 0$. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

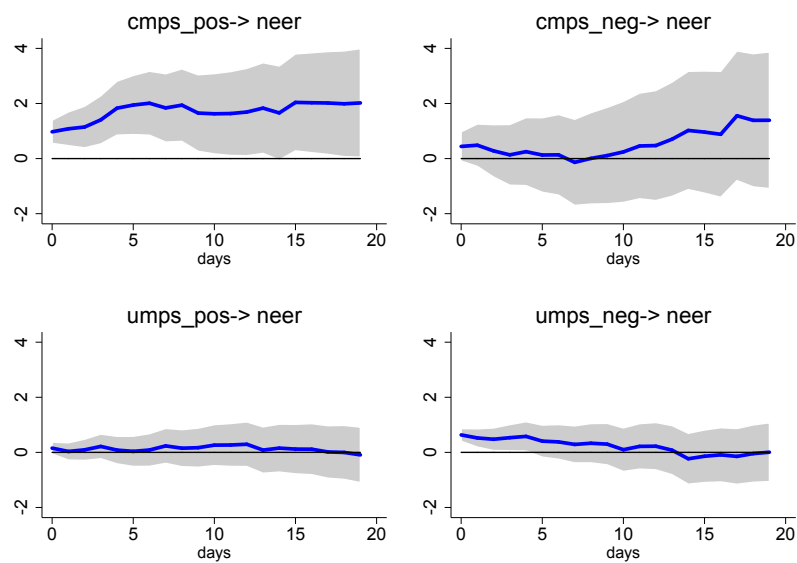**Figure 15: Asymmetric effects on the nominal effective exchange rate**

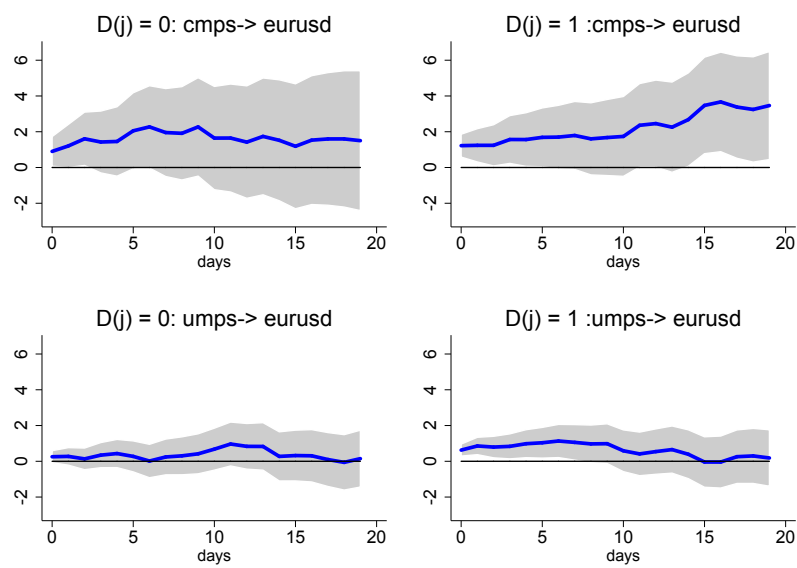*Notes:* Sample: January 2013- September 2017. cmps pos if $cmps_t > 0$ cmps neg if $cmps_t < 0$. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 16: Robustness to information effects on the euro-dollar exchange rate

Notes: Sample: January 2013 - September 2017. For $j = c, u D(j) = 1$ if $corr(stock_t, jmps_t) < 0$. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Figure 17: Robustness to information effects on the nominal effective exchange rate
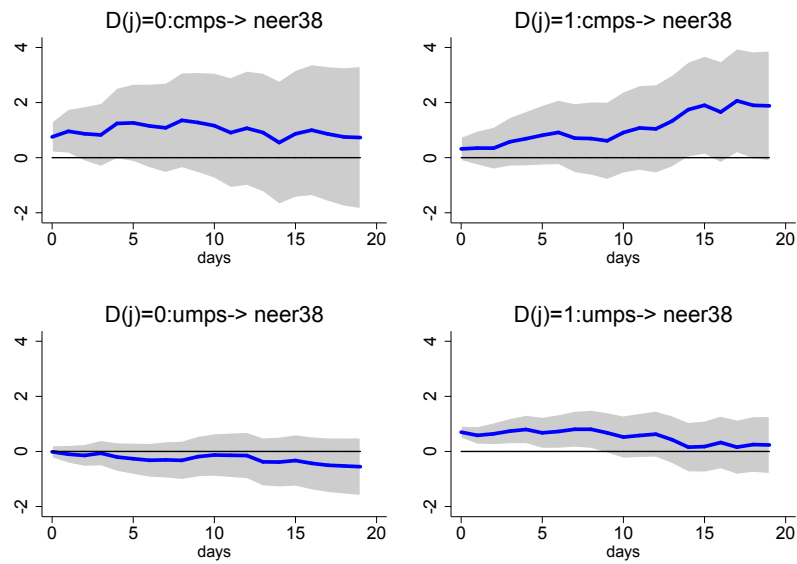
Notes: Sample: January 2013- September 2017. For j = c, u D(j) =1 if $corr(stock_t, jmps_t) < 0$. IRFs (cumulated) to a contractionary surprise of 1 bp. Increase in exchange rate = appreciation. Full lines are point estimates; grey area indicate 95% confidence intervals. Newey-West standard errors.

Table 1: Impact effect of monetary surprises on the euro-dollar

	(1) full sample	(2) pre-crisis (1999-2008)	(3) pre-crisis (2002-2008)	(4) post-crisis (2013-2017)
$cmps$	0.174***	-0.0795	0.194*	1.117***
	(0.0656)	(0.0655)	(0.114)	(0.368)
$umps$	0.132	-0.186*	-0.195	0.640***
	(0.0860)	(0.108)	(0.146)	(0.218)
Δoil	0.00700	-0.0333*	-0.00788	-0.0310
	(0.0196)	(0.0196)	(0.0296)	(0.0618)
Δvix	-0.00743	0.00731	0.00474	-0.00182
	(0.00802)	(0.00967)	(0.0132)	(0.0212)
Δi_{us}^{2y}	-0.0141	0.00500	0.0159	-0.108
	(0.0121)	(0.0117)	(0.0229)	(0.0879)
Δi_{us}^{10y}	-0.00183	-0.0153	-0.0270	-0.0161
	(0.0125)	(0.0144)	(0.0226)	(0.0407)
Observations	248	151	80	46
R^2	0.110	0.238	0.262	0.690

Notes: Dependent variable is the daily changes of the euro dollar exchange rate. Newey-West standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The estimation includes also as regressors two lags of the control variables whose coefficients are not reported.

Table 2: Impact effect of monetary surprises on the nominal effective exchange rate

	(1) full sample	(2) pre-crisis (1999-2008)	(3) pre-crisis (2002-2008)	(4) post-crisis (2013-2017)
$cmps$	0.142***	0.0463	0.308***	0.678***
	(0.0323)	(0.0394)	(0.0587)	(0.166)
$umps$	0.128***	-0.0541	-0.00213	0.363***
	(0.0414)	(0.0614)	(0.0694)	(0.0799)
Δoil	-0.0243*	-0.0249*	-0.00751	-0.0600
	(0.0140)	(0.0145)	(0.0201)	(0.0736)
Δvix	0.0123**	0.00372	0.000932	0.0327
	(0.00573)	(0.00716)	(0.00892)	(0.0252)
Δi_{us}^{2y}	-0.0258***	-0.0177**	-0.0204	-0.0445
	(0.00866)	(0.00863)	(0.0155)	(0.105)
Δi_{us}^{10y}	0.00873	0.00577	0.00129	-0.00497
	(0.00895)	(0.0107)	(0.0153)	(0.0484)
Observations	248	151	80	46
R^2	0.168	0.189	0.305	0.515

Notes : Dependent variable is the two-day changes of the nominal effective exchange rate. Newey-West standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The estimation includes also as regressors two lags of the control variables whose coefficients are not reported.

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BRIPI F., *The role of regulation on entry: evidence from the Italian provinces,* World Bank Economic Review, v. 30, 2, pp. 383-411, **TD No. 932 (September 2013).**

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2017

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2018

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CASIRAGHI M., E. GAIOTTI, L. RODANO and A. SECCHI, *A "Reverse Robin Hood"? The distributional implications of non-standard monetary policy for Italian households,* Journal of International Money and Finance, **TD No. 1077 (July 2016).**

CIPRIANI M., A. GUARINO, G. GUAZZAROTTI, F. TAGLIATI and S. FISHER, *Informational contagion in the laboratory,* Review of Finance, **TD No. 1063 (April 2016).**

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