

Staff memo

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Keywords

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Macroeconomic News and Exchange Rate Dynamics *

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Abstract

We study how macroeconomic news drives exchange rate dynamics. We construct market-based surprise measures from bilateral exchange rate movements over daily windows around CPI releases and monetary policy announcements in Norway, the euro area, and the United States, capturing news at the time it reaches financial markets. We combine these announcement-induced movements into relative inflation and monetary policy surprises for EURNOK and USDEUR, incorporating information from both economies underlying each exchange rate. Using these measures as external instruments in a proxy SVAR, we identify relative inflation and monetary policy news and trace their dynamic effects on bilateral exchange rates. The two identified news factors jointly account for roughly 70–80 percent of EURNOK forecast-error variance and 60–70 percent of USDEUR forecast-error variance at the reported horizons. The estimated responses are consistent with exchange rates adjusting to revisions in expected future interest rate differentials.

JEL classification codes: C32, E32, E52, F31.

Keywords: Inflation, Monetary Policy, Exchange Rates, Business Cycle Dynamics.

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1 Introduction

Exchange rates are among the most forward-looking asset prices in the economy. Under uncovered interest parity (UIP), the nominal exchange rate reflects the expected path of future interest rate differentials, together with currency risk premia. Macroeconomic news that changes the expected relative stance of monetary policy should therefore induce an immediate exchange-rate adjustment. Empirically, however, the relationship between exchange rates and interest rate differentials is often weak, unstable, and sometimes of the opposite sign from that predicted by standard models, giving rise to the well-known UIP puzzle (Fama, 1984; Engel, 1996, 2016). More broadly, the apparent disconnect between exchange rates and macroeconomic conditions remains a central challenge in international macroeconomics and finance (Meese and Rogoff, 1983; Engel and West, 2005).

This paper shows that the connection between exchange rates and the macroeconomy becomes clearer when we focus on the time at which new information reaches financial markets and on its implications for the relative conditions in the two economies underlying a bilateral exchange rate. We study exchange rate movements around consumer price inflation (CPI) releases and monetary policy announcements in Norway, the euro area, and the United States. These announcements provide precisely timed information about inflationary pressures and the current and expected future stance of monetary policy. Because a bilateral exchange rate prices conditions in two economies, we combine the announcement-induced movements originating on both sides of each currency pair into relative inflation and relative monetary-policy surprises. Our high-frequency evidence shows that exchange rates adjust immediately when this information is released, highlighting an important contemporaneous component of the relationship between macroeconomic news and exchange rates.

We deliberately study two distinct exchange-rate settings. Our baseline is EURNOK. Norway is a small open economy (SOE) and the euro area is its largest trading partner. EURNOK is a natural laboratory for studying how domestic and foreign macroeconomic news is incorporated into the currency of a small economy whose trade and financial conditions are tightly linked to a much larger neighbor. We then repeat the analysis for USDEUR. The dollar and the euro are issued by two large economies and trade in one of the deepest currency markets in the world. Comparing

EURNOK with USDEUR allows us to ask whether the same mechanism operates both for a SOE currency and for a major-currency pair.

For each scheduled announcement in either economy, we measure the bilateral exchange-rate return over a daily event window. This baseline is designed to capture both the immediate response and the subsequent reassessment of the information in the release. A CPI publication contains several components that can alter the perceived persistence of inflation and the expected policy response, even when the headline figure is close to expectations. Interpreting this information and incorporating it into trading decisions may take longer than the first 30 minutes. Monetary-policy announcements likewise convey information about the current decision, the outlook, and the future policy path. A daily window allows more time for these implications to be reflected in exchange rates. This motivation is consistent with evidence that macroeconomic news reaches currency prices both directly and through trading (Evans and Lyons, 2008). We assess this choice using 30-minute windows, which provide tighter temporal isolation (Andersen et al., 2003; Faust et al., 2007), and using interest-rate-differential surprises constructed within the same narrow windows. The main qualitative results are similar under both alternatives.

We aggregate the event-window returns within each month and combine the reactions to announcements in the two relevant economies. The resulting monthly instruments measure the exchange-rate-relevant component of relative inflation and monetary policy news. An important practical advantage is that the method does not require a fully comparable set of survey forecast errors or highly liquid interest-rate futures for every economy. Our measures capture the exchange rate adjustment associated with the arrival of specific macroeconomic information. Inflation announcements can affect exchange rates by changing expectations about inflation and the future path of relative monetary policy, while central bank announcements reveal news about both current decisions and future policy. Monetary policy announcements have received substantial attention in the high-frequency identification literature, whereas inflation releases are often treated mainly as inputs into future policy decisions. Our estimates identify CPI-announcement news as an important source of exchange-rate movements, conditional on the identification scheme.

To quantify the importance of these news shocks, we use monthly macro-financial data from 1999 to 2025 and estimate a proxy structural vector autoregression with the announcement-based measures as external instruments, following [Stock and Watson \(2012\)](#) and [Mertens and Ravn \(2013\)](#). The proxy SVAR isolates structural innovations associated with relative inflation and monetary policy news and traces their effects on bilateral exchange rates, interest-rate differentials, and other macro-financial variables beyond the announcement window. We complement the proxy SVAR with local projections ([Jordà, 2005](#)), which provide a flexible assessment of the dynamic responses.

Our main finding is that the two identified relative news factors jointly account for roughly 70–80 percent of EURNOK forecast-error variance and 60–70 percent of USDEUR forecast-error variance at the reported horizons, from impact to twenty-four months. Both sources of news are quantitatively important. Importantly, our high-frequency evidence shows that exchange rates adjust sharply at the time of the announcements, with much of the immediate repricing occurring within the first few minutes after the information is released. Both monetary policy announcements and inflation releases generate immediate exchange rate adjustments, consistent with revisions in the expected future policy path. The importance of macroeconomic news is therefore not confined to central bank decisions: information that changes expectations of future policy also plays a central role in currency pricing.

Our results do not imply that UIP holds unconditionally or that currency risk premia are unimportant. Rather, they document systematic exchange-rate responses associated with announcement-related news. Conventional tests relate realized depreciation to observed interest rate differentials over intervals during which both variables are exposed to many additional shocks. The daily baseline links announcement-day repricing to subsequent exchange-rate dynamics. Because the proxies are constructed from the exchange rate itself, their close link to the outcome warrants particular caution. The 30-minute interest-rate-based measures remove this direct construction link for both news types: together, they explain about half of EURNOK forecast-error variance at twelve and twenty-four months. Conventional CPI forecast errors provide a further non-FX measure of infla-

tion news. These checks support an economically substantial relationship while yielding smaller variance shares than the baseline.

Our descriptive evidence builds on [Andersen et al. \(2003\)](#), who document exchange-rate responses to macroeconomic announcement surprises, and [Andersen et al. \(2007\)](#), who examine news-related price discovery across stock, bond, and foreign-exchange markets. Whereas these studies focus on announcement-time responses, our analysis combines CPI and monetary-policy news from both sides of a currency pair and traces their subsequent monthly dynamics and variance contributions.

Our paper contributes to the literature using high-frequency identification to measure monetary policy news and its effects on financial markets and the macroeconomy ([Kuttner, 2001](#); [Gürkaynak et al., 2005](#); [Gertler and Karadi, 2015](#); [Jarociński and Karadi, 2020](#); [Miranda-Agrippino and Ricco, 2021](#)). Whereas this literature typically constructs surprises within a single economy, our approach emphasizes that the relevant news for a bilateral exchange rate is inherently relative. Closely related is [Karau \(2024\)](#), who constructs relative monetary policy surprises for the United States and the euro area and finds that they explain a large share of short-run USDEUR fluctuations. We extend this work by identifying inflation news alongside monetary policy news, constructing the measures from exchange-rate responses, and examining their dynamic implications through both a proxy SVAR and local projections.

Our paper also builds on recent evidence for Norway. [Bjørnland et al. \(2024\)](#) examine medium- to long-term real exchange-rate movements in Norway and Canada using a structural VAR with common trends. They highlight the importance of productivity differentials and commodity-market developments for persistent exchange-rate movements and find interest rate differential responses consistent with immediate overshooting followed by gradual depreciation using annual data. [Mæhlum \(2025\)](#) uses high-frequency monetary policy surprises and a local projections instrumental variable (LP-IV) framework to study the response of the Norwegian krone to domestic and euro-area monetary policy shocks, documenting an immediate appreciation following a Norwegian tightening and a relatively quick reversal. [Aastveit and Maffei-Faccioli \(2026\)](#) uses high-frequency

monetary policy surprises as external instruments in Proxy SVAR and LP-IV models to study monetary policy transmission in Norway. Their analysis incorporates inflation, economic activity, and the exchange rate, highlighting the key role of the exchange-rate channel in monetary policy transmission to inflation. We complement these studies by jointly examining inflation and monetary policy news, constructing relative announcement-based measures that incorporate information from both economies underlying a bilateral exchange rate, and quantifying the contributions of the identified shocks through forecast error variance and historical decompositions. We further examine whether these relationships hold for both EURNOK and USDEUR.

Finally, our paper is closely related to [Stavrakeva and Tang \(2026\)](#), who show that macroeconomic news explains a substantial share of exchange-rate fluctuations at monthly and quarterly frequencies, with much of this relationship driven by responses to past rather than contemporaneous news. In contrast, we establish a strong connection between exchange rates and macroeconomic news already at the time information is released, documenting sharp adjustments within the first minute of inflation and monetary policy announcements. We then use these announcement-induced movements to construct relative inflation and monetary policy instruments and show that the identified shocks jointly account for a large share of exchange-rate fluctuations over time.

In sum, the paper makes three contributions. First, it links a sizeable share of exchange-rate forecast-error variance to relative CPI and monetary-policy news in the two currency pairs. Second, it establishes inflation announcements as an important source of currency movements alongside monetary policy decisions, documenting the immediate incorporation of both types of news into exchange rates and highlighting the role of revisions in the expected future policy path. Third, it develops a relative, exchange-rate-based approach to high-frequency identification that can be applied where conventional expectations measures are limited. By combining announcement-based identification with structural time-series methods, the paper links the immediate reaction of currency markets to the subsequent dynamics of exchange rates and interest rate differentials.

The remainder of the paper is organized as follows. Section 2 describes the data and the construction of the relative surprise measures. Section 3 presents the proxy-SVAR and local-projection

methodologies. Section 4 reports the empirical results, including robustness to alternative specifications, and Section 5 concludes.

2 Data and Descriptive Analysis

2.1 Exchange rates, announcements, and macro-financial variables

The empirical analysis operates at two frequencies. Announcement responses are measured using tick-level data. The baseline instruments use daily event-window returns, which are summed within each month. The VAR and the complementary dynamic local projections use monthly data. Section 3 explains the estimation sample and the shorter period over which the announcement-based proxies are available. This study combines these announcement-based measures with monthly macro-financial variables. The high-frequency component of the dataset consists of tick-level data from LSEG Tick History on EURNOK and USDEUR exchange rates, available from January 2002 onward. The analysis focuses on announcement windows associated with CPI releases and monetary-policy decisions in Norway, the euro area, and the United States. The exchange rate at each point in time is measured as the midpoint of the prevailing bid and ask quotes. EURNOK denotes Norwegian kroner per euro, so an increase indicates a weaker krone. USDEUR denotes euros per US dollar, so an increase indicates a weaker euro. EURUSD, used in the intraday examples, is the inverse of USDEUR. USDNOK denotes kroner per US dollar and is used only in the descriptive analysis.

As a robustness check, we also consider tick-level data on the one-year interest rate differential between Norway (NOK1YOIS, referencing NOWA) and the euro area (EUREON1Y, historically referencing EONIA). This differential provides an alternative measure of the relative repricing of monetary policy expectations around announcements. Exchange rates remain our preferred high-frequency measure because of their greater liquidity, which ensures more frequent price updates and reduces concerns about stale quotes and infrequent trading. Moreover, exchange rates capture the broader market response to macroeconomic news, whereas the interest rate differential reflects

the narrower interest rate channel.

The use of scheduled announcements is central to the empirical strategy. Macroeconomic releases occur at known times and represent moments at which new information becomes available to financial-market participants. Looking at exchange-rate movements in narrow windows around these releases therefore allows us to separate periods of unusually concentrated information arrival from the much broader set of forces that move exchange rates at lower frequencies. The high-frequency data are used both to document how exchange rates respond when information is released and, ultimately, to construct the announcement-based instruments employed in the proxy-SVAR analysis.

To complement the high-frequency exchange-rate data, we incorporate a set of macro-financial variables that capture expectations and broader market conditions at the monthly frequency. In the baseline Norway–euro-area specification, we use the two-year swap-rate differential between Norway and the euro area as a measure of the expected relative path of short-term interest rates. Oil prices are included given their importance for the Norwegian economy. We use data from the Oslo Stock Exchange to capture forward-looking information embedded in Norwegian equity prices and the EURO STOXX 50 to capture corresponding information in euro-area equity markets. We also include the Global Economic Policy Uncertainty index as a measure of aggregate uncertainty. Together, these variables form a parsimonious macro-financial system. Equity prices contain forward-looking information but do not substitute for observed inflation or real activity, neither of which is included in the baseline.

As an additional application, we apply the same framework to USDEUR. This allows us to assess whether the mechanism identified for the Norwegian krone also appears in a major currency pair that is less directly exposed to Norway-specific conditions and oil-price developments. In this exercise, the Norway-specific financial variables are replaced by their counterparts for the relevant economy. For the euro-area, we use the EURO STOXX 50, while for the U.S. we use the S&P 500. These equity-market variables play the same role as the Oslo Stock Exchange measure in the NOK analysis: they capture forward-looking information and broader market expectations that

may adjust when macroeconomic news is released.

Before defining the announcement-based instruments, we first document the high-frequency behavior of exchange rates around the underlying events. This ordering is useful because the instrument construction relies directly on the idea that exchange-rate movements around scheduled announcements capture the market's reassessment when new macroeconomic information arrives. The descriptive evidence below therefore establishes the empirical properties of the variation that we subsequently aggregate and use for identification in the VAR.

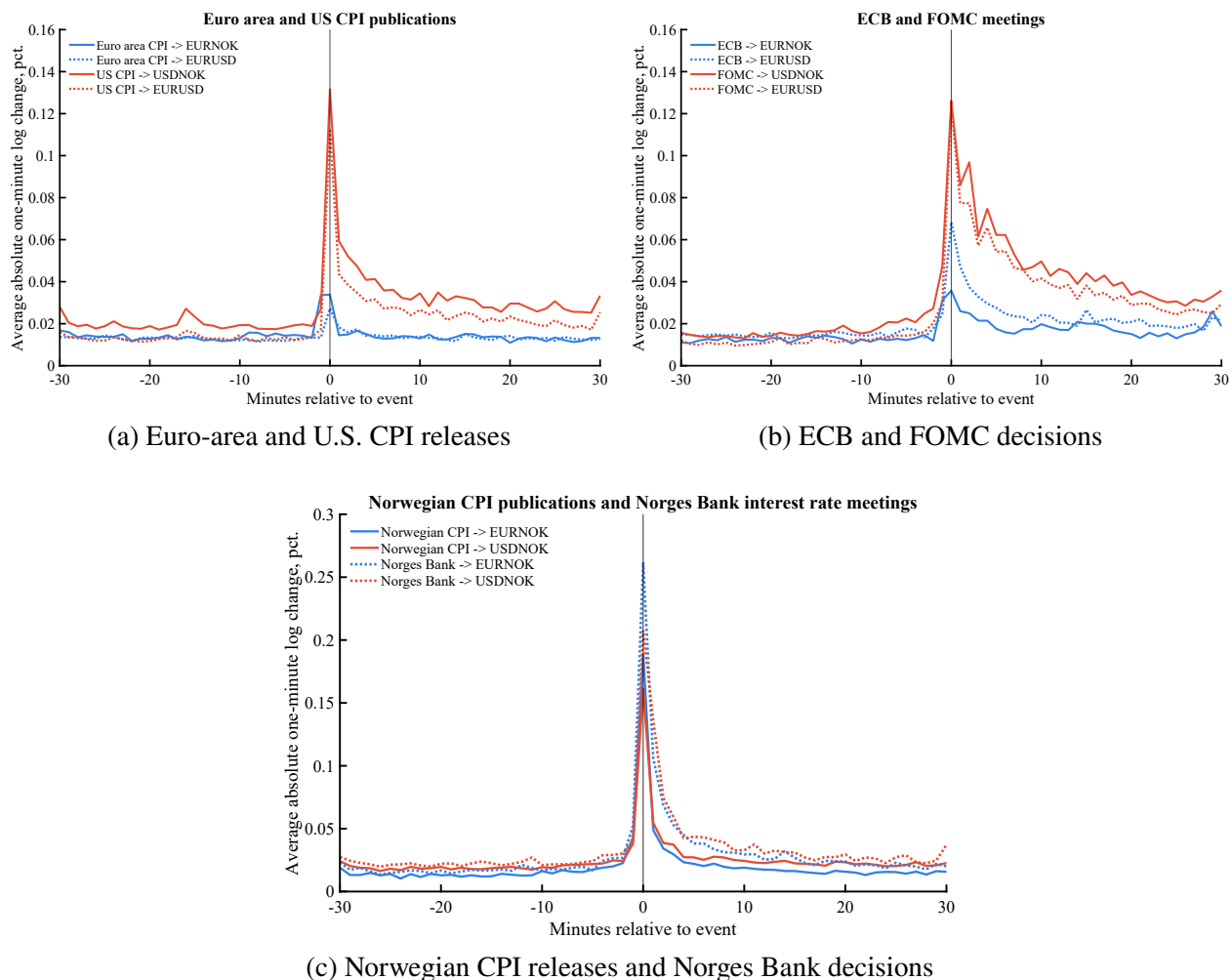
2.2 High-frequency evidence around macroeconomic announcements

We organize the descriptive analysis around four questions. First, does exchange-rate activity increase discretely when scheduled information becomes public? Second, does the direction of the exchange-rate response depend on the sign of the news? Third, does the magnitude of the exchange-rate response vary with the magnitude of the underlying surprise? Fourth, are announcement-window exchange-rate movements systematically related to revisions in expected interest-rate differentials? Together, these exercises provide a direct motivation for using announcement-window exchange-rate movements as market-based measures of macroeconomic news.

2.2.1 Exchange-rate volatility around announcements

We begin by examining whether exchange-rate activity changes discretely when macroeconomic information is released. Figure 1 plots the average absolute one-minute log change in the relevant exchange rates from 30 minutes before to 30 minutes after CPI releases and monetary policy announcements in the euro area, the United States, and Norway.

The figure shows a pronounced announcement-time discontinuity in exchange-rate volatility across countries and announcement types. Prior to the release, average absolute returns are comparatively stable and display no clear tendency to increase as the announcement approaches. At time zero, however, volatility rises sharply. The increase is concentrated in the first few minutes following the release and subsequently declines toward its pre-announcement level. This pattern is



Note: The figure reports the average absolute one-minute log change in the indicated exchange rates, in percent, from 30 minutes before to 30 minutes after the scheduled announcement. Panel (a) shows euro-area and U.S. CPI releases, panel (b) ECB and FOMC monetary policy decisions, and panel (c) Norwegian CPI releases and Norges Bank interest-rate decisions. Time zero denotes the scheduled release time.

Figure 1: Intraday exchange-rate volatility around macroeconomic announcements

particularly pronounced around U.S. CPI releases and FOMC decisions, which generate the largest volatility spikes in the figure, but a similar announcement-time increase is also evident around euro-area CPI releases, ECB decisions, Norwegian CPI releases, and Norges Bank decisions.

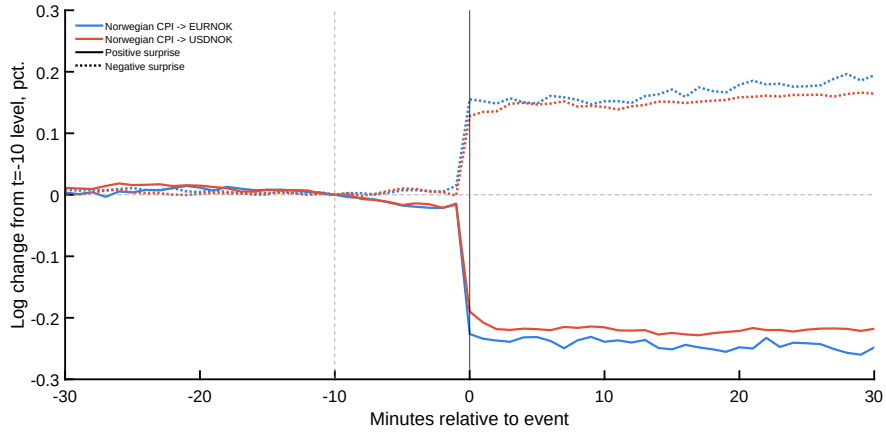
There is substantial heterogeneity in the magnitude of the response across announcements. U.S. announcements generally generate larger movements than their European counterparts, consistent with the broader role of U.S. macroeconomic news in global financial markets. At the same time, Norwegian announcements produce clearly visible increases in volatility in exchange rates involving the krone. Thus, although the magnitude of the response differs across countries and

announcement types, its timing is remarkably similar: exchange-rate activity increases precisely when the scheduled information becomes public. Importantly, the increase in volatility is visible across multiple exchange rates rather than being confined to a single currency pair. For the major international announcements, the same release generates elevated activity in more than one exchange rate, while Norwegian announcements produce simultaneous movements in both EURNOK and USDNOK. This common timing makes it less likely that the observed spikes simply reflect idiosyncratic movements in a particular bilateral exchange rate. Instead, they point to the scheduled announcement as the common source of the increase in market activity.

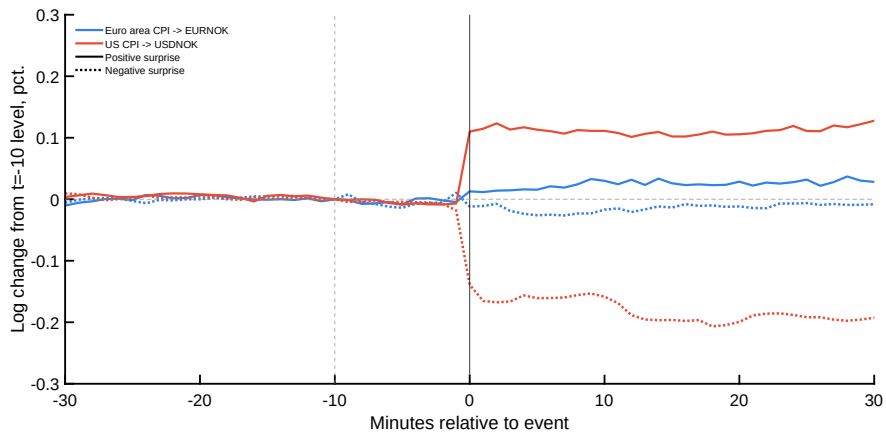
The behavior of exchange rates immediately before the announcements is also informative. The absence of a comparable systematic increase in volatility during the minutes leading up to the release suggests that the adjustment is closely tied to the publication of the information itself. The discontinuity at time zero therefore provides a first validation of the event-study logic: the announcement windows isolate short periods in which the information set of market participants changes sharply.

Finally, volatility remains elevated for several minutes after the initial spike. A substantial share of the exchange-rate adjustment occurs on impact, but price discovery continues during the minutes following the announcement. This feature is relevant for the construction of the instruments below. A window that is too narrow may isolate the initial jump very cleanly but miss part of the market's subsequent reassessment, whereas a somewhat longer event window can capture more of the total repricing associated with the release.

The volatility evidence establishes that scheduled announcements coincide with unusually large exchange-rate movements. It does not by itself establish that these movements contain information about the content of the release. We therefore next ask whether the direction of exchange-rate adjustment varies systematically with the sign of the underlying news.



(a) Norwegian CPI announcements



(b) Euro-area and U.S. CPI announcements

Note: The figure reports average cumulative log exchange-rate changes relative to the exchange-rate level at $t = -10$ minutes. Solid lines denote positive surprises and dotted lines negative surprises. The vertical line at zero denotes the scheduled publication time.

Figure 2: Exchange-rate responses to positive and negative CPI surprises

2.2.2 Direction of the exchange-rate response

Figure 2 separates CPI announcements according to whether the reported headline CPI index exceeds or falls below Bloomberg median consensus estimates and plots the average cumulative exchange-rate change relative to its level 10 minutes before the release.

The sign split reveals a clear directional response beginning at the announcement time. Prior to the release, the average paths remain close to zero and display little systematic divergence between positive and negative surprises. At time zero, however, the paths separate sharply according to the sign of the CPI surprise and remain distinctly separated over the subsequent minutes. The

announcement-time increase in volatility documented above is therefore not driven only by larger absolute price movements. The direction of the exchange-rate adjustment is systematically related to the information contained in the release.

For Norwegian CPI announcements, the response is visible in both EURNOK and USDNOK. Positive and negative inflation surprises generate movements in opposite directions, with the divergence emerging almost exactly at the scheduled publication time. The fact that both krone exchange rates display the same qualitative pattern suggests that the response reflects a broad revaluation of the Norwegian currency rather than idiosyncratic variation in one particular bilateral exchange rate.

A similarly clear sign-dependent response is visible for U.S. CPI announcements. These releases generate particularly large movements in USDNOK, consistent with the importance of U.S. inflation news for the valuation of the dollar. The separation between positive and negative surprises is both sharp and persistent, suggesting that market participants rapidly incorporate the directional content of the announcement into exchange-rate prices. By contrast, the response to euro-area CPI news in EURNOK is more muted, although the average paths still move in systematically different directions following positive and negative surprises.

The differences in magnitude across announcements are consistent with heterogeneity in both the information content of the releases and the sensitivity of individual currency pairs to news originating in different economies. U.S. inflation announcements, in particular, appear to contain information with broader implications for international financial markets, whereas the effects of Norwegian and euro-area releases are more concentrated in the currencies most directly exposed to those economies.

The timing of the separation is important for the empirical design. There is little evidence that positive and negative surprise groups begin to diverge systematically before the scheduled release. Instead, the difference emerges at the point at which the information becomes public and persists thereafter. Taken together with the announcement-time volatility results, this indicates that exchange-rate movements within the event window are closely linked not only to the arrival of macroeconomic news but also to its directional content.

The sign split nevertheless treats all positive surprises, and all negative surprises, alike. It therefore does not exploit variation in the magnitude of the underlying news. We next use the continuous variation in the size of CPI surprises to show more directly that larger pieces of news are associated with larger exchange-rate responses.

2.2.3 Event-time local projections

The preceding figures document exchange-rate movements around CPI announcements using average absolute changes and responses conditional on the sign of the surprise. To illustrate more directly how the magnitude of the exchange-rate response varies with the size of the news, we consider two representative announcement–exchange-rate pairs: Norwegian CPI and EURNOK, and U.S. CPI and EURUSD. For each CPI announcement, we measure the inflation surprise as the difference between the published CPI figure and the Bloomberg median consensus forecast available immediately prior to the release. Specifically,

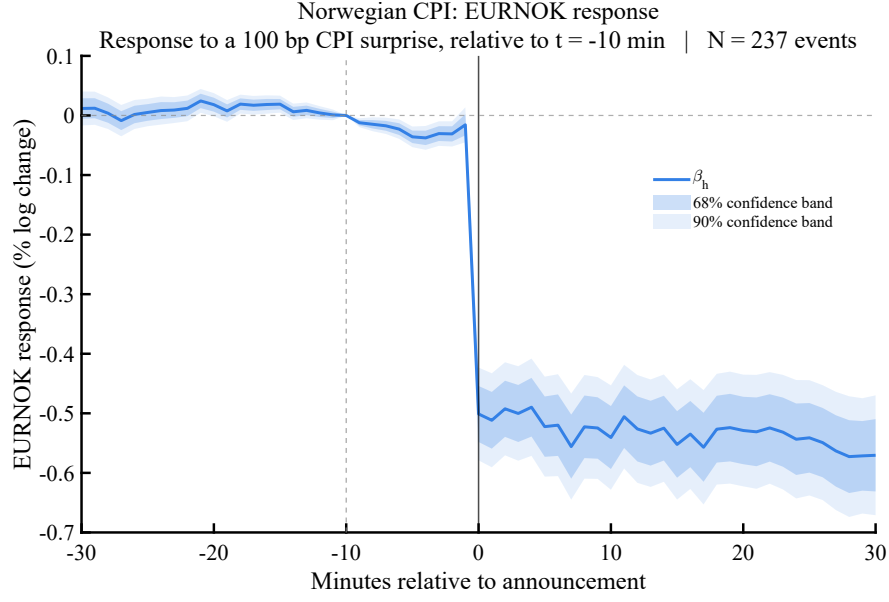
$$\varepsilon_j^\pi = \pi_j^{\text{actual}} - \pi_{j|j^-}^{\text{Bloomberg}}, \quad (1)$$

where π_j^{actual} denotes the published CPI figure associated with announcement j and $\pi_{j|j^-}^{\text{Bloomberg}}$ denotes the median Bloomberg consensus forecast formed prior to the announcement. This measure isolates the unexpected component of the CPI release using information available to market participants before the announcement. At each event-time horizon h , we then estimate

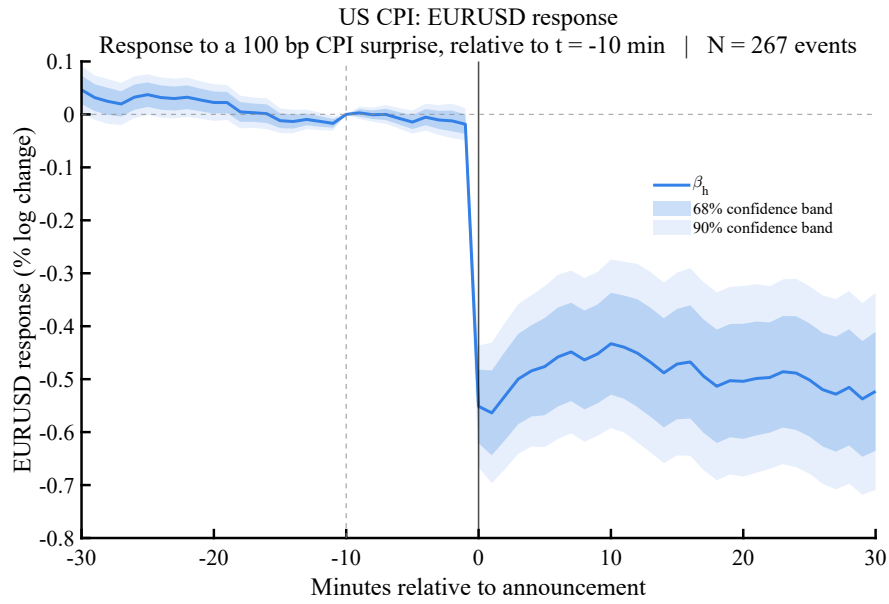
$$100 \left[\log S_{j,t_0+h} - \log S_{j,t_0-10} \right] = \alpha_h + \beta_h \varepsilon_j^\pi + \varepsilon_{j,h}, \quad (2)$$

where t_0 denotes the announcement time. Estimating equation (2) separately at each horizon traces out the event-time response of the exchange rate to the size of the inflation surprise. The reported coefficients are scaled to represent the exchange-rate response to a 100-basis-point CPI surprise. Figure 3 presents the two examples.

The two cases provide clear examples of the relationship between CPI news and exchange



(a) Norwegian CPI $\rightarrow$ EURNOK



(b) U.S. CPI $\rightarrow$ EURUSD

Note: The solid line reports $\hat{\beta}_h$ from equation (2). Shaded areas denote the 68 and 90 percent confidence intervals. The dependent variable is the cumulative log exchange-rate change relative to $t = -10$ minutes. Coefficients are scaled to a 100-basis-point CPI surprise. The solid vertical line denotes the announcement time.

Figure 3: Event-time exchange-rate responses to CPI surprises

rates. Norwegian CPI surprises generate an immediate response in EURNOK: the coefficient shifts sharply at the publication time and remains economically sizeable over the subsequent event window. There is little evidence of a comparable systematic movement before the release. Thus,

larger Norwegian inflation surprises are associated with correspondingly larger movements in the krone at the time the information becomes public.

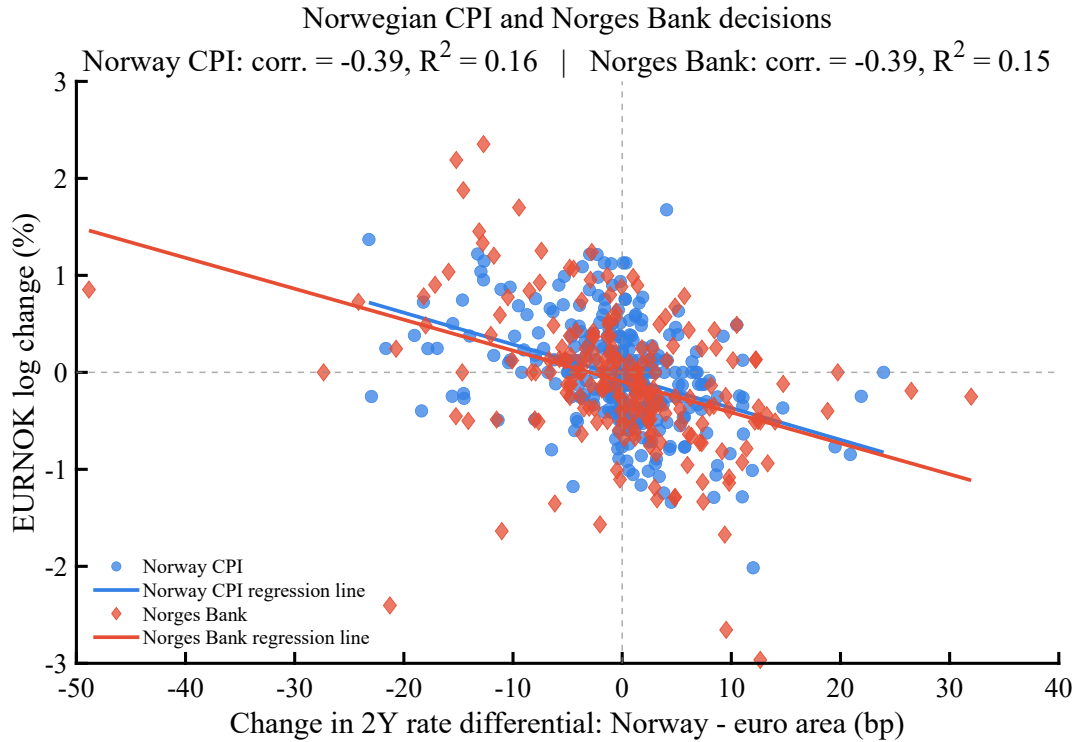
The U.S. CPI example shows the same pattern in a major currency pair. Positive U.S. CPI surprises are associated with a decline in EURUSD, consistent with an appreciation of the U.S. dollar. The adjustment occurs primarily at the scheduled announcement time and remains persistent over the following minutes.

These examples serve a different purpose from the broader descriptive evidence above. Rather than documenting every announcement–currency combination, they illustrate that high-frequency exchange-rate movements are systematically related to the magnitude of the underlying macroeconomic surprise. The response becomes visible when the information is released and is not immediately reversed over the first 30 minutes after the release. The conventional CPI forecast errors used here also provide an alternative inflation-news instrument in the robustness analysis. This is an important feature for the instrumental-variable strategy: the event-window exchange-rate movement is not simply a measure of announcement-time volatility, but contains systematic information about the size and direction of the news absorbed by the market.

2.2.4 Exchange rates and interest-rate differentials

A natural channel through which macroeconomic announcements affect exchange rates is a revision in the expected relative path of monetary policy. Figure 4 plots the daily EURNOK change against the change in the two-year Norway–euro-area swap-rate differential over a one-day window around each Norwegian announcement. These daily associations are consistent with an interest-rate channel, but the window also admits other information and does not isolate a causal announcement effect.

The relationship is negative for both types of Norwegian announcements. For Norwegian CPI releases, the correlation between the change in the two-year Norway–euro-area rate differential and EURNOK is -0.39 , with an R^2 of 0.16 . Around Norges Bank decisions, the corresponding correlation is also -0.39 and the R^2 is 0.15 . The sign of the relationship is economically intuitive.



Note: The horizontal axis reports the change in the two-year swap-rate differential between Norway and the euro area, in basis points, over the one-day announcement window. The vertical axis reports the corresponding EURNOK log change, in percent. Lines show separate OLS fits for Norwegian CPI publications and Norges Bank monetary-policy decisions.

Figure 4: EURNOK and changes in the two-year interest-rate differential around Norwegian announcements

An increase in the Norwegian two-year rate relative to the euro-area rate is associated with a decline in EURNOK, that is, an appreciation of the Norwegian krone against the euro. Conversely, a decline in the relative Norwegian rate is associated with a weaker krone. Macroeconomic news can move exchange rates in part by changing expectations about the future relative stance of monetary policy.

The descriptive exercises therefore point to a common interpretation of the high-frequency data. Scheduled macroeconomic announcements coincide with discrete exchange-rate repricing at the time the information becomes public. The direction of the repricing depends on the sign of the news, and larger pieces of news are associated with larger exchange-rate responses. Daily exchange-rate changes around Norwegian announcements are negatively associated with changes in the two-year swap-rate differential. These are precisely the properties that motivate the market-based surprise measures constructed below.

2.3 Announcement-window exchange-rate surprises

We now turn from the descriptive evidence to the construction of the instruments used in the proxy-SVAR. The basic idea is to use the announcement-induced movement in the exchange rate as a market-based measure of the unexpected information revealed by a scheduled macroeconomic release. For each event, we compare the exchange rate immediately before the relevant event window with the exchange rate after the information has had time to be incorporated into prices. The resulting return captures the direction and magnitude of the market's exchange-rate reassessment associated with the announcement.

There are several reasons for constructing the surprise from exchange-rate movements rather than relying exclusively on the reported macroeconomic forecast error. First, an observed release may contain several pieces of information at the same time. A CPI publication, for example, can convey information not only through the headline number but also through other components of the release and through the implications that market participants draw for the future policy path. Similarly, a monetary policy announcement can contain information through the policy decision itself and through the broader information conveyed by the announcement. The exchange-rate response summarizes the net valuation effect of the information that financial markets actually perceive as relevant for the currency.

Second, the mapping from a given numerical forecast error into an exchange-rate response need not be constant over time. The same inflation surprise may have different implications depending on the prevailing state of the economy, the monetary-policy regime, or the extent to which the release changes expectations about future interest rates. Measuring the surprise through the realized exchange-rate repricing allows the importance of the news to be scaled by the market response itself.

Third, the timing evidence above makes the announcement window particularly useful for this purpose. Exchange-rate volatility rises discretely when the scheduled information is released, the direction of the movement is related to the sign of the news, and the response is systematically related to the magnitude of the surprise. Moreover, there is little evidence of comparable systematic

adjustment immediately before the release. Restricting attention to exchange-rate changes around these scheduled events therefore concentrates on periods in which the relevant information flow changes sharply and limits the contribution of unrelated lower-frequency movements.

The announcement-based exchange-rate returns are used as external instruments rather than interpreted as direct measures of the structural shocks themselves. The baseline daily event window is intended to capture the market pricing associated with the announcement, including both the immediate response and subsequent reassessment over the trading day. The resulting return is therefore not intended to isolate the structural disturbance perfectly, but to measure the exchange-rate variation associated with the information released. To assess whether the broader daily window is important for the results, we also construct instruments using 30-minute event windows. These narrower windows provide tighter temporal isolation around the release and therefore a cleaner measure of the immediate announcement response. The resulting estimates are nevertheless very similar to those obtained with the daily-window instruments.

2.3.1 Baseline event window and short-window measure

Our baseline measure of the announcement surprise is constructed from the exchange-rate movement over a daily event window around the scheduled release. Let t_0 denote the scheduled announcement time. The pre-announcement exchange rate is defined as the last available observation before the start of the event day, while the post-announcement exchange rate is defined as the last available observation after the announcement within the same daily window.¹ For announcement j , the exchange-rate surprise can therefore be written as

$$z_j = 100 \left[\log S_{j,\text{post}} - \log S_{j,\text{pre}} \right], \quad (3)$$

where $S_{j,\text{pre}}$ and $S_{j,\text{post}}$ denote the exchange-rate levels before and after the event window. Events are retained only when valid exchange-rate observations are available on both sides of the window. The measure is expressed in percent, so that positive and negative values have a direct interpretation

¹The exchange rate is defined as the average of the ask and bid prices.

as appreciation or depreciation depending on the quotation convention of the currency pair.

We use the daily window as the baseline because our objective is to measure the broader market reassessment associated with a release, including adjustment beyond the initial price jump. CPI releases contain information about several expenditure categories and measures of underlying price pressures. Their composition can change the assessment of inflation persistence and the expected monetary-policy response, even when the headline surprise is small. Market participants may need time to interpret these details, compare them with prior expectations, and adjust positions across currency and interest-rate markets. The resulting repricing may therefore extend beyond a 30-minute window. Monetary-policy releases can similarly combine the current decision with projections, guidance, and other communication about the policy outlook. A daily window allows these different pieces of information to be incorporated into the market's exchange-rate assessment.

The daily baseline thus accommodates the possibility of continued information processing and trading after the immediate announcement response. [Evans and Lyons \(2008\)](#) show that macroeconomic news can affect exchange rates indirectly through order flow as well as directly, providing a rationale for allowing the trading process to contribute to price discovery. This evidence motivates a broader window. It does not establish that every release requires more than 30 minutes to be absorbed. Our intraday figures document the initial adjustment, while the narrower-window exercises assess whether the main findings depend on including the rest of the event day.

The choice of a longer baseline window necessarily involves a trade-off. As the window widens, more of the total adjustment to the announcement can be captured, but there is also greater scope for unrelated information to enter the exchange rate. We therefore assess the sensitivity of the results to a much narrower event window. As a robustness measure, we construct short-window exchange-rate surprises from 10 minutes before the announcement to 20 minutes after the announcement. In this case, the pre-announcement exchange rate is defined as the last available observation at or before $t_0 - 10$ minutes, while the post-announcement exchange rate is defined as the first available observation at or after $t_0 + 20$ minutes. The surprise is again the logarithmic exchange-rate return over the window. This measure exploits the sharp event-time discontinuity documented in [Figure 1](#)

and places minimal weight on information arriving away from the scheduled release.

As we show below, using the short-window exchange-rate surprise yields results that are qualitatively similar to those obtained under the daily baseline. This similarity is informative because the two windows emphasize different aspects of the identification strategy: the narrow window provides tighter temporal isolation around the announcement, whereas the daily window allows for a more complete market adjustment to the information released. The main conclusions are therefore not sensitive to the choice of event window.

2.3.2 Relative inflation and monetary-policy surprises

The next step is to transform the event-level exchange-rate movements into monthly instruments that correspond to the bilateral nature of the exchange rate. This relative construction is important because a currency pair reflects news about both economies. EURNOK, for example, can move because information about the Norwegian economy changes the value of the krone, because information about the euro area changes the value of the euro, or because both occur within the same month. An instrument intended to capture announcement-driven variation in EURNOK should therefore incorporate relevant news from both sides of the currency pair.

For the Norway–euro-area specification, we construct separate relative inflation and monetary-policy surprises. The relative inflation surprise is the monthly sum of the EURNOK exchange-rate surprises associated with Norwegian and euro-area inflation announcements. The relative monetary-policy surprise is constructed analogously from the EURNOK movements around Norges Bank and ECB monetary-policy announcements. For example, a positive Norwegian CPI surprise that appreciates the krone lowers EURNOK, whereas a positive euro-area CPI surprise that appreciates the euro raises EURNOK. Because both movements are expressed in the same exchange-rate quotation, they enter the relative measure with opposite signs. Summing the event-level returns therefore captures the combined exchange-rate response to news from both economies. The shocks enter the monthly sum with their observed signs because every event-level surprise is expressed in terms of the change in the same exchange rate, EURNOK. Thus, regardless of which economy

releases the information, a positive observation corresponds to an increase in EURNOK and a negative observation to a decrease in EURNOK.

The same logic is applied to the United States–euro-area pair. We aggregate the exchange-rate movements around U.S. and euro-area announcements after expressing each event in terms of the same bilateral exchange rate, USDEUR. The resulting monthly measures summarize the combined announcement-induced exchange-rate repricing associated with inflation and monetary-policy news from the two economies.

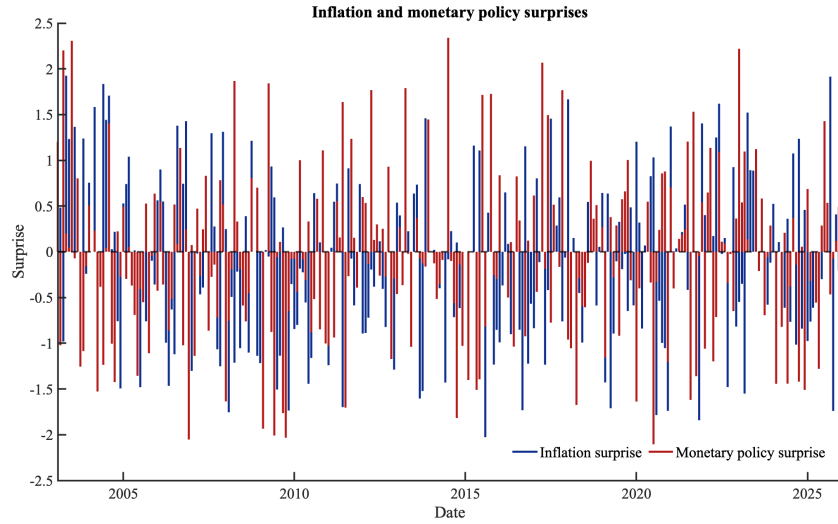
More formally, let $\mathcal{J}_{c,m}^k$ denote the set of announcements of type k in country c occurring in month m , where k denotes inflation or monetary policy. The relative surprise for country pair (a, b) can be written schematically as

$$Z_m^{k,(a,b)} = \sum_{j \in \mathcal{J}_{a,m}^k} z_j + \sum_{j \in \mathcal{J}_{b,m}^k} z_j, \quad (4)$$

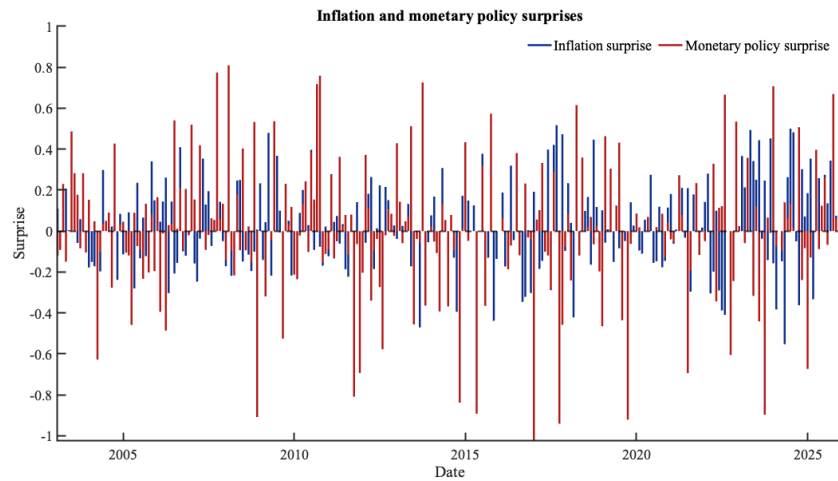
where each z_j is defined using the same exchange-rate quotation for the country pair. Equation (4) makes clear that the relative surprise is not a difference between two survey forecast errors. It is the monthly sum of announcement-induced movements in a common bilateral exchange rate. The relative nature of the measure comes from combining news originating on both sides of that currency pair.

Figure 5 plots the resulting relative surprises used in the analysis. The values in Figure 5 can be interpreted approximately as percentage changes in the relevant exchange rate associated with the scheduled announcements occurring within the month. For EURNOK, positive values indicate an increase in EURNOK, corresponding to an appreciation of the euro against the Norwegian krone, or equivalently a depreciation of the krone. Negative values indicate a fall in EURNOK and therefore an appreciation of the krone against the euro. The magnitude of each monthly observation reflects the cumulative size of the exchange-rate repricing around the relevant set of announcements.

These measures are well suited to the proxy-SVAR analysis for several reasons. First, they are built from exchange-rate movements concentrated around scheduled information releases. The



(a) EURNOK



(b) USDEUR

Note: Panel 5a reports the relative inflation and monetary-policy surprises for the Norway–euro-area country pair, while Panel 5b reports the corresponding surprises for the United States–euro-area country pair. The relative surprise is defined as the sum, within each month, of the exchange-rate surprises associated with announcements in the two countries. The surprises enter with the same sign because they are constructed to correspond to changes in a common bilateral exchange rate around each country’s announcements. For each country pair and announcement type, the measure therefore captures the combined announcement-induced movement in the relevant exchange rate.

Figure 5: Relative inflation and monetary-policy surprises

high-frequency evidence above shows that these are precisely the periods in which exchange-rate activity changes discontinuously and in which the direction and magnitude of the movement are systematically connected to the underlying news. The instruments therefore retain the event-time

variation that is most closely associated with new information.

Second, measuring the surprise directly from the exchange rate captures the component of the announcement that is relevant for the asset price whose dynamics we seek to understand. Rather than imposing that one reported headline forecast error is the complete measure of news, the market-based surprise allows the exchange rate to summarize the net information content of the release, including the way in which the announcement changes expectations about the future policy path. The negative relationship between EURNOK movements and changes in the Norway–euro-area two-year swap differential in Figure 4 is consistent with this interpretation.

Third, the relative construction matches the bilateral nature of exchange rates. An exchange rate is a relative price, and macroeconomic news from either economy can change that relative price. Aggregating announcement-window movements from both sides of the currency pair therefore yields an instrument that is aligned with the object entering the VAR rather than assigning all variation to one economy in isolation.

The time-series properties of the resulting measures are also consistent with their use as announcement innovations. Autocorrelation tests indicate that neither of the relative surprise series is autocorrelated. Negative surprises occur slightly more frequently than positive surprises on average, although the distributions do not display clear fat tails. The two relative surprise measures also have very similar unconditional volatility: the standard deviation is 0.86 for inflation surprises and 0.87 for monetary policy surprises, in the units shown in Figure 5. The two types of announcement-based variation are therefore of comparable magnitude in the sample.

The descriptive evidence and the construction above define the source of identifying variation used in the next section. Scheduled macroeconomic announcements create discrete episodes of exchange-rate repricing. These movements occur when new information becomes public, their direction and magnitude are systematically related to the content of the news, and they co-move with revisions in expected interest-rate differentials. We exploit this high-frequency variation by aggregating announcement-window exchange-rate movements into monthly relative inflation and monetary-policy surprises. These monthly announcement-based series are used as external instru-

ments in the proxy-SVAR. The purpose of the high-frequency step is therefore not to estimate the full dynamic response of the macroeconomy within the event window. Instead, it provides a source of variation tied to clearly dated information arrivals that can be used to identify the corresponding innovations in the monthly VAR. The proxy-SVAR then traces how these announcement-based innovations propagate over time to exchange rates, interest-rate differentials, and the broader set of macro-financial variables.

3 Econometric Methodology

This section presents our empirical framework for tracing the dynamic responses of exchange rates and other macro-financial variables to relative inflation and monetary policy surprises. We first employ a Proxy SVAR that uses our announcement-based measures as external instruments to identify two orthogonalized innovations, allowing us to estimate their dynamic effects and quantify their contributions to exchange rate fluctuations. We then complement this analysis with local projections that directly regress the variables of interest on both surprise measures, allowing us to estimate their dynamic responses without imposing the VAR's system dynamics.

3.1 A Proxy-SVAR model

We estimate a monthly proxy SVAR to study bilateral nominal exchange-rate responses to relative inflation news and monetary-policy news. The reduced-form VAR is estimated using monthly macro-financial data from January 1999 to December 2025. The external proxies are used over a shorter sample beginning in 2002, when the relevant announcement-surprise series become available. Specifically, the proxy regressions and instrument–innovation covariance moments are estimated only over the available common sample of proxies and VAR residuals. This allows the reduced-form dynamics to be estimated using the longer monthly dataset while identification relies on the shorter proxy sample.

For each currency pair, we estimate the reduced-form VAR with n variables and p lags:

$$Y_t = C + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + u_t, \quad (5)$$

where Y_t is an $n \times 1$ vector of endogenous variables, C is an $n \times 1$ vector of constants, $A_1, \dots, A_p$ are $n \times n$ coefficient matrices, and $u_t \sim WN(0_n, \Omega)$ is the vector of reduced-form innovations.

For the EURNOK specification, Y_t contains the two-year Norway–euro area swap-rate differential, the log of EURNOK, the log of the Norwegian stock-price index (OSEBX), the log of the Brent oil price, the log of the EURO STOXX 50 index, and the Global Economic Policy Uncertainty index. This is a parsimonious macro-financial system for studying relative announcement news in a small open economy. The swap-rate differential summarizes revisions in the expected relative policy path, while Norwegian and euro-area equity prices capture forward-looking information about economic activity, earnings, and discount rates. Brent oil prices are included because of their importance for the Norwegian economy, and global policy uncertainty controls for common international risk factors that may affect the krone independently of domestic and euro-area news.

The reported USDEUR results contain seven variables: the two-year bilateral swap-rate differential, the log of USDEUR, the log of the EURO STOXX 50 index, the log of the Brent oil price, the Global Economic Policy Uncertainty index, the National Financial Conditions Index (NFCI), and the log of the S&P 500 index. NFCI measures financial distress in this application. The system therefore also includes a financial-conditions measure in addition to the variables used in the EURNOK application. This allows us to compare the transmission of relative inflation and monetary policy news across two distinct settings: a small-open-economy currency and a major currency pair linking two large economies.

In the baseline specification, all variables enter in levels and the VAR includes twelve monthly lags, allowing for dynamics over the previous year. In the robustness analysis, we show that the results are not sensitive to alternative lag lengths, variable transformations, or model specifications.

We assume that reduced-form innovations admit the structural representation

$$u_t = S\eta_t + v_t, \quad (6)$$

where η_t is a 2×1 vector collecting the structural shocks of interest, S is the corresponding $n \times 2$ matrix of impact coefficients, and v_t captures all remaining $n - 2$ structural shocks. Thus, the reduced-form residuals reflect a combination of the two shocks of interest and other orthogonal disturbances to which we do not give a formal interpretation. Identification amounts to recovering the components of u_t that are driven by η_t .

In particular,

$$\eta_t = \begin{pmatrix} \eta_t^\pi \\ \eta_t^r \end{pmatrix}, \quad S = [s^\pi \ s^r], \quad (7)$$

where s^π and s^r are $n \times 1$ vectors. The first column of S captures the contemporaneous effects of the relative inflation-news shock η_t^π , while the second column captures the effects of the relative monetary policy shock η_t^r . Accordingly, the VAR can be written as

$$Y_t = C + \sum_{j=1}^p A_j Y_{t-j} + s^\pi \eta_t^\pi + s^r \eta_t^r + v_t. \quad (8)$$

To identify these shocks, we exploit a vector of external instruments

$$Z_t = \begin{pmatrix} Z_t^\pi \\ Z_t^r \end{pmatrix}, \quad (9)$$

where Z_t^π denotes inflation surprises and Z_t^r denotes monetary policy surprises, as defined in the previous section. These two measures are potentially correlated, reflecting the fact that inflation and monetary policy news may convey overlapping information about underlying economic conditions.

The instruments are required to satisfy standard relevance and exogeneity conditions. In

particular, they must be correlated with the structural shocks of interest,

$$E(Z_t \eta_t') = \Phi, \quad (10)$$

where Φ is a 2×2 full-rank matrix, and orthogonal to all other structural disturbances,

$$E(Z_t \nu_t') = 0. \quad (11)$$

The full-rank condition ensures that the instruments contain sufficient independent variation to identify two distinct linear combinations of the reduced-form residuals corresponding to η_t^π and η_t^r .

In the estimation, we allow the two instruments to be correlated and do not impose orthogonality at this stage. Instead, we first extract their joint predictive content for the reduced-form residuals. Orthogonality of the identified structural shocks is then imposed ex post using the covariance matrix of reduced-form innovations together with an ordered orthogonalization procedure. The ordering is inflation news first and monetary policy news second. This ordering is motivated by the timing of the underlying information releases. Inflation surprises observed in month t typically refer to inflation realized in $t - 1$, implying that a monetary policy shock occurring in month t cannot affect the underlying inflation realization. Moreover, when the inflation release precedes the monetary policy announcement within the month, the inflation news may enter the information set relevant for the policy decision, whereas the reverse contemporaneous effect is not possible. Under relevance and exclusion, the proxies identify a two-dimensional space of news-related innovations.

Estimation proceeds by first recovering the reduced-form residuals $\hat{u}_t$ from the VAR and projecting them onto the space spanned by the instruments. Specifically, each element of $\hat{u}_t$ is regressed on both instruments, yielding a matrix of coefficients that captures the partial effect of each instrument on the residuals, controlling for the other instrument. This step extracts the joint predictive content of the potentially correlated instruments for the reduced-form innovations. To map these projections into structural shocks, we account for the covariance structure of the residuals. Let $\Sigma_u = E(u_t u_t')$ and let L denote its lower-triangular Cholesky factor such that $\Sigma_u = LL'$. We then

whiten the projected coefficients by pre-multiplying by L^{-1} and obtain an orthonormal basis via a QR decomposition, preserving the ordering of the instrument-based directions as inflation first and monetary policy second. This step imposes orthogonality on the identified shocks and yields two mutually orthogonal directions in the whitened residual space. Under the imposed ordering, the first direction is associated with inflation news, while the second is associated with the component of monetary policy news that is orthogonal to inflation news. Finally, the impact matrix $\hat{S}$ is recovered by mapping these orthogonal directions back into the original space of reduced-form residuals, and the corresponding structural shocks are obtained as linear combinations of $\hat{u}_t$. Hence, the identified shocks correspond to orthogonal linear combinations of the reduced-form innovations that are most closely aligned with the information contained in the external instruments, subject to the recursive ordering described above.

A detailed explanation of the estimation strategy and instrument relevance is provided in Appendix A. The diagnostics support statistical relevance in both EURNOK and USDEUR systems.

3.2 Local Projections

As a complementary approach, we estimate impulse responses using direct Local Projections as a robustness exercise. The methodology follows the local projection framework of Jordà (2005), where the observed macroeconomic surprises enter the local projection equations directly rather than serving as instruments. This approach estimates the response of each variable separately at every horizon following relative inflation and monetary policy surprises, without imposing a model for the full system dynamics. Specifically, we estimate the following regression for each horizon h and for each currency pair:

$$y_{t+h} - y_{t-1} = \alpha_h + \beta_h^\pi Z_t^\pi + \beta_h^r Z_t^r + \Gamma_h(L)Y_{t-1} + \varepsilon_{t+h}, \quad (12)$$

where $y_{t+h} - y_{t-1}$ is the cumulative response of the variable of interest relative to the period preceding the surprise, and $\Gamma_h(L)Y_{t-1}$ contains lags of the same endogenous variables included in

the VAR of the previous subsection. Because Z_t^π and Z_t^r enter the same regression, the coefficient β_h^π measures the response at horizon h to the inflation surprise, conditional on the contemporaneous monetary-policy surprise. Similarly, β_h^r measures the response to the monetary-policy surprise, conditional on the contemporaneous inflation surprise.

Unlike the Proxy-SVAR approach, this specification does not contain a first-stage regression and does not instrument the reduced-form residuals. Instead, a causal interpretation requires the contemporaneous surprises to be exogenous conditional on the lagged variables and the other contemporaneous surprise. These direct local projections assess sensitivity to the dynamic specification and are not an independent validation of FX-based identification. In the baseline specification, we include twelve lags of all endogenous variables contained in the VAR. The equations are estimated separately for each response variable and each horizon. To account for the serial correlation induced by overlapping cumulative responses, inference is based on heteroskedasticity- and autocorrelation-consistent Newey–West standard errors, with the truncation lag allowed to increase with the projection horizon.

4 Main findings

This section examines the effects of macroeconomic news on bilateral exchange rates. We first evaluate the impulse responses of EURNOK and USDEUR to relative inflation-news and monetary-policy-news shocks. Second, we quantify the contribution of these shocks to exchange-rate forecast-error variance using variance decompositions and assess their historical importance through historical decompositions.

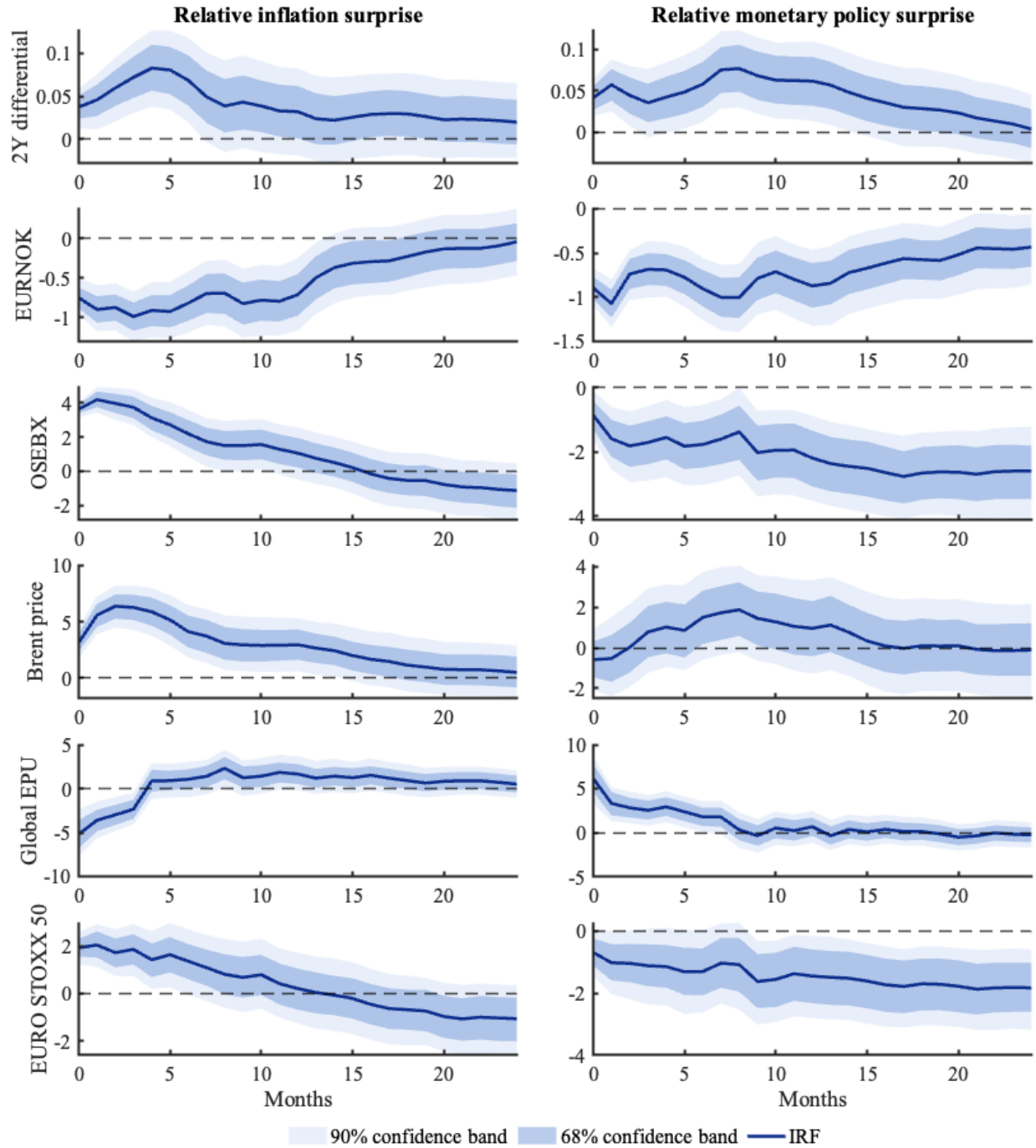
4.1 Impulse response analysis

Figure 6 reports the EURNOK impulse responses to one-standard-deviation shocks. The y-axis reports percentage-point changes in the interest-rate differential and approximate percentage changes in log asset prices. The uncertainty index, and NFCI in the USDEUR system, are reported in their

model units. The x -axis measures time, in months, after the innovation has occurred. The sign normalization sets both shocks to raise the two-year Norway–euro-area interest-rate differential. EURNOK falls after either shock, implying an appreciation of the Norwegian krone against the euro. The exchange-rate response is immediate, sizeable, and persistent. This is the central asset-pricing result: news that raises the expected relative return on NOK assets is associated with a stronger krone.

The inflation-news shock has a distinct macro-financial signature. The two-year differential rises gradually and peaks after several months, while the krone appreciates on impact and remains stronger for an extended period. The delayed peak in the yield response suggests that a CPI release changes the expected policy path rather than only the current short rate. The exchange rate, as a forward-looking asset price, reflects this information immediately. Norwegian equity prices rise after the inflation surprise, while the response of the EURO STOXX is also initially positive before weakening at longer horizons. Global economic policy uncertainty declines initially and subsequently rises above its pre-shock level. The initial equity and uncertainty responses are consistent with favourable macroeconomic information. The identified CPI-news shock is interpreted as announcement-related inflation news that is relevant for relative monetary and macroeconomic conditions, rather than as a primitive structural markup shock. This distinction is important because the empirical object of interest is the information in scheduled CPI releases that is priced by currency and financial markets.

The monetary-policy-news shock raises the two-year interest-rate differential and appreciates the krone. The exchange-rate response is initially sharp and remains negative over most of the horizon. Norwegian and euro-area equity prices decline persistently, which is consistent with a stronger discount-rate component. In contrast to the response following inflation news, global economic policy uncertainty increases after the monetary-policy surprise. This association may reflect the broader information contained in relative monetary-policy news, but it does not imply that policy actions by either central bank cause global uncertainty. Brent oil prices do not respond significantly.



Note: The solid lines represent the OLS estimates, and the shaded areas indicate 68% and 90% bootstrap confidence bands.

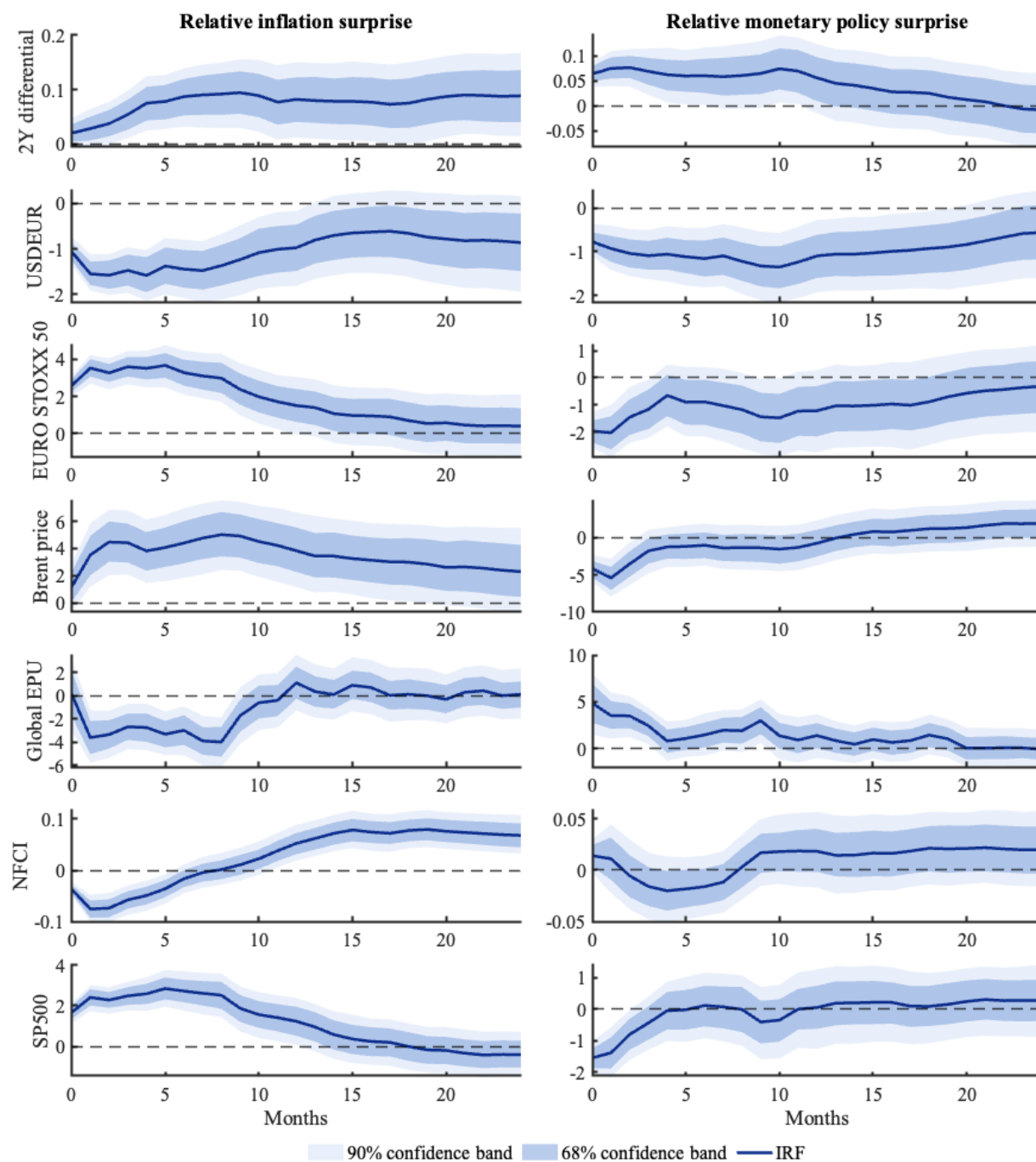
Figure 6: Impulse responses of EURNOK to relative inflation-news and monetary-policy-news shocks

The EURNOK responses therefore distinguish the two news sources while preserving a common interest-rate channel. Both shocks raise the expected relative interest-rate path by similar magnitudes and appreciate the krone, but their broader macro-financial signatures differ. Inflation news is initially associated with stronger equity prices and lower global policy uncertainty, consistent with favourable information about economic conditions. Monetary-policy news is associated with weaker equity prices and higher global policy uncertainty, pointing instead to a more pronounced discount-rate effect and a less favourable or more uncertain information component.

The USDEUR results are broadly similar to those obtained for EURNOK, see Figure 7. A positive relative inflation-news shock raises the two-year bilateral interest-rate differential and generates an immediate fall in USDEUR. Given our exchange-rate convention, this decline corresponds to an appreciation of the euro against the US dollar. The exchange-rate response is persistent and follows the same broad pattern as for EURNOK: the exchange rate adjusts quickly, while the interest-rate differential responds more gradually. This suggests that currency markets incorporate the implications of inflation news for the future relative monetary-policy path at the time of the announcement.

The broader asset-price responses also resemble those in the EURNOK specification. Equity prices rise after the inflation surprise, while global economic policy uncertainty declines. As in the EURNOK case, this pattern suggests that CPI releases contain, on average, information about stronger demand, activity, or nominal income rather than only adverse cost pressures. The response to relative monetary-policy news is also closely aligned with the EURNOK results. The two-year euro-area–United States interest-rate differential increases, and USDEUR falls, implying an appreciation of the euro against the US dollar. Equity prices decline, consistent with a stronger discount-rate component. Global economic policy uncertainty increases initially following monetary-policy news, while Brent oil prices decline on impact and subsequently recover.

Taken together, the USDEUR estimates confirm that the distinction between inflation and monetary-policy news is not specific to the Norwegian krone. In both currency pairs, the two shocks operate through a common relative interest-rate channel, but they have different broader



Note: The solid lines represent the OLS estimates, and the shaded areas indicate 68% and 90% bootstrap confidence bands.

Figure 7: Impulse responses of USDEUR to relative inflation-news and monetary-policy-news shocks

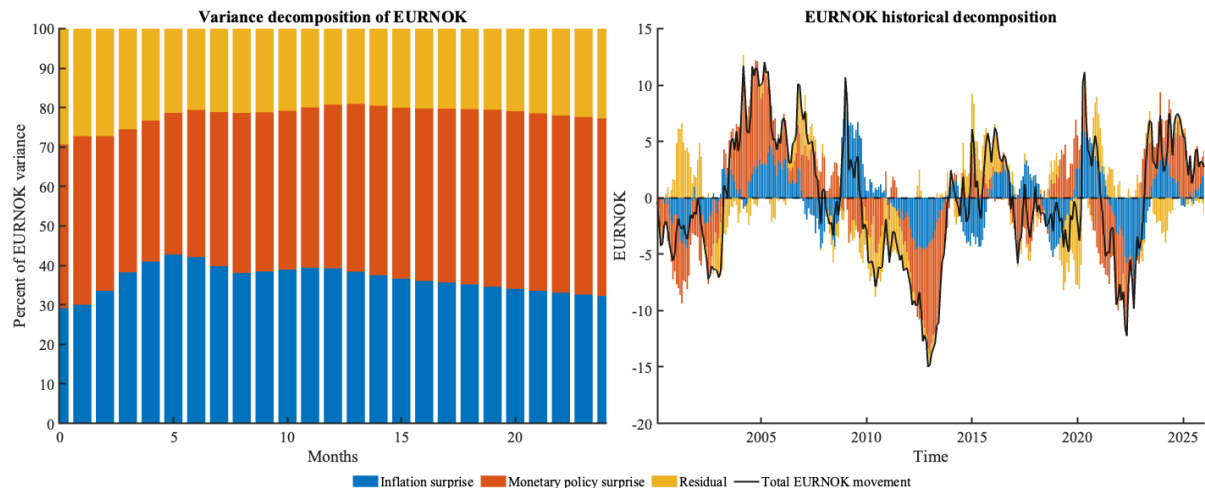
macro-financial signatures. Inflation news is initially associated with stronger equity prices and lower global policy uncertainty, whereas monetary-policy news is initially associated with weaker equity prices and higher uncertainty. The close similarity between EURNOK and USDEUR indicates that the mechanism is present both for the currency of a small open economy and for a major currency pair linking two large economies.

Local-projections. As a complementary exercise, we estimate the responses of the two-year interest-rate differential and the exchange rate using direct local projections. Figures 9a and 9b show that the main qualitative patterns are preserved.² For EURNOK, both inflation and monetary-policy surprises are associated with movements in the interest-rate differential and the exchange rate that are broadly consistent with the VAR estimates: when the relative interest-rate differential rises, the krone appreciates. The same comovement is present for USDEUR. Relative inflation and monetary-policy news generate corresponding movements in the bilateral interest-rate differential and the dollar–euro exchange rate, with the exchange rate adjusting in the direction implied by the change in relative rates. Although the local-projection estimates are less smooth and generally less precisely estimated at longer horizons, the central result is unchanged: across both currency pairs, relative interest-rate differentials and exchange rates move in tandem following inflation and monetary-policy news.

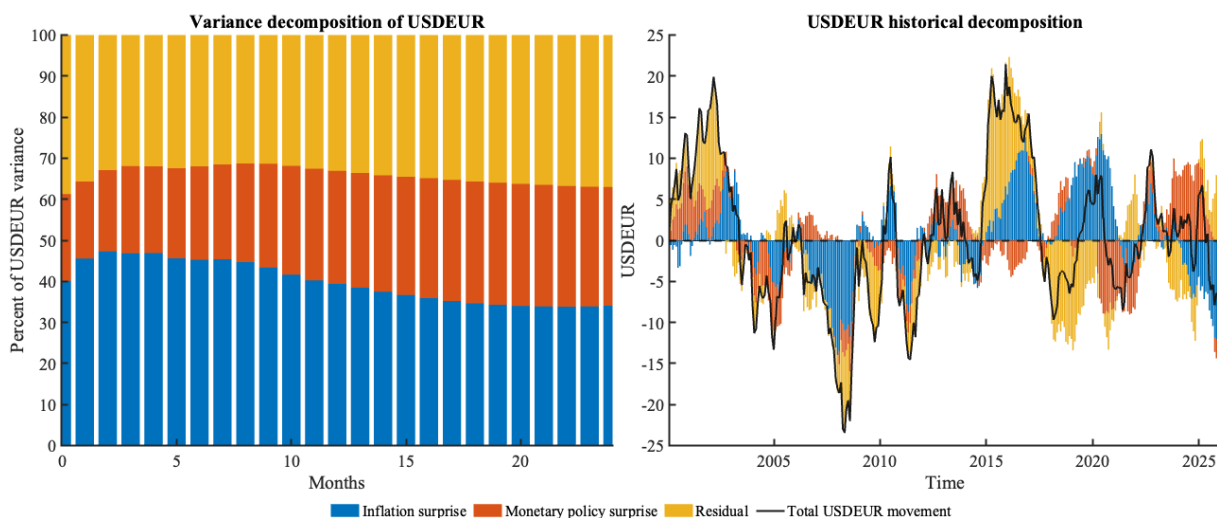
4.2 Variance and historical decompositions

Figure 8 compares the forecast-error variance and historical decompositions for EURNOK and USDEUR, while Table 1 reports the forecast-error variance decompositions for all variables in the two specifications. The historical decompositions trace the contributions of past shocks to exchange-rate movements over time and are expressed as deviations from the deterministic component (zero-shock path) implied by the estimated VAR model. This path is obtained by recursively iterating the model from its observed initial conditions, setting all subsequent innovations equal to zero. The

²The full set of impulse responses for the additional variables included in the EURNOK VAR is presented in Appendix Figure 10 for comparison.



(a) EURNOK



(b) USDEUR

Note: The left plot in each panel reports the percentage contribution of relative inflation news, relative monetary-policy news, and the residual component to the exchange-rate forecast-error variance over the plotted monthly horizons. The right plot reports the historical contributions to the exchange rate relative to the VAR zero-shock path. The black line is the observed log exchange rate minus that path, rather than an independently filtered business-cycle component. The residual collects all disturbances outside the two identified news directions.

Figure 8: Variance and historical decompositions of EURNOK and USDEUR

historical decompositions therefore illustrate how inflation surprises, monetary policy surprises, and other shocks have contributed to exchange-rate movements relative to the deterministic path of the model in the absence of subsequent innovations (see [Bergholt et al. \(2026\)](#)).

The EURNOK results are quantitatively striking. At short horizons, inflation news explains approximately 30 percent of exchange-rate forecast-error variance and monetary-policy news about

40 percent. The inflation share then rises above 40 percent at horizons of roughly five to six months before gradually declining to about one-third after two years. The monetary-policy share initially falls as inflation news becomes more important, then rises to approximately 45 percent at longer horizons. Together, the two identified shocks account for roughly three-quarters to four-fifths of EURNOK forecast-error variance over most horizons. The particularly large equity shares may reflect a broad macro-information factor revealed on CPI-release days.

The decompositions for the remaining variables reveal a broader contrast between the two news sources. Inflation news is especially important for Norwegian equity prices, explaining almost 80 percent of OSEBX forecast-error variance on impact and still more than 40 percent after one year. Its contribution to Brent is smaller initially but rises to almost 40 percent at the one-year horizon, consistent with inflation releases containing information about broader demand and economic conditions. Monetary-policy news, by contrast, has little explanatory power for Brent, but becomes increasingly important for OSEBX and global economic policy uncertainty at longer horizons. For the Norway–euro-area two-year interest-rate differential, both shocks account for more moderate but persistent shares, of roughly 10–17 percent. The EURO STOXX 50 is affected by both shocks to a similar extent, with each explaining around 14–18 percent of its variance. Overall, the EURNOK system suggests that inflation news has a particularly strong contemporaneous macroeconomic-information component, whereas monetary-policy news becomes more important for financial conditions and uncertainty as the horizon increases.

The USDEUR decomposition is similar in shape but differs in level. Inflation news explains roughly 40 percent at short horizons and remains close to that level through much of the first year before declining toward one-third at two years. Monetary-policy news begins near 20 percent and rises toward 30 percent. The joint contribution is therefore approximately two-thirds across the horizon. The residual share is larger than for EURNOK, but inflation and monetary-policy news still account for the majority of short-run USDEUR fluctuations.

The broader USDEUR system shows an equally clear difference in transmission. For the US–euro-area two-year swap-rate differential, monetary-policy news is most important on impact,

explaining about 28 percent of the variance, but its contribution falls below 10 percent at longer horizons. Inflation news displays the opposite pattern, rising from only 3 percent on impact to more than 20 percent after two years. Inflation news also explains a large share of EURO STOXX 50 fluctuations, around 60 percent over the first year, and becomes increasingly important for Brent and global economic policy uncertainty at longer horizons. Its contribution to the S&P 500 is more modest, at around 15 percent beyond the impact horizon. Monetary-policy news has a sizeable immediate contribution to the EURO STOXX 50 and Brent, but these shares decline substantially with the horizon, while its contribution to the S&P 500 remains comparatively stable. These patterns again suggest that inflation announcements contain broad information about economic conditions, whereas monetary-policy surprises have a more immediate effect on relative interest rates and asset valuations.

Two comparative conclusions follow. First, inflation news is not less important than monetary-policy news. In EURNOK, the two components are of comparable magnitude and inflation temporarily becomes the largest source of identified variation. In USDEUR, inflation is the single largest identified component at essentially all reported horizons. Second, the division of labor over horizons is similar. Inflation news dominates earlier, when a CPI release induces a broad reassessment of activity and the expected policy path. The relative contribution of monetary-policy news becomes more important later, as central bank communication and policy-path information persist. These results sharpen the comparison with [Karau \(2024\)](#), who demonstrates that relative monetary-policy surprises explain a large share of short-run dollar–euro movements. Our US-DEUR decomposition confirms that relative policy news is important, but shows that omitting inflation releases leaves out an equally important, and at short horizons larger, source of variation. The EURNOK results then show that the conclusion is not confined to the dollar–euro market. Relative inflation and policy news explain an even larger joint share for the currency of a small open economy.

The historical decomposition for EURNOK shows that the large variance shares are not driven by a single episode. The model attributes substantial contributions to monetary policy news

Variable	Forecast horizon		
	0	12	24
Panel (a): FEVD – EURNOK specification			
<i>Inflation surprise</i>			
Norway–euro area 2-year swap-rate differential	10.6	15.1	14.5
log(EURNOK)	29.2	39.3	32.2
log(OSEBX)	79.2	41.4	27.4
log(Brent)	18.1	38.3	31.2
log(EURO STOXX 50)	12.7	14.5	14.2
Global Economic Policy Uncertainty	26.3	10.8	9.7
<i>Monetary-policy surprise</i>			
Norway–euro area 2-year swap-rate differential	13.0	16.5	17.1
log(EURNOK)	41.5	41.5	45.0
log(OSEBX)	4.5	17.2	32.7
log(Brent)	0.6	2.6	2.2
log(EURO STOXX 50)	17.6	16.4	13.9
Global Economic Policy Uncertainty	3.5	9.1	17.7
Panel (b): FEVD – USDEUR specification			
<i>Inflation surprise</i>			
Bilateral 2-year swap-rate differential	2.6	17.2	23.5
log(USDEUR)	40.1	39.4	34.1
log(EURO STOXX 50)	57.6	64.0	49.4
log(Brent)	2.2	29.2	31.2
log(S&P 500)	0.0	16.6	14.9
Global Economic Policy Uncertainty	27.7	22.0	43.7
NFCI	40.5	59.3	42.9
<i>Monetary-policy surprise</i>			
Bilateral 2-year swap-rate differential	28.4	13.6	9.8
log(USDEUR)	21.1	27.5	28.9
log(EURO STOXX 50)	33.1	13.0	12.4
log(Brent)	28.7	9.9	9.2
log(S&P 500)	12.3	13.8	13.1
Global Economic Policy Uncertainty	4.2	2.8	3.7
NFCI	34.7	5.0	3.9

Notes: The table reports forecast error variance decompositions (FEVDs), measured as the percentage of the forecast error variance explained by the identified inflation and monetary-policy surprises. Panel (a) reports results for the EURNOK specification, while Panel (b) reports results for the USDEUR specification.

Table 1: Forecast Error Variance Decompositions

during the appreciation episodes in the mid-2000s and around 2023–2025, as well as during the depreciation episodes around 2011–2013 and 2021–2022. The identified inflation news component makes material contributions in the late 2000s, around 2012–2014, and during the large fluctuations surrounding 2020–2022. The two components sometimes reinforce one another and sometimes offset each other. The residual is important during selected episodes, including the global financial crisis and the pandemic period, but the sum of the identified contributions tracks a substantial part of the exchange rate relative to the zero-shock path.

The USDEUR decomposition likewise shows repeated contributions from both types of news. The model attributes contributions to the identified inflation-news component that are especially visible in the large swings around the global financial crisis, the mid-2010s, the pandemic period, and the most recent observations. The model also attributes material contributions to monetary policy news, particularly during episodes of policy divergence between the Federal Reserve and the ECB. The residual component is larger and accounts for some of the sharpest dollar–euro movements, which may reflect factors outside the identified news components, including global risk-premium shocks.

The historical evidence provides a comparison across the two currency pairs. The exact timing and relative size of the estimated contributions differ across the two currency pairs. Nevertheless, the identified inflation and monetary policy news components repeatedly coincide with large deviations from the zero-shock path in both markets. The common result is not that every exchange-rate episode has the same cause, but that the model identifies relative macroeconomic news as a persistent and quantitatively important component of exchange-rate fluctuations across environments.

In the Appendix, we also present the historical decompositions together with the deterministic component of the VAR model, using VAR specifications in which exchange rates enter in raw levels rather than logarithms. This alternative representation allows the contributions of the different shocks to be visualized directly in exchange-rate units, rather than as approximate percentage deviations from the zero-shock path, see Figure 11.

4.3 Robustness

We assess the robustness of our main findings along three dimensions, focusing on the EURNOK specification, which serves as our baseline throughout the analysis. We begin with the checks that address proxy construction most directly: 30-minute FX measures, 30-minute interest-rate-based measures for both news types, and conventional CPI forecast errors. We then examine lag length and treatment of low-frequency variation. Across these exercises, the main qualitative conclusions remain unchanged.

Alternative high-frequency surprise measures. We assess the sensitivity of our findings to two alternative constructions of the announcement-based surprises. First, we shorten the event window used to measure exchange-rate movements around CPI releases and monetary policy announcements. Second, we replace exchange-rate movements with high-frequency changes in the bilateral interest-rate differential. In both exercises, we use a 30-minute window, extending from 10 minutes before to 20 minutes after each announcement.

Our first exercise constructs relative inflation and monetary policy surprises using exchange-rate movements within a 30-minute window around each announcement, rather than the daily window employed in the baseline specification. Narrower windows offer tighter identification by limiting the influence of unrelated information arriving outside the announcement period. At the same time, they may capture a smaller fraction of the total exchange-rate adjustment, as financial markets can take time to process the information contained in CPI releases and central bank announcements. We therefore expect the narrower-window measures to explain somewhat less exchange-rate variation than the baseline measures. Reassuringly, the resulting impulse responses are very similar to those obtained under the baseline specification in terms of their dynamics, and persistence (see Figure 14). The forecast error variance decompositions also reveal substantial explanatory power. As reported in Table 3, the two surprises jointly account for 49.9 percent of EURNOK forecast error variance on impact, 52.1 percent at the 12-month horizon, and 50.1 percent at the 24-month horizon. Although these contributions are smaller than in the baseline specification, they remain

economically substantial. The similarity of the impulse responses is particularly informative, as it suggests that the estimated dynamics are not driven by exchange-rate movements occurring outside the immediate announcement window.

Our second exercise replaces exchange-rate movements with changes in the Norway–euro area one-year interest-rate differential, measured within the same 30-minute announcement windows. We use the one-year maturity because of its greater liquidity at high frequencies. These changes provide an alternative market-based measure of revisions to the expected relative monetary policy stance following CPI releases and central bank announcements. The resulting impulse responses, reported in Figure 15, exhibit dynamics similar to those obtained using exchange-rate-based surprises. Table 4 shows that the two surprises jointly explain 19.6 percent of EURNOK forecast error variance on impact, rising to 48.7 percent at the 12-month horizon and 47.3 percent at the 24-month horizon. The latter contributions are close to those obtained using exchange-rate movements over the same 30-minute window, which amount to 52.1 and 50.1 percent, respectively.

Taken together, these exercises reinforce our main findings. Even when news is measured within a narrow window that prioritizes the isolation of announcement-related information over capturing the full market adjustment, inflation and monetary policy surprises explain a substantial share of exchange-rate fluctuations. Moreover, the similarity of the impulse responses across the alternative measures indicates that the estimated exchange-rate dynamics are robust to both the choice of event window and the financial-market variable used to measure the surprises.

Alternative measurement of inflation surprises. We next examine whether our results depend on the measurement of inflation news. In the baseline analysis, inflation surprises are constructed using exchange rate movements around CPI releases. As an alternative, we use the announcement-based CPI surprise introduced in equation (1), namely the difference between the actual CPI release and the Bloomberg median consensus forecast available immediately prior to the announcement. This alternative measure has the advantage of isolating the unexpected component of the CPI release using information that was directly observable to market participants before the announcement. We

define the relative surprise as the difference between the Norwegian and Euro Area headline CPI surprises, subtracting the latter from the former. Both surprises are measured in percentage points and enter without standardization, preserving the economic interpretation of the relative surprise as the difference in unexpected inflation between the two economies. This exercise replaces the inflation proxy. Re-estimating the model using this announcement-based measure produces results that are consistent with our baseline findings, in sign and persistence, see Figure 16. The CPI-forecast-error specification yields a larger peak EURNOK appreciation (approximately 2.5 percent, compared with approximately 1 percent in the daily FX-based baseline). The response magnitudes, however, are not directly comparable to those in the baseline specification because the two inflation proxies are measured in different units and imply different shock normalizations. The relevant result is therefore the similarity in the qualitative dynamic responses across the two measures of inflation news.

Taken together, these exercises show that the main results are robust to alternative model specifications, alternative announcement windows, non-FX interest-rate-based proxies, and survey-based CPI forecast errors.

Alternative lag and trend specifications. We also vary the lag length of the VAR. Figure 12 compares specifications with 6 and 24 lags. The impulse responses preserve the same broad shape and magnitude as in the baseline model: inflation and monetary policy surprises generate similar movements in both the two-year interest-rate differential and the exchange rate.

Figure 13 considers alternative treatments of low-frequency variation. We compare a specification estimated in first differences with one based on HP-filtered data. For the first-difference specification, the exchange-rate responses are cumulated to recover the implied response in levels. These responses are slightly more persistent than in the baseline, while being very similar in shape and magnitude. By contrast, the HP-filtered specification produces less persistent exchange-rate responses. Despite these differences in persistence, the qualitative response patterns remain similar across specifications. The main conclusions are therefore robust to alternative treatments of

low-frequency variation.

5 Concluding remarks

This paper studies how bilateral exchange rates respond to inflation and monetary-policy news. We combine high-frequency exchange-rate reactions to scheduled announcements on both sides of a currency pair into monthly relative surprises and use these measures as external instruments in a proxy SVAR to trace their effects over time. We apply the same framework to EURNOK and USDEUR to examine whether the relationship between macroeconomic news and exchange rates holds both for a small-open-economy currency and for a major-currency pair.

Three findings stand out. First, exchange rates respond sharply and immediately to macroeconomic news. Our high-frequency evidence shows that substantial adjustments occur within the first minute of inflation releases and monetary-policy announcements. These movements are systematically related to the direction and magnitude of the underlying surprises, indicating that exchange rates incorporate macroeconomic information as it reaches financial markets. Inflation announcements, in particular, emerge as an important source of immediate currency repricing alongside monetary-policy decisions.

Second, the two relative announcement-news factors jointly account for approximately 71–81 percent of EURNOK forecast-error variance and 61–67 percent of USDEUR forecast-error variance at the reported horizons. Both sources of news are quantitatively important, with inflation surprises alone accounting for a substantial share of exchange-rate variation in both currency pairs. The estimated responses are also consistent with revisions in expected relative interest-rate paths: news that raises the relative two-year interest-rate differential is associated with an immediate currency appreciation. Historical decompositions further show that both types of news contribute to exchange-rate movements throughout the sample, rather than only during exceptional episodes.

Third, the main findings extend beyond the Norwegian krone. Despite differences in economic size, financial-market depth, and exposure to global shocks, EURNOK and USDEUR exhibit

similar responses to inflation and monetary-policy news. The two types of announcements generate immediate exchange-rate adjustments, and the identified innovations explain a substantial share of forecast-error variance in both currency pairs. This suggests that the importance of macroeconomic news is not confined to small-open-economy currencies or to Norway-specific economic conditions.

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Appendix

A Structural Shocks with External Instruments

This appendix provides the step-by-step identification procedure underlying the proxy SVAR estimated in the main text.

Recall the reduced-form VAR

$$Y_t = C + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + u_t, \quad (13)$$

where u_t denotes the $n \times 1$ vector of reduced-form residuals. We assume that these innovations can be decomposed as

$$u_t = S\eta_t + v_t, \quad (14)$$

where

$$\eta_t = \begin{pmatrix} \eta_t^\pi \\ \eta_t^r \end{pmatrix} \quad (15)$$

collects the two structural shocks of interest, namely the inflation-news shock and the monetary policy surprise shock, S is the associated $n \times 2$ impact matrix, and v_t collects all remaining structural disturbances.

To identify η_t , we use the vector of external instruments

$$Z_t = \begin{pmatrix} Z_t^\pi \\ Z_t^r \end{pmatrix}, \quad (16)$$

where Z_t^π denotes inflation surprises and Z_t^r denotes monetary policy surprises. The instruments are assumed to satisfy

$$E(Z_t \eta_t') = \Phi, \quad (17)$$

where Φ is a full-rank 2×2 matrix, and

$$E(Z_t v_t') = 0. \quad (18)$$

These conditions imply that the instruments are informative about the shocks of interest and orthogonal to the remaining structural disturbances.

In economic terms, the relevance and exclusion assumptions identify the two-dimensional news-related innovation space. The inflation-first QR step then allocates overlapping information to two orthogonal directions. Reversing the ordering generally changes their separate interpretations and variance shares. Orthogonalization does not establish the validity of the proxies.

The identification procedure consists of the following steps.

First, we estimate the reduced-form VAR by OLS and recover the residuals $\hat{u}_t$.

Second, for each equation $i = 1, \dots, n$, we regress the estimated reduced-form residual on the two external instruments:

$$\hat{u}_{i,t} = \alpha_i + \beta_{i\pi} Z_t^\pi + \beta_{ir} Z_t^r + \xi_{i,t}. \quad (19)$$

Stacking the estimated coefficients across equations yields the matrix

$$B = \begin{pmatrix} \beta_{1\pi} & \beta_{1r} \\ \beta_{2\pi} & \beta_{2r} \\ \vdots & \vdots \\ \beta_{n\pi} & \beta_{nr} \end{pmatrix}, \quad (20)$$

whose two columns summarize the partial effect of each instrument on the reduced-form residuals, controlling for the other instrument. Since inflation and monetary policy surprises may be correlated, we do not impose orthogonality on the instruments themselves at this stage.

Third, let

$$\Sigma_u = E(u_t u_t') \quad (21)$$

denote the covariance matrix of reduced-form residuals, and let L be its lower-triangular Cholesky factor such that

$$\Sigma_u = LL'. \quad (22)$$

We use L to whiten the first-stage coefficient matrix:

$$G = L^{-1}B. \quad (23)$$

This transformation expresses the instrumented directions in a space in which the reduced-form innovations have identity covariance.

Fourth, we impose orthogonality on the identified shocks by applying a QR decomposition to the whitened matrix:

$$G = QR, \quad (24)$$

where Q is an $n \times 2$ matrix with orthonormal columns. This step orthogonalizes the shock directions implied by the instruments. Importantly, it is not the instruments themselves that are orthogonalized. Instead, orthogonality is imposed on the linear combinations of reduced-form residuals associated with the instruments. Because QR decomposition is order-dependent, the ordering of the instruments in Z_t determines the ordering of the identified shocks.

Fifth, the impact matrix of the two identified structural shocks is recovered as

$$S = LQ. \quad (25)$$

Under the inflation-first ordering, the first column of S corresponds to the inflation-news direction, while the second corresponds to monetary-policy news orthogonal to that direction.

Finally, the corresponding structural shocks are obtained as

$$\hat{\eta}_t = Q' L^{-1} \hat{u}_t. \quad (26)$$

Thus, the identified structural shocks are orthogonal linear combinations of the reduced-form residuals that are most closely related to the information contained in the external instruments.

Given the estimated impact matrix $\hat{S}$, impulse responses are computed using the moving-average representation of the estimated VAR. Let C_h denote the matrix of moving-average coefficients at horizon h . Then the impulse responses are given by

$$IRF_h = C_h \hat{S}, \quad h = 0, 1, \dots, H. \quad (27)$$

Each column of IRF_h traces the dynamic response of the endogenous variables to one of the two identified shocks.

A.1 Instrument relevance

A necessary condition for identification is that the external instruments contain information about the reduced-form innovations. We assess this condition separately for the EURNOK and USDEUR systems using the first-stage regressions

$$\hat{u}_{i,t} = \alpha_i + \beta_{i\pi} Z_t^\pi + \beta_{ir} Z_t^r + \xi_{i,t}, \quad i = 1, \dots, n. \quad (28)$$

For each currency pair and each instrument, we test the null hypothesis that the corresponding coefficients are jointly equal to zero across all reduced-form VAR equations, conditional on the presence of the other instrument. We also test the joint null that the coefficients on both instruments are zero across the entire system. The results are reported in Table 2.

The system-wide relevance tests reject instrument irrelevance for both currency pairs. In the EURNOK system, the null that the inflation-surprise instrument is irrelevant is rejected with a Wald statistic of 20.433 and a p -value of 0.0023. The corresponding null for the monetary-policy-surprise instrument is rejected with a Wald statistic of 24.994 and a p -value of 0.0003. The joint null that both instruments are irrelevant is also strongly rejected, with a Wald statistic of 48.972 and a p -value below 0.001.

	EURNOK			USDEUR		
	Statistic	df	<i>p</i> -value	Statistic	df	<i>p</i> -value
Panel A: System-wide relevance tests						
Inflation-surprise instrument is irrelevant	20.433	6	0.0023	14.267	7	0.0466
Monetary-policy-surprise instrument is irrelevant	24.994	6	0.0003	16.447	7	0.0213
Both instruments are jointly irrelevant	48.972	12	< 0.001	32.982	14	0.0029
Panel B: Rank-strength diagnostics	EURNOK			USDEUR		
Largest singular value	8.248			0.611		
Smallest singular value	1.341			0.224		
Smallest-to-largest singular-value ratio	0.163			0.367		
Condition number	6.15			2.73		
Numerical rank of $\widehat{E[Z_t u_t']}$	2			2		
Bootstrap median singular-value ratio	0.177			0.332		
Bootstrap 5th–95th percentile	[0.040, 0.643]			[0.133, 0.729]		

Notes: Panel A reports system-wide Wald tests based on regressions of the reduced-form VAR innovations on both external instruments. For each individual instrument, the null hypothesis is that its coefficients are jointly equal to zero across all VAR equations, conditional on the other instrument. The final row of Panel A tests the joint null that the coefficients on both instruments are zero across all equations. Panel B reports singular-value diagnostics for the estimated instrument–innovation covariance matrix, $\widehat{E[Z_t u_t']}$. Identification of two structural shocks requires this matrix to have rank two. Singular values and condition numbers depend on the scaling of the instruments and innovations. The bootstrap percentiles are descriptive stability diagnostics and do not constitute a formal test of the rank-one null.

Table 2: Instrument relevance and rank-strength diagnostics

The USDEUR instruments are also statistically relevant. The Wald statistic for the inflation-surprise instrument is 14.267, with a *p*-value of 0.0466, while the statistic for the monetary-policy-surprise instrument is 16.447, with a *p*-value of 0.0213. The joint null that both instruments are irrelevant is rejected more strongly, with a Wald statistic of 32.982 and a *p*-value of 0.0029. Thus, in both applications, each instrument contains predictive information for the vector of reduced-form innovations conditional on the other instrument, and the two instruments are jointly informative for the VAR system.

The evidence is stronger statistically for EURNOK, particularly for the individual instruments, whereas the USDEUR relevance tests are closer to conventional significance thresholds. Nevertheless, irrelevance is rejected at the 5 percent level for both USDEUR instruments, and joint irrelevance is rejected at well below the 1 percent level. The results therefore support the use of both announcement-based instruments in each currency-pair specification.

The system-wide Wald tests establish predictive relevance but do not by themselves guarantee that the two instruments identify two separate structural directions. Identification requires the

population instrument–innovation covariance matrix to satisfy

$$\text{rank}(E[Z_t u_t']) = 2. \quad (29)$$

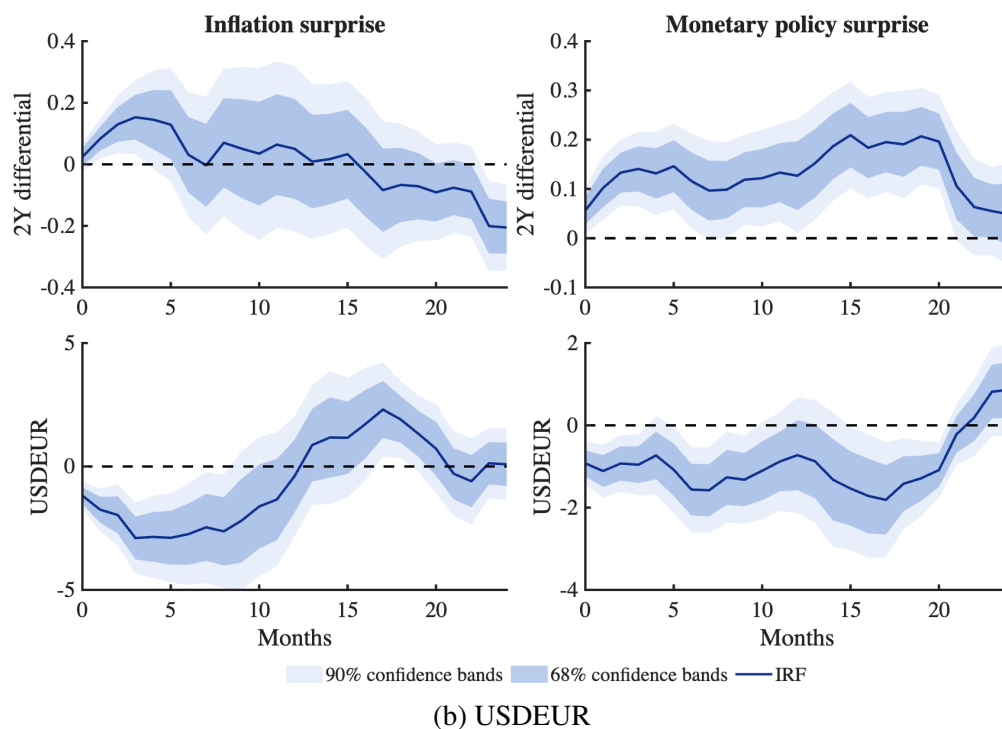
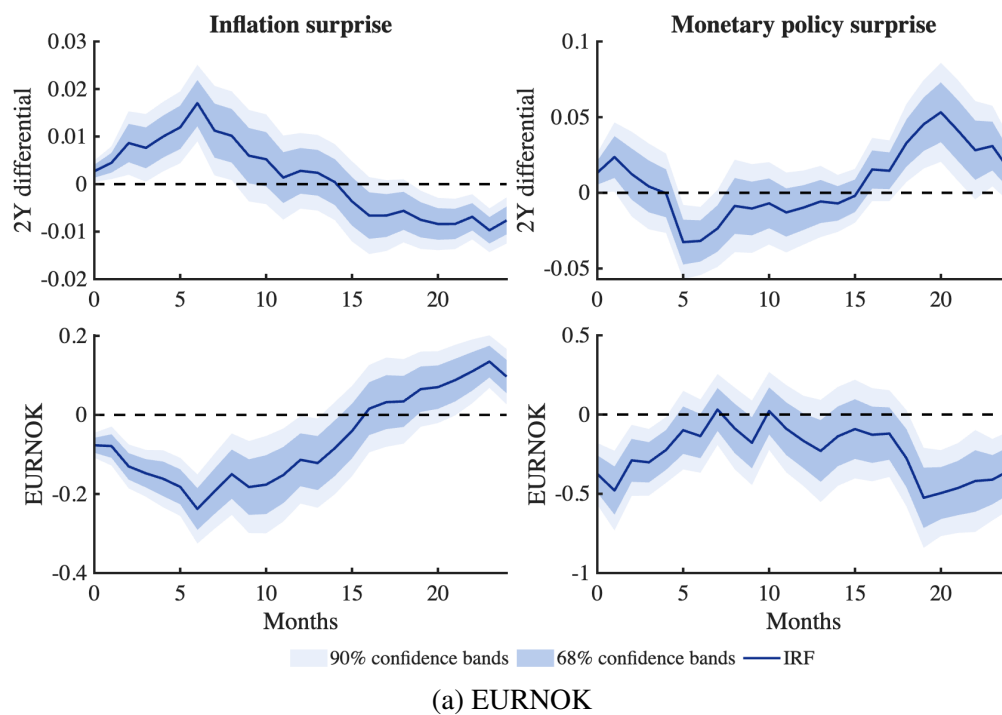
We therefore complement the relevance tests with singular-value diagnostics for the estimated covariance matrix.

For EURNOK, the estimated instrument–innovation covariance matrix has numerical rank two. Its largest and smallest singular values are 8.248 and 1.341, respectively, producing a smallest-to-largest singular-value ratio of 0.163 and a condition number of approximately 6.15. The second identifying direction is therefore weaker than the first, but the estimated matrix does not display an immediate numerical rank deficiency. For USDEUR, the estimated covariance matrix also has numerical rank two. Its largest and smallest singular values are 0.611 and 0.224, respectively. The resulting singular-value ratio is 0.367 and the condition number is approximately 2.73. Under the normalization used in the estimation, the two identifying directions are therefore more balanced in relative terms than in the EURNOK system. The absolute singular values should not be compared directly across currency pairs because they depend on the scale of the instruments and reduced-form innovations.

The bootstrap diagnostics provide additional evidence on the sampling stability of the estimated rank structure. For EURNOK, the observed singular-value ratio of 0.163 is close to the bootstrap median of 0.177 and lies within the 5th–95th percentile range of [0.040, 0.643]. For USDEUR, the observed ratio of 0.367 is similarly close to the bootstrap median of 0.332 and lies within the corresponding interval of [0.133, 0.729]. In neither case is the observed relative strength of the second identifying direction unusual compared with the bootstrap distribution.

Taken together, the results show that the inflation and monetary-policy instruments are relevant in both the EURNOK and USDEUR systems and that the estimated instrument–innovation covariance matrices have numerical rank two. The diagnostics therefore support the identification of two distinct structural news shocks in both currency pairs. At the same time, these statistics should not

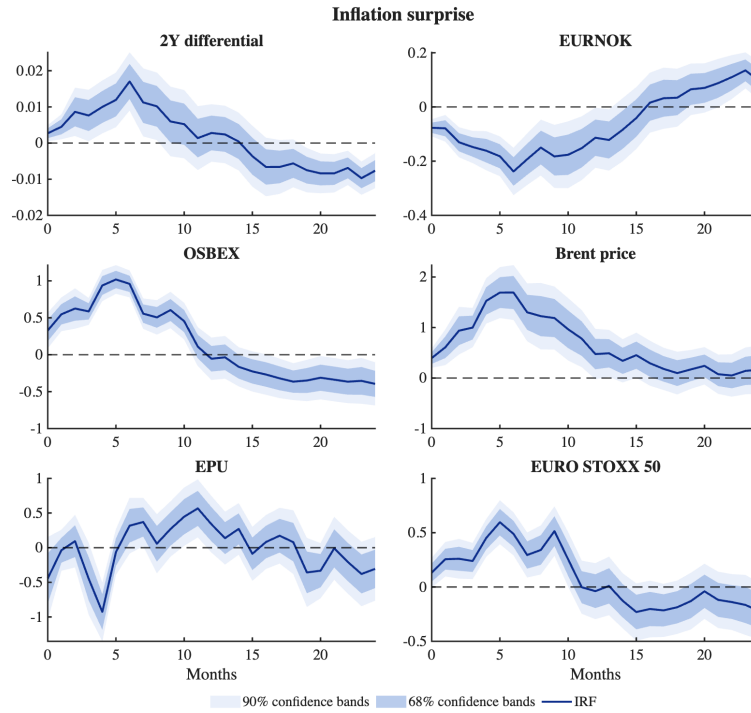
be interpreted as formal weak-instrument or rank tests. The singular-value measures are descriptive and normalization-dependent, and the bootstrap procedure does not impose a rank-one null. These diagnostics do not rule out weak identification or establish instrument exogeneity, particularly for the less precisely relevant USDEUR inflation proxy.



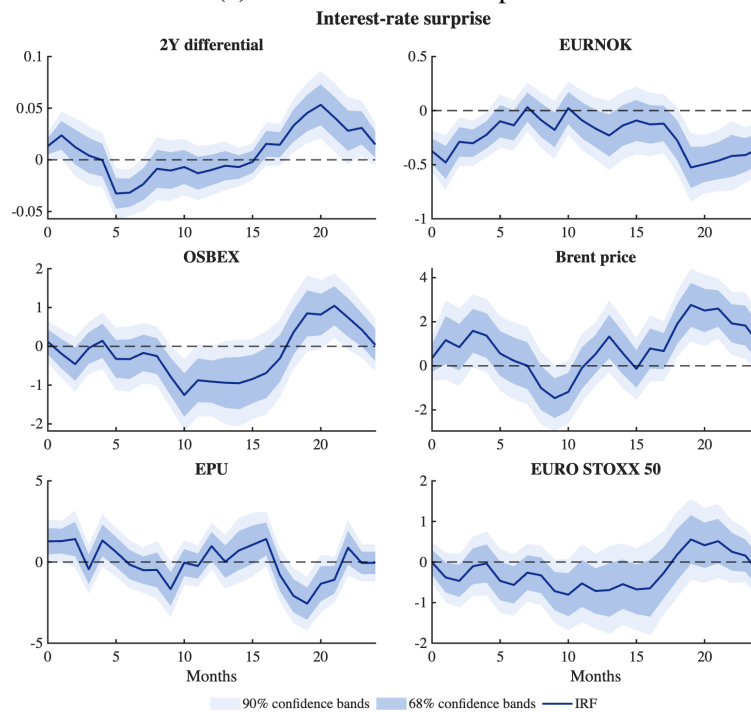
Note: The solid lines report the local-projection estimates. Shaded areas indicate 68% and 90% Newey–West confidence bands.

Figure 9: Local-projection responses for EURNOK and USDEUR

B Additional Tables and Figures

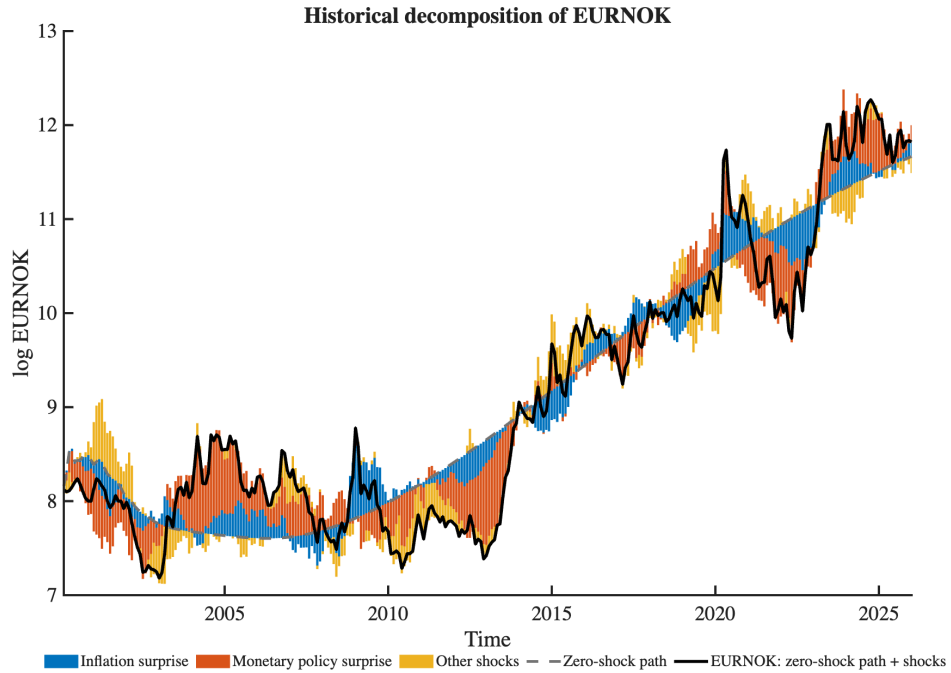


(a) Relative inflation surprise

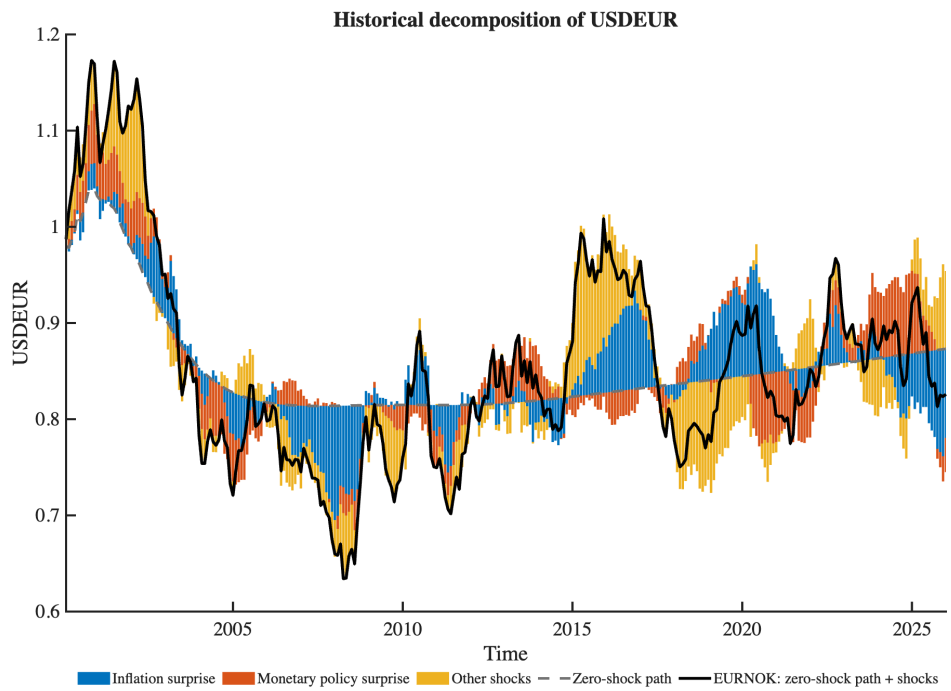


(b) Monetary policy surprise

Figure 10: Local projection impulse responses: EURNOK

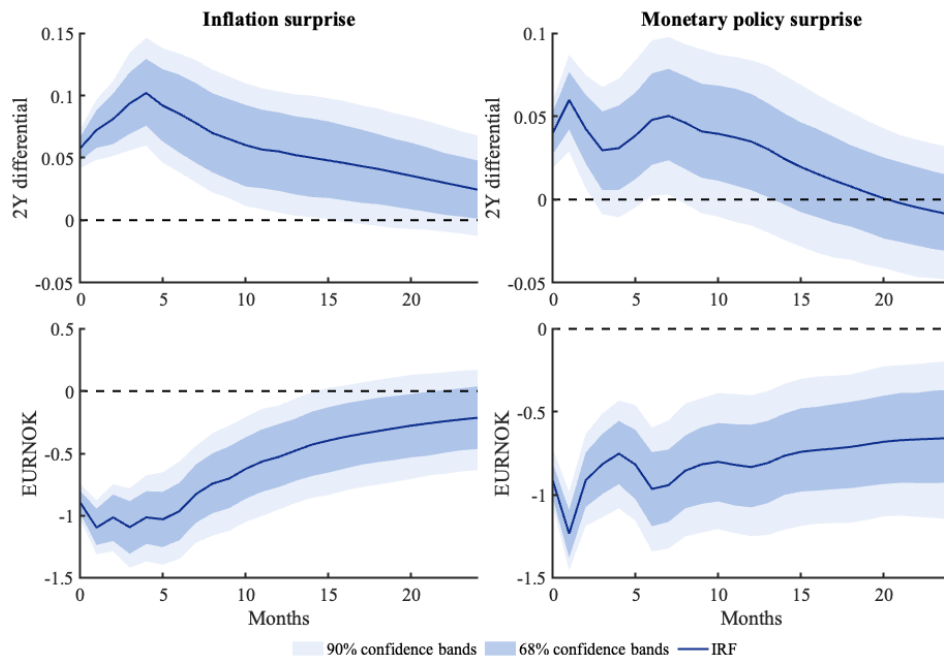


(a) Historical decomposition of EURNOK

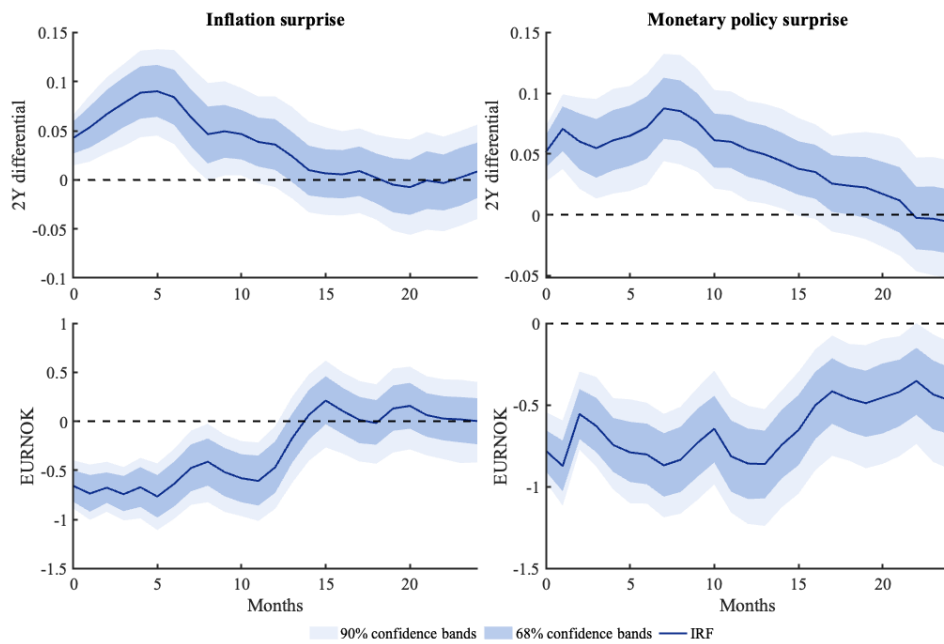


(b) Historical decomposition of USDEUR

Figure 11: Historical decompositions for EURNOK and USDEUR

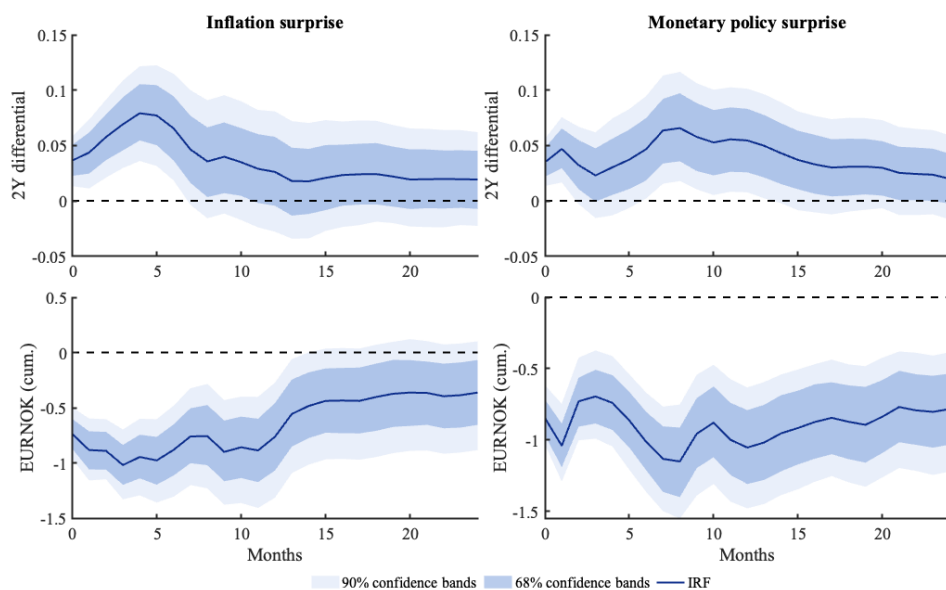


(a) 6 lags

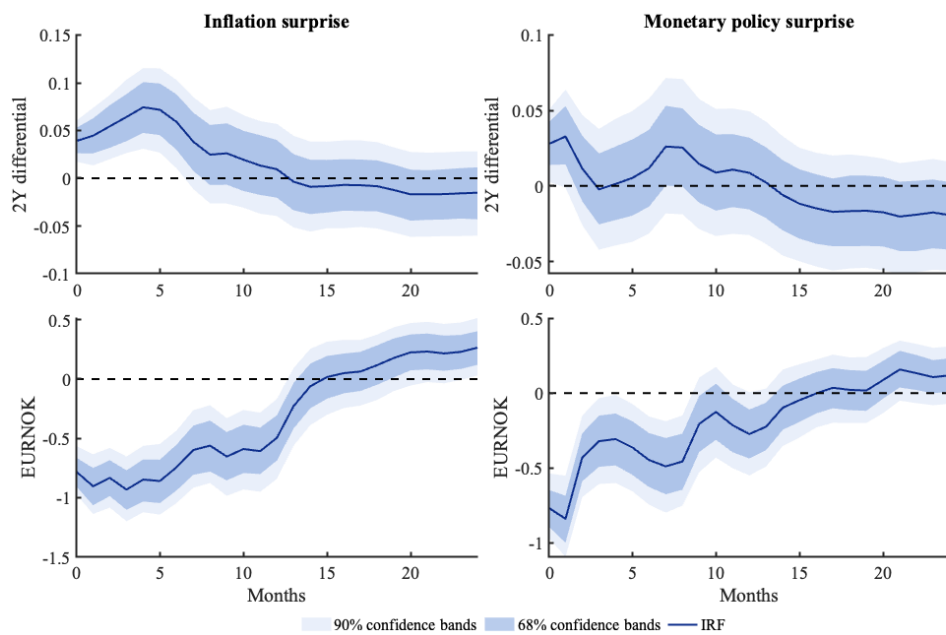


(b) 24 lags

Figure 12: Robustness to the lag length of the VAR.



(a) First-differenced specification



(b) HP-filtered specification

Figure 13: Robustness to alternative treatments of low-frequency movements.

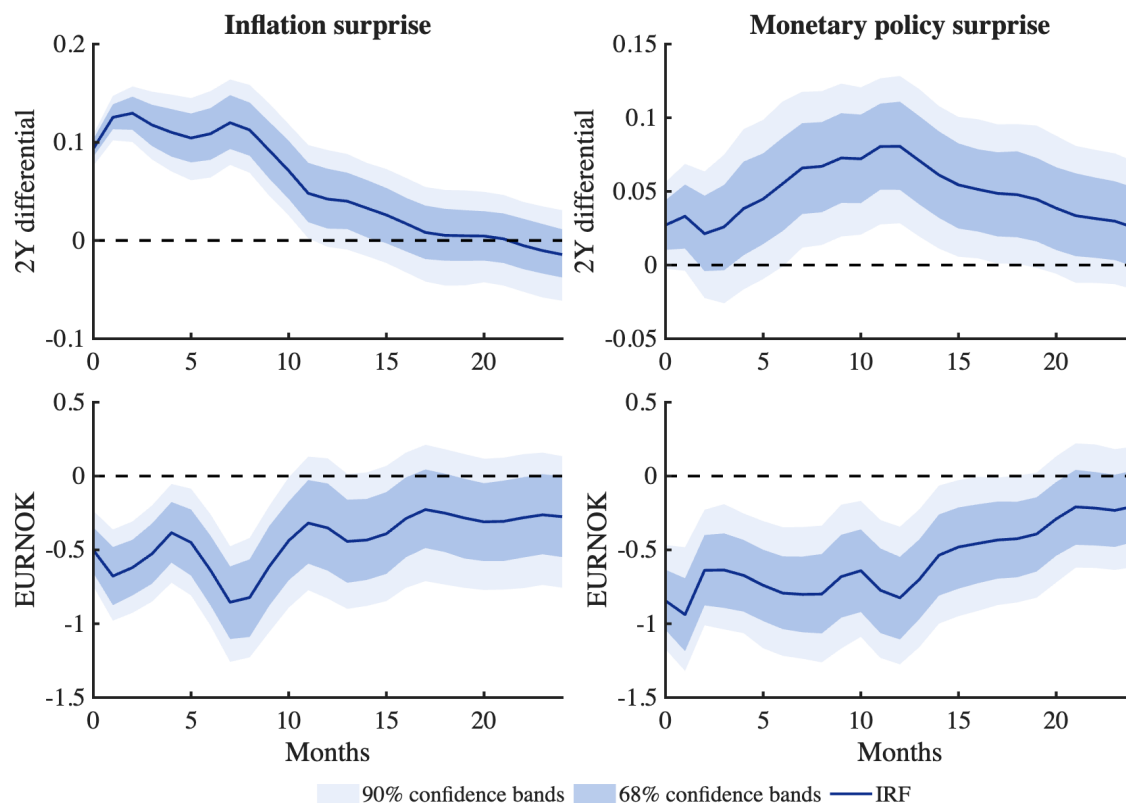


Figure 14: Robustness to alternative high-frequency surprises – 30-min window.

Variable	Forecast horizon		
	0	12	24
<i>Inflation surprise</i>			
Norway–euro area 2-year swap-rate differential	66.6	51.4	42.9
log(EURNOK)	13.0	19.1	18.5
log(OSEBX)	9.9	34.9	39.9
log(Brent)	10.6	4.6	3.6
log(EURO STOXX 50)	0.2	13.6	14.6
Global Economic Policy Uncertainty	3.1	25.2	33.2
<i>Monetary-policy surprise</i>			
Norway–euro area 2-year swap-rate differential	5.6	15.9	21.0
log(EURNOK)	36.9	33.0	31.6
log(OSEBX)	1.4	0.8	16.1
log(Brent)	5.3	1.3	2.8
log(EURO STOXX 50)	2.7	2.8	2.9
Global Economic Policy Uncertainty	5.5	3.1	5.0

Notes: The table reports forecast error variance decompositions (FEVDs), measured as percentages of the forecast error variance explained by the identified inflation and monetary-policy surprises.

Table 3: Forecast Error Variance Decompositions – 30-min window

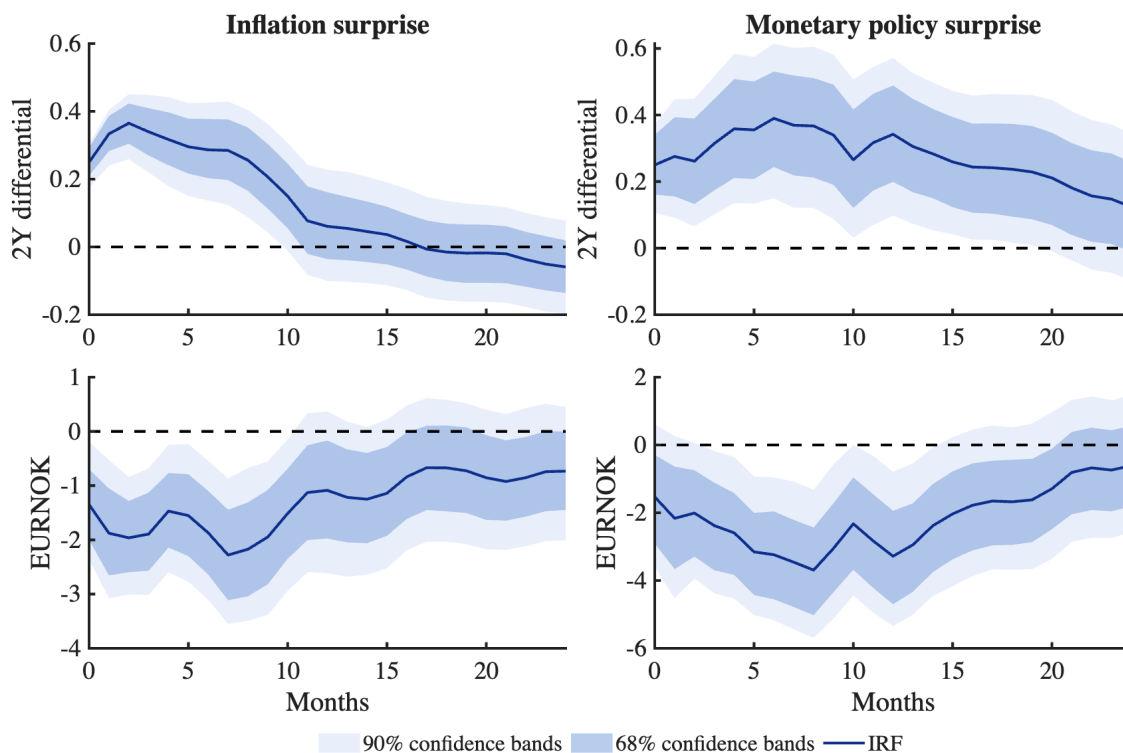


Figure 15: Robustness to alternative high-frequency surprises – interest rate differential.

Variable	Forecast horizon		
	0	12	24
<i>Inflation surprise</i>			
Norway–euro area 2-year swap-rate differential	65.6	48.2	39.7
log(EURNOK)	13.0	24.0	22.6
log(OSEBX)	0.1	17.3	19.7
log(Brent)	26.5	15.8	12.6
Global Economic Policy Uncertainty	4.5	19.8	20.1
log(EURO STOXX 50)	2.0	27.7	36.3
<i>Monetary-policy surprise</i>			
Norway–euro area 2-year swap-rate differential	25.8	28.7	33.5
log(EURNOK)	6.6	24.7	24.7
log(OSEBX)	1.4	2.2	6.8
log(Brent)	12.7	2.5	4.8
Global Economic Policy Uncertainty	12.1	11.3	13.5
log(EURO STOXX 50)	0.2	0.8	4.7

Notes: The table reports forecast error variance decompositions (FEVDs), expressed as percentages of forecast error variance at horizons of 0, 12 and 24 months. Contributions are shown separately for the two identified news shocks. The residual share, not displayed, is 100 minus their sum for each variable and horizon.

Table 4: Forecast Error Variance Decompositions – interest rate differential

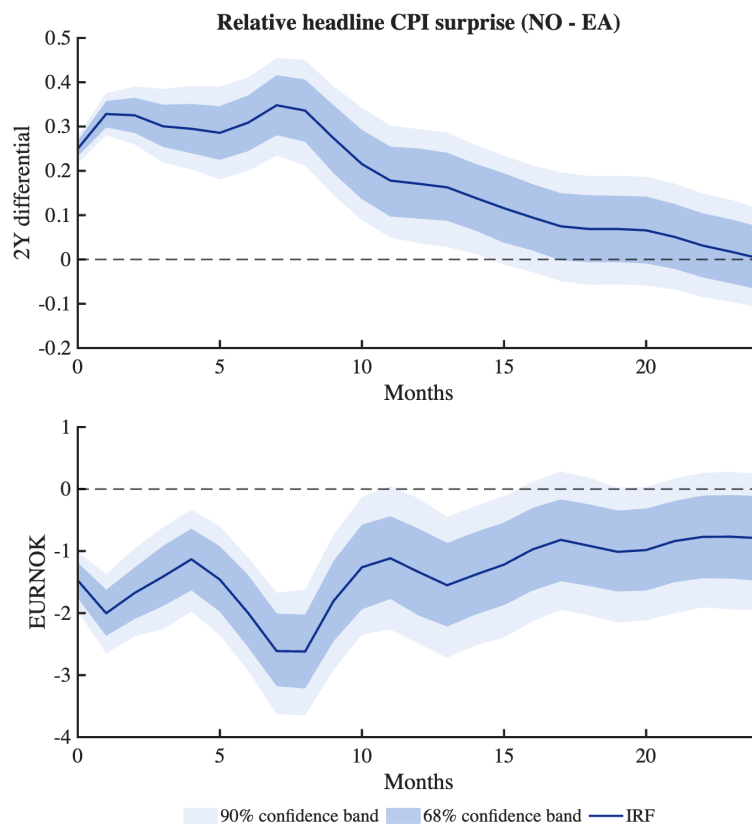


Figure 16: Robustness to alternative high-frequency surprises – CPI surprises.