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Monetary Policy Announcements, Information Schocks, and Exchange Rate Dynamics

Daniel Gründler* Eric Mayer† Johann Scharler‡

May 25, 2021

Abstract

We study nominal exchange rate dynamics in the aftermath of U.S. monetary policy announcements. Using high-frequency interest rate and stock price movements around FOMC announcements, we distinguish between pure monetary policy shocks and information shocks, which are associated with new information contained in the announcements. Contractionary pure policy shocks give rise to a strong, but transitory, appreciation on impact. Information shocks also appreciate the exchange rate, but the effect builds up only slowly over time and is highly persistent. Thus, we conclude that although the short-run effects on the exchange rate are primarily due to pure policy shocks, the medium-run response is driven by information effects.

Keywords: central bank information, high-frequency identification, proxy VAR, exchange rate dynamics

JEL codes: E44, E52, E30

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1 Introduction

In this paper, we study the response of the U.S. Dollar to information shocks and pure monetary policy shocks in context of FOMC announcements. In addition to information about specific policy measures, which is capured by pure monetary policy shocks, central bank announcements typically reveal news about the central bank's assessment of the state of the economy (see e.g. Campbell et al., 2012; Nakamura and Steinsson, 2018; Jarocinski and Karadi, 2020). Although the effects of monetary policy on exchange rates are studied in a number of contributions (see e. g. Rüth, 2020; Inoue and Rossi, 2019; Bjørnland, 2009; Scholl and Uhlig, 2008), information shocks associated with central bank announcements as a source of exchange rate fluctuations have received less attention. Nevertheless, financial market participants closely monitor and process information provided by central banks.[1] Thus, information shocks may give rise to exchange rate fluctuations as well.

To address this issue, we disentangle pure monetary policy shocks and information shocks by imposing sign restrictions on high-frequency changes in interest rates and stock prices measured within short time windows around central bank announcements. The main identifying assumption is that a pure policy shock results in a negative co-movement of high-frequency changes in interest rates and stock prices, while an information shock exerts a positive co-movement (Jarocinski and Karadi, 2020; Jarociński, 2020; Kerssenfischer, 2019). Intuitively, a contractionary pure policy shock should lead to higher interest rates and lower expected discounted dividends, which in turn leads to lower stock prices. However, if stock prices increase despite a monetary tightening and higher interest rates, then the stock market movement is likely to reflect a more positive economic assessment by the central bank conveyed with the announcement

[1] Several studies find that information effects exert economically significant and persistent effects on interest rates (Jarociński, 2020; Jarocinski and Karadi, 2020; Breitenlechner et al., 2021). Andrade and Ferroni (2021) find larger interest responses to information shocks around policy announcements than to pure policy shocks, while Cieslak and Schrimpf (2019) find evidence that information effects on impact account for a larger share in the variance decomposition of bond yields of different maturities.

of the change in monetary policy. Based on these identifying assumptions, we decompose the high-frequency interest rate change into pure policy and information components using rotational sign restrictions as in Jarociński (2020). The fact that changes in interest rates and stock prices are measured within short windows around announcements ensures that these changes reflect surprises associated with the announcement (Kuttner, 2001; Gürkaynak et al., 2005). As a next step, we use the pure policy and information surprise components as instruments in a proxy VAR as in Gertler and Karadi (2015).[2]

Our results show that contractionary monetary policy shocks lead to a sharp appreciation followed by a persistent depreciation of the nominal effective exchange rate consistent with the overshooting model of Dornbusch (1976) and in line with empirical evidence presented in e.g. Bjørnland (2009) and Rüth (2020). Despite of pure monetary policy and information shocks both contributing to the appreciation, the dynamic patterns induced by these two shocks differ strongly. A pure monetary policy shock appreciates the U.S. Dollar in the short run, but the effect is transitory. The exchange rate response to an information shock, in contrast, is rather muted on impact but becomes more pronounced over the medium run, resulting in a persistent appreciation. Although the appreciation triggered by the information shock is less precisely estimated, the magnitude is economically significant. The historical decomposition shows that due to the higher persistence of its effects, which accumulate over time, the information shock contributes substantially to exchange rate dynamics. Nevertheless, the persistent effects of the information shock on exchange rates do not feed through to ex-post deviations from uncovered interest rate parity (UIP) in a sizeable way.

The response of the exchange rate to monetary policy shocks has been studied in a number of contributions. Several papers explore the issue whether exchange rate dynamics are consistent with the exchange rate overshooting model of Dornbusch (1976). Eichenbaum and Evans (1995)

[2] Rogers et al. (2018) and Rüth (2020) apply proxy VARs to study exchange rate dynamics.

and Grilli and Roubini (1995, 1996) find evidence for delayed exchange rate overshooting, i.e., a smaller response of the exchange rate in the short term than in the long term (see also Froot and Thaler, 1990). Scholl and Uhlig (2008) use sign restrictions to identify policy shocks and find that the maximum appreciation occurs after 1 to 2 years. In contrast, Faust and Rogers (2003) follow Faust (1998) obtain the maximum exchange rate responses at horizons that are close to impact period. Bjørnland (2009) identifies monetary policy shocks by imposing long-run monetary neutrality restrictions and finds real exchange rate responses consistent with Dornbusch (1976) for a number of countries. Inoue and Rossi (2019) identify monetary policy shocks as changes in the whole yield curve in response to monetary policy surprises and also find support for exchange rate overshooting. Müller et al. (2019) use narrative monetary policy shocks as in Romer and Romer (2004) and updated by Coibion et al. (2017) in a local projections framework. Their results are rather consistent with delayed overshooting.

Methodologically, our paper is perhaps most closely related to Rogers et al. (2018) and Rüth (2020). These two contributions use proxy VARs in combination with high frequency instruments to identify policy shocks and find little evidence in favor of delayed overshooting. We contribute to this branch of the literature by exploring the effects of new information conveyed at central bank announcements.[3]

The paper is structured as follows: Section 2 describes our econometric approach and the data we use in our estimations. Section 3 presents our main findings, which include impulse response functions as well as a historical decomposition. Afterwards, Section 4 contains a battery of robustness checks and finally, Section 5 concludes.

[3]Although Rüth (2020) and Müller et al. (2019) also do estimations with policy shocks orthogonalized against information effects, they do not analyse the implications of the information shock itself.

2 Estimation and Data

We estimate the following reduced form VAR-model:

$$y_t = c + \sum_{j=1}^{p} B_j y_{t-j} + u_t, \tag{1}$$

where y_t is the vector of endogenous variables, c is a vector of constant terms, B_j are matrices containing the coefficients on lagged endogenous variables, and u_t is a vector of error terms with distribution $u_t \sim N(0, \Sigma)$. We set $p = 6$ in our baseline specification.[4]

The vector of endogenous variables consists of the 1-year bond yield (GS1), the S&P500 stock market index (S&P500), industrial production (IP), the consumer price index (CPI), the excess bond premium (EBP), and the spot nominal effective exchange rate index (NEER). The choice of endogenous variables is standard and closely follows Gertler and Karadi (2015). We take logs of IP, CPI, S&P500, and the exchange rate index and multiply the resulting series by 100. The remaining series are included without any transformations. While we focus on the NEER in our baseline analysis, we also estimate the model with bilaterial exchange rates and excess returns that measure deviations from UIP. We define spot exchange rates as the price of one unit of foreign currency in terms of U.S. Dollars. The data ranges from 1984M2 to 2016M12. Table 1 provides details about the variables we use in this paper and their data source.

To identify pure policy and information shocks, we use high-frequency changes in interest rates and stock prices between 10 minutes before and 20 minutes after a FOMC announcement. Specifically, we use the surprises in the 3-month federal funds future and the S&P500 index from Jarocinski and Karadi (2020). Since only the announcement of the central bank should have a systematic effect on interest rates and financial market variables more generally within such a

[4] In Section 4, we check the robustness of our results to different lag lengths.

short time window, these high-frequency changes can be interpreted as broad policy surprises, i.e., they should be correlated with the pure policy shock and the information shock but not with other shocks (see e.g. Kuttner, 2001; Gürkaynak et al., 2005; Hamilton, 2008; Miranda-Agrippino, 2016). We include only scheduled FOMC meetings between 1990M2 to 2016M12.[5] Although the surprises are available only from 1990M2 onward, the proxy-VAR methodology, which we describe below, allows us to estimate the reduced-form VAR starting in 1984M2, in order to increase the efficiency of our estimates (Gertler and Karadi, 2015; Rüth, 2020).

We follow Jarociński (2020) and use rotational sign restrictions to decompose the interest rate surprise into two orthogonal components:[6] the policy surprise, mp_t, and the information surprise, cbi_t. The decomposition is based on the restrictions that a pure policy shock gives rise to a negative co-movement of interest rate and stock price surprises and that an information shock results in a positive co-movement (see also Cieslak and Schrimpf, 2019; Jarocinski and Karadi, 2020; Breitenlechner et al., 2021).[7] We use these two orthogonal surprises as instrument for the 1-year bond yield, which we interpret as the monetary policy indicator, in a proxy-VAR as in Gertler and Karadi (2015). We follow Montiel Olea et al. (2020) and calculate the impact responses to our two orthogonal shocks as:

$$\delta^{mp} = u_t^p mp_t / T, \tag{2}$$

$$\delta^{cbi} = u_t^p cbi_t / T, \tag{3}$$

[5]Nakamura and Steinsson (2018) argue that unscheduled meetings may be arranged in response to other macroeconomic shocks and that these meetings should therefore be excluded. In addition, if unscheduled meetings are not expected for market participants, the pre-meeting asset prices may not capture the expected effect of the policy announcement (Caldara and Herbst, 2019).

[6]For more technical details, see Appendix B of Jarociński (2020). Andrade and Ferroni (2021) use a similar approach.

[7]As in Jarociński (2020), we first estimate the shares of the variance of the interest rate surprise associated with each of the orthogonal surprises using the so-called poor man's sign restrictions approach. In this first step, we find that the monetary policy and central bank information surprises explain 86 percent and 14 percent of the interest rate surprises' total variance.

where u_t^p are the residuals in the policy indicator equation and T is the sample size.[8] The two coefficients δ^{mp} and δ^{cbi} capture the contemporaneous effects of the pure policy shock and the information shock on the variables in the system. We scale these coefficients such that each of the identified shocks induces a unit increase in the policy indicator on impact. Finally, we use the delta-method as described in Montiel Olea et al. (2020) to calculate asymptotically valid confidence bands.

3 Results

3.1 Effective Exchange Rate

Figure 1 displays the main results. The solid lines show the point estimates and the shaded areas represent 68 percent and 90 percent confidence bands. As a first analysis, we show the responses to a broad policy shock, that is, without taking information effects into account, in the first column of the figure. A contractionary monetary policy shock gives rise to persistent declines in industrial production and the CPI. While the stock market declines, the 1-year rate and the excess bond premium increase, indicating tighter financing conditions. These responses are in line with the existing literature (see e.g. Gertler and Karadi, 2015; Miranda-Agrippino and Ricco, 2018; Caldara and Herbst, 2019). The exchange rate appreciates significantly in effective terms on impact and in the first month after the shock. This initial appreciation is followed

[8] Gertler and Karadi (2015) estimate the contemporaneous response with a two stage approach. First, they regress the residuals from the policy indicator equation on the instruments and estimate the component in the residuals predicted by the instruments. In the second stage, they regress this component on the residuals in the policy indicator equation to estimate the impact effects. Up to scale, estimating δ^{mp} and δ^{cbi} as in Equations (2) and (3) is equivalent to the following approach:

$$\begin{aligned} u_t^p &= \gamma^0 + \gamma^{mp} mp_t + \gamma^{cbi} cbi_t + \eta_t, \\ u_t^{mp} &= \gamma^{mp} mp_t, \\ u_t^{cbi} &= \gamma^{cbi} cbi_t, \\ u_t &= \delta^{mp} u_t^{mp} + \delta^{cbi} u_t^{cbi} + \nu_t, \end{aligned}$$

where the only difference to Gertler and Karadi (2015) is that the last three equations do not include constants, since we use two surprises in a single model to identify two shocks. We also estimated responses to the shocks in two separate models containing only a single instrument as in Gertler and Karadi (2015) and obtained virtually identical responses.

by a slow and highly persistent depreciation back to the pre-shock level. Since the maximum response, which is about 5 percent, occurs within the first quarter after the shock, we interpret these dynamics as being in line with the exchange rate overshooting model of Dornbusch (1976) and with the empirical evidence presented in Rüth (2020) and Bjørnland (2009), among others.

Next, we distinguish between pure policy shocks and information shocks. The responses to a pure policy shock are displayed in the second column of Figure 1 and the third column shows the responses to an information shock. The pure policy shock induces contractionary effects, with persistent declines in production, prices, and equity prices as well as tightened financing conditions. The information shock, in contrast, exerts only a small effect on industrial production, but leads to higher consumer prices as well as equity prices, and a lower excess bond premium.

Turning to the exchange rate responses, we see that although the exchange rate appreciates in response to either of the two shocks, the timing of the effects differs strongly. Although the maximum response to the pure shock occurs in the second month after the shock, as in the case of the broad shock, the response is less persistent than in the first column of the figure, where the point estimate remains below zero for all horizons shown in the figure. The information shock has essentially no effect on the exchange rate in the short run, but the effect builds up over time and becomes more pronounced over the medium run and reaches its maximum roughly 2 years after the shock. The rather persistent response to the information shock is in line with the more persistent interest rate response, shown in the first row of the figure.[9] Although the medium-run response of the exchange rate to the information shock is of a similar order of magnitude as the short-run response to the pure policy shock, it is somewhat less precisely estimated as indicated by the rather wide confidence bands at higher horizons. Still, the effect

[9] The result that interest rates respond more persistently to information shocks than to pure policy shocks is consistent with e.g. Jarocinski and Karadi (2020). Breitenlechner et al. (2021) find similar results for information effects associated with announcements of unconventional monetary policy.

is significant on the 68% level, indicating a systematic effect of the information shock on the exchange rate. Overall, it appears that the persistence of the response to the broad shock in the first column is largely the result of information effects, captured by the broad shock, rather than pure policy shocks.

Despite differences in the timing of the effects, both shocks contribute to the appreciation following pure policy and information shocks. To compare the contributions quantitatively, Figure 2 shows the historical decomposition of the nominal effective exchange rate, which we obtain by following the approach suggested in Montiel Olea et al. (2020). The figure depicts the nominal effective exchange rate (black line) on the right axis together with the contributions of the two identified shocks on the left axis. It has to be noted that since the two shocks are only identified up to a scaling factor, only the relative size of the contributions can be interpreted. That is, we cannot interpret the size of the contributions relative to the black line in the black figure.

Figure 2 shows that the contributions of the pure policy shock fluctuate stronger than those associated with the information shock, which is likely due to the substantially more persistent effects generated by the information shock, as discussed above. In other words, the figure indicates that pure policy shocks are more relevant when the exchange rate is subject to sharp, but short-lived movements, such the the appreciation in late 2008. Longer-lasting movements, in contrast, are primarily due to the slowly accumulating effects of the information shock.

3.2 Bilateral Exchange Rates and Deviations from UIP

To study the effect of monetary policy on foreign exchange markets in more detail and take potential heterogeneities into account, we now estimate a separate VAR models including bilateral exchange rates. To do so, we replace the effective exchange rate index by either the British

Pound, the Japanese Yen, or the Canadian Dollar.[10]

Figure 3 displays responses of these bilateral exchange rates after broad and pure policy shocks as well as information shocks.[11] We see that the appreciation of the British Pound against the Dollar is more persistent than for the other currencies. And while the persistence is again strongly driven by the information shock in this case, the response to the pure shock is also more persistent than for the other currencies. The figure also shows that although the information shock gives rise to a delayed appreciation in general, with only small effects on impact, the U. S. Dollar initially depreciates against the Canadian Dollar, which is partly the reason for the dampened impact response to the broad policy shock. Nevertheless, over time the U.S. Dollar appreciates slowly in response to the information shock, similar to our baseline results. Overall, we conclude qualitatively the results for bilateral exchange exchange rates are largely similar to our findings for the nominal effective exchange rate.

Do policy and information shocks lead to deviations from UIP? To study this issue, we replace the bilateral exchange rates with ex-post deviations from UIP and re-estimate the VAR. We calculate the ex-post excess returns as:

$$\lambda_t^h = \frac{i^*_{t-h} - i_{t-h}}{1200/h} + s_t - s_{t-h}, \tag{4}$$

where s_t is the exchange rate, i^*_{t-h} and i_{t-h} are the annualized foreign and U.S. money market interest rates for either one month ($h = 1$) or three months ($h = 3$) in period $t - h$. The factor $1200/h$ adjusts the annualized interest rate differential to either monthly or quarterly returns. As stated, a decline in s_t denotes an appreciation of the Dollar. Thus, the (ex-post) return

[10] We use data from the Refinitive Eikon. Due to limited data availability, we estimate the VAR with the U.S. Dollar-Japanese Yen exchange rate and with the U.S. Dollar-Canadian Dollar exchange rates with data starting in 1985M12. For more details, we refer to Table 1.

[11] In this figure we do not show the responses of the macroeconomic variables, which closely resemble the responses in the baseline model shown in Figure 1.

reflects the return of an investor who shortens the U.S. Dollar in $t-h$ (home country) and goes long in the foreign currency. Proceeds from this transaction, which are composed out of the interest rate differential $i^*_{t-h} - i_{t-h}$ and the percentage appreciation or depreciation of the exchange rate from period $t-h$ to t, are settled in period t. If $\lambda^h_t < 0$, the investor receives a negative return from the transaction.

Figures 4 and 5 show the responses of the monthly and quarterly ex-post UIP deviations, respectively. We see that broad monetary policy shocks give rise to only short-lived monthly and quarterly deviations from UIP, which is in line with Rüth (2020) and Bjørnland (2009), among others. Note that the responses of the UIP deviations are conditional on the monetary policy shock and do not necessarily tell us much about whether or not UIP holds unconditionally. We also see that the responses to the broad shock mirror the responses to the pure shock in the second column of the figure, similar to our findings for the exchange rate responses.

The responses to the information shock are shown in last column. Interestingly, although the exchange rate responses to the information shock in Figure 3 are rather persistent, the UIP deviations respond only slightly more persistently to the information shock than to the pure policy shock. For the Japanese Yen, the response of the UIP is somewhat more persistent, but still small. Overall, we conclude that the persistence of the exchange rate responses to the information shock is only to a small extent mirrored in the responses of the UIP responses. This may be partly due to the fact that although the exchange rate responses display a higher degree of persistence, most of the appreciation still occurs within the first few months after the shock and the exchange remains rather stable afterwards. Thus, even in the aftermath of an information shock, the contribution of the exchange rate movement to the UIP deviation vanishes quickly.

4 Robustness Analysis

In this section, we support our results by a number of robustness checks. First, we increase the number of lags from $p = 6$ to $p = 12$. The results are shown in Figure 6. The bands are somewhat wider than what we obtain with our baseline specification, which might be due to the larger number of estimated parameters. Our main conclusions, however, do not appear to be sensitive to the number of included lags.

Second, we consider an alternative set of endogenous variables. We replace industrial production and the consumer price index by GDP and GDP deflator from Jarocinski and Karadi (2020), who use the methodology of Stock and Watson (2010) to obtain interpolated monthly series. Figure 7 shows a small expansionary GDP response following the information shock, which is somewhat in contrast to the slightly decreasing response of industrial production in Figure 1. Otherwise, responses are similar to our baseline results. Next, as another alternative to industrial production, we consider the unemployment rate as an indicator for overall economic activity that is somewhat broader than industrial production. Figure 8 suggests that the information shock exerts expansionary effects on the job market, leading to a decrease in the unemployment rate. Looking at the exchange rate, we see that the response is again similar to the baseline results, although the information shock induces a depreciation on impact, prior to the persistent appreciation familiar from Figure 1.

And finally, we consider different monetary policy instruments. In particular, we replace the 3-month federal funds future surprise with the first principal component of surprises in the current month and 3-month federal funds rate and the 2-quarter, 3-quarter, and 4-quarter eurodollar future as an interest rate surprise, which we take from Jarocinski and Karadi (2020).[12]

[12] This instrument is also used in Gürkaynak et al. (2005) and Nakamura and Steinsson (2018).

This surprise measure contains forward guidance elements to a larger degree.[13] Figure 9 shows that the results based on this instrument are in line with our baseline results.

5 Conclusion

In this paper, we investigate exchange rate responses after policy announcements while distinguishing between pure monetary policy shocks and information shocks, which are the result of new information conveyed in central bank announcements. We use rotational sign restrictions as in Jarociński (2020) to decompose high-frequency changes in the interest rate into orthogonal components, which we then use as instruments in a proxy-VAR to study the role of monetary policy and information shocks for exchange rate movements.

We find that although pure monetary policy shocks as well as information shocks give rise to exchange rate fluctuations, the dynamics generated by these two types of shock differ. Contractionary pure policy shocks evoke an appreciation on impact in line with the exchange rate overshooting model of Dornbusch (1976). While the response to pure policy shocks is initially pronounced, it is also transitory. Information shocks, in contrast, give rise to a delayed, albeit highly persistent, appreciation. And due to their persistent effects, information shocks contribute strongly to exchange rate fluctuations throughout the sample, as illustrated by a historical decomposition. Nevertheless, ex-post deviations from UIP are mostly short-lived and unsystematic, even in the case of the information shock.

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[13] It has to be noted, however, that a drawback of this measure is that eurodollar futures are not as liquid as federal funds futures (Jarocinski and Karadi, 2020).

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Table 1: Variable description and data sources

Variable	Description	Source	Sample
FF4 surprise	Surprise in the 3-month federal funds future from Jarocinski and Karadi (2020) in percentage points, measured 30 minutes around FOMC announcements, monthly average	Jarocinski and Karadi (2020)	1990M2:2016M12
Interest rate surprise factor	First principal component of surpirses in current month and 3-month federal funds future and in 2, 3 and 4 quarter eurodollar future from Jarocinski and Karadi (2020), in percentage points, measured 30 minutes around FOMC announcements, monthly average	Jarocinski and Karadi (2020)	1990M2:2016M12
S&P500 surprise	Surprise in the S&P500 Index from Jarocinski and Karadi (2020) in percent, measured 30 minutes around FOMC announcements, monthly average	Jarocinski and Karadi (2020)	1990M2:2016M12
1Y U.S. Treasury Yield	1-year treasury constant maturity rate in percentage points, monthly average, not seasonally adjusted	FRED	1984M2:2016M12
S&P500	S&P500 Index, monthly average of daily close values, not seasonally adjusted	Yahoo Finance	1984M2:2016M12
U.S. IP	Industrial Production: Total index, index 2012=100, monthly, seasonally adjusted	FRED	1984M2:2016M12
U.S. CPI	U.S. Consumer Price Index: Total all items for the United States, index 2015=100, seasonally adjusted	FRED	1984M2:2016M12
EBP	Updated excess bond premium series	Favara et al. (2016)	1984M2:2016M12
U.S. Effective Exchange rate	Nominal U.S. effective exchange rate, narrow index based on 15 trade partners from the BIS, index Jan 2010=100, monthly average, not seasonally adjusted	FRED	1984M2:2016M12

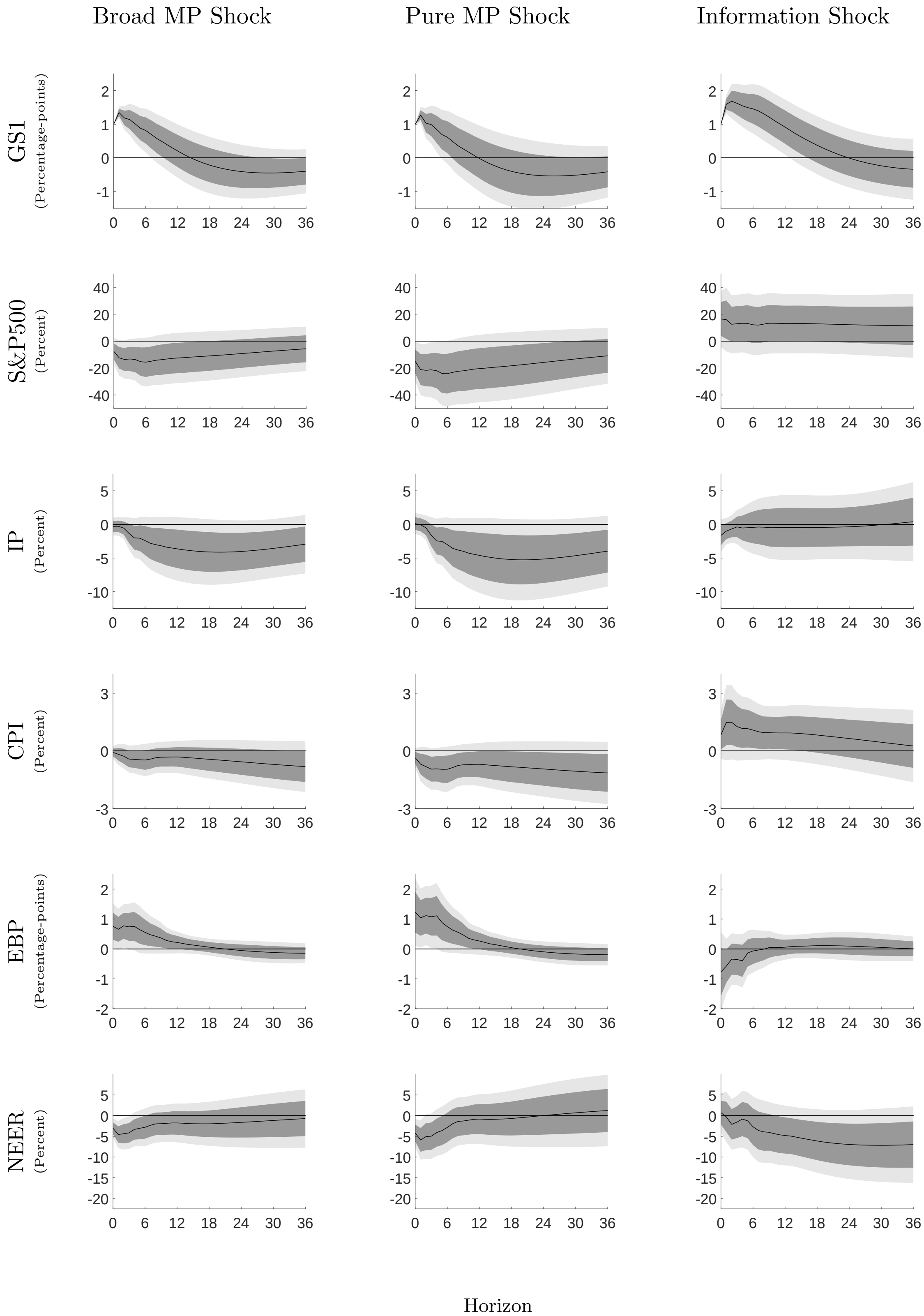
Notes: FRED - Federal Reserve Bank of St. Louis Economic Data; BIS - Bank for International Settlements;

Table 1: Variable description and data sources (continued)

Variable	Description	Source	Sample
USD/BP Exchange rate	Bilateral spot exchange rate as the price of one British Pound in terms of U.S. Dollars.	Refinitive Eikon	1984M2:2016M12
USD/JPY Exchange rate	Bilateral spot exchange rate as the price of one Japanese Yen in terms of U.S. Dollars.	Refinitive Eikon	1985M12:2016M12
USD/CAD Exchange rate	Bilateral spot exchange rate as the price of one Canadian Dollar in terms of U.S. Dollars.	Refinitive Eikon	1985M12:2016M12
USD/BP 1M UIP residual	Deviation from the uncovered interest rate parity condition based on the U.S. Dollar - British Pound exchange rate and 1 month money market interest rates	Refinitive Eikon , own calculations	1984M2:2016M12
USD/JPY 1M UIP residual	Deviation from the uncovered interest rate parity condition based on the U.S. Dollar - Japanese Yen exchange rate and 1 month money market interest rates	Refinitive Eikon , own calculations	1986M2:2016M12
USD/CAD 1M UIP residual	Deviation from the uncovered interest rate parity condition based on the U.S. Dollar - Canadian Dollar exchange rate and 1 month money market interest rates	Refinitive Eikon , own calculations	1986M2:2016M12
USD/BP 3M UIP residual	Deviation from the uncovered interest rate parity condition based on the U.S. Dollar - British Pound exchange rate and 3 month money market interest rates	Refinitive Eikon , own calculations	1984M2:2016M12
USD/JPY 3M UIP residual	Deviation from the uncovered interest rate parity condition based on the U.S. Dollar - Japanese Yen exchange rate and 3 month money market interest rates	Refinitive Eikon , own calculations	1986M4:2016M12
USD/CAD 3M UIP residual	Deviation from the uncovered interest rate parity condition based on the U.S. Dollar - Canadian Dollar exchange rate and 3 month money market interest rates	Refinitive Eikon , own calculations	1986M4:2016M12

Notes: FRED - Federal Reserve Bank of St. Louis Economic Data; BIS - Bank for International Settlements;

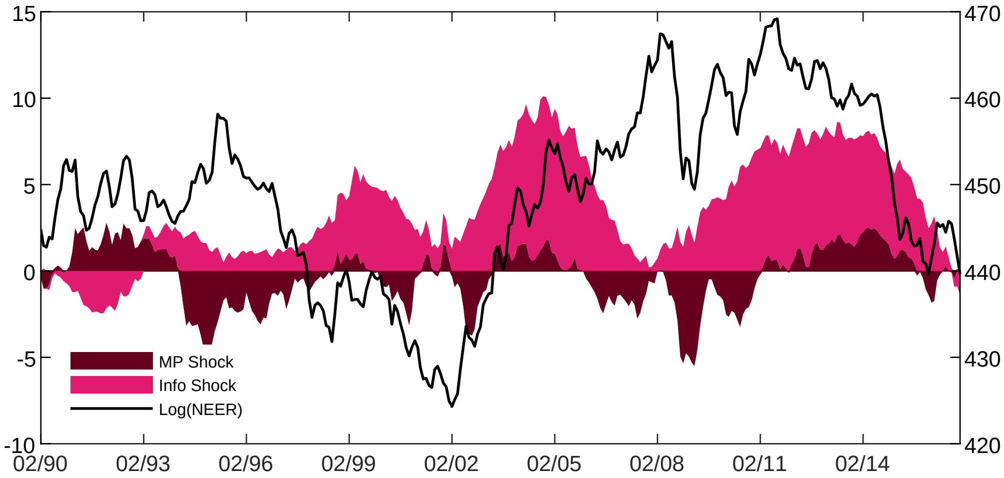
Figure 1: IRFs, BL Model



Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12, while instruments are available only from 1990M2 on.

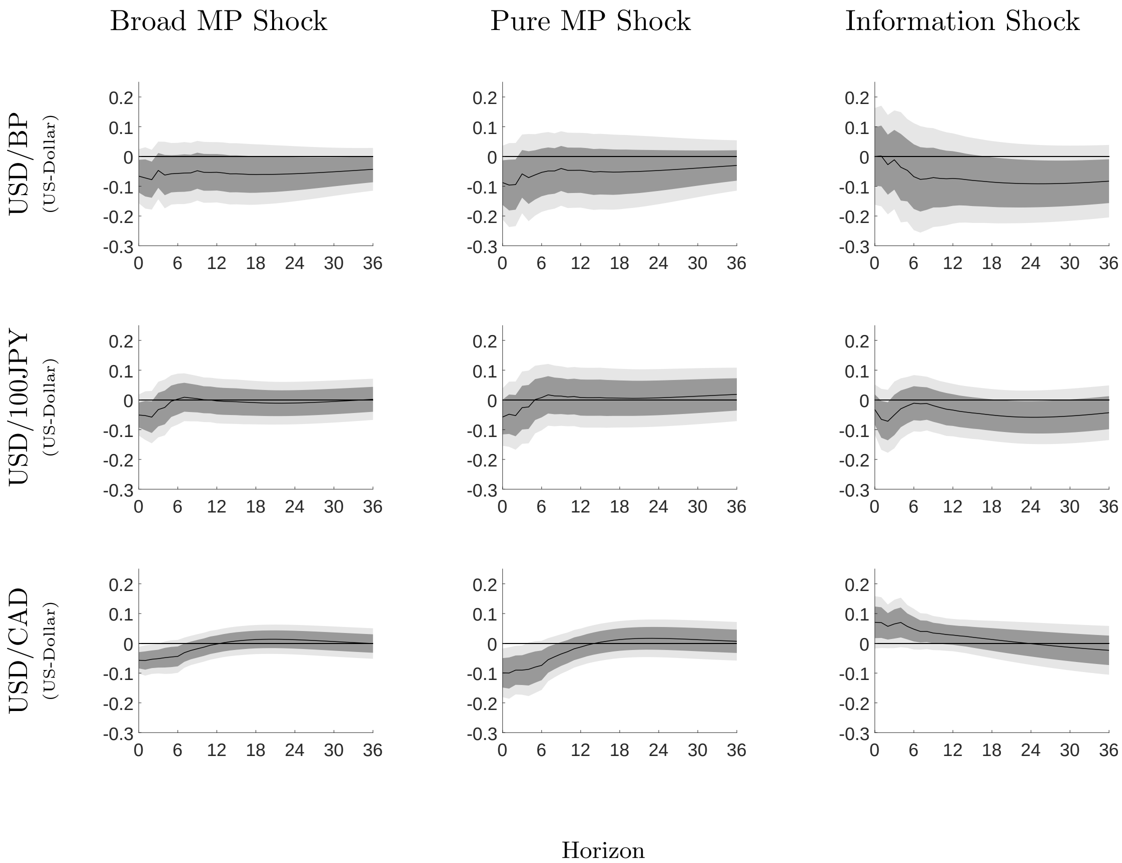
Figure 2: BL model, historical decomposition of effective exchange rate

Contributions of shocks to the dynamics of the exchange rate



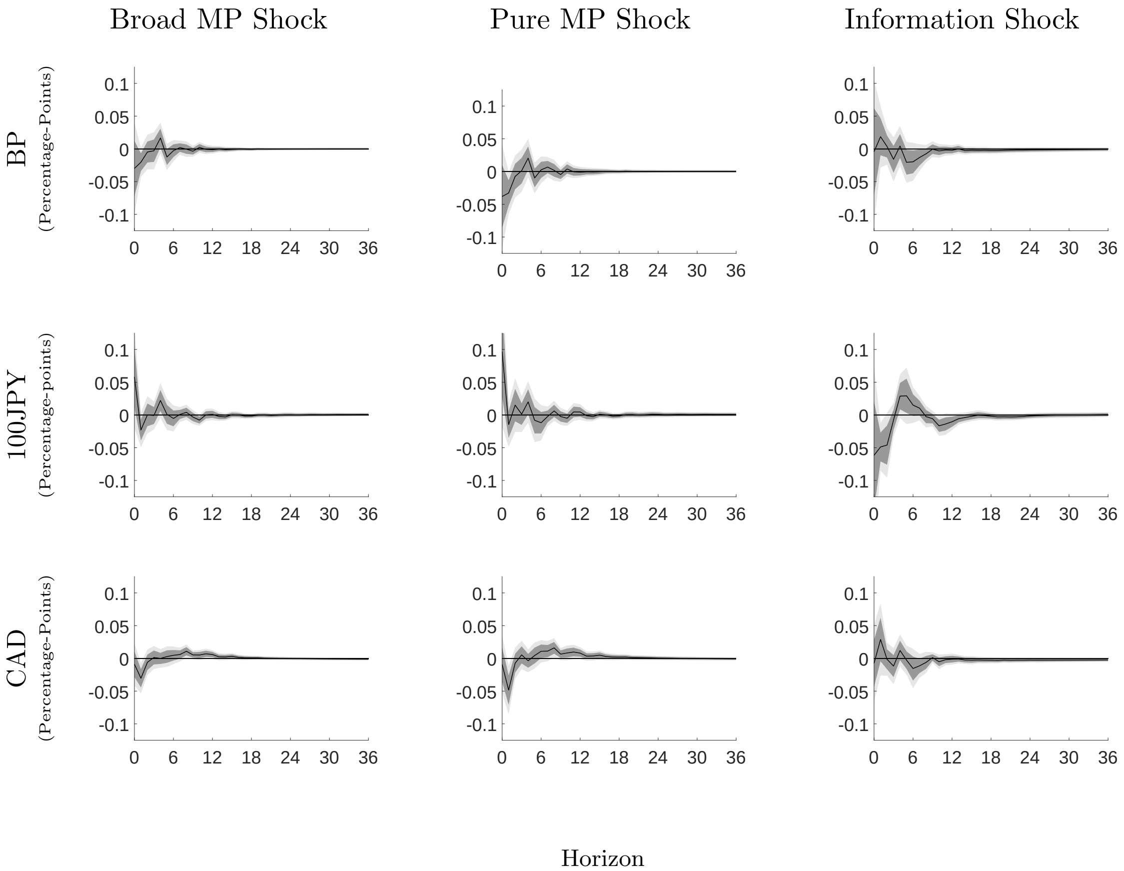
Notes: The figure shows point-wise median values of the historical decompositions' posterior distributions. These are represented by the coloured areas. Since shocks are only up to scale, the magnitude of these areas (left axis) relative to the black line (right axis) cannot be interpreted. The black line shows 100 times the log of the nominal effective exchange rate index. An increase in the coloured areas or the black line are associated with an exchange rate depreciation.

Figure 3: IRFs, different exchange rates



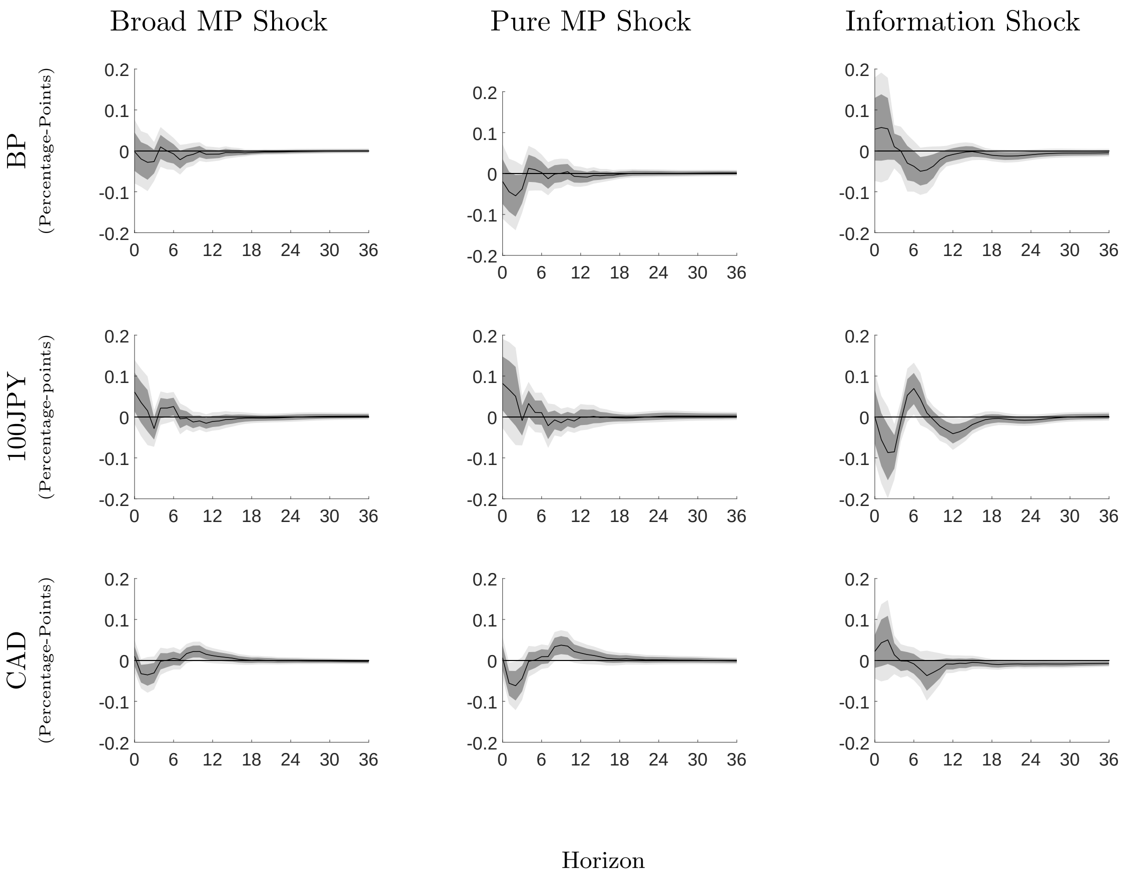
Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12 in case of the first row and from 1985M12 to 2016M12 in case of the last two rows, while instruments are available only from 1990M2 on.

Figure 4: IRFs, 1M UIP residuals



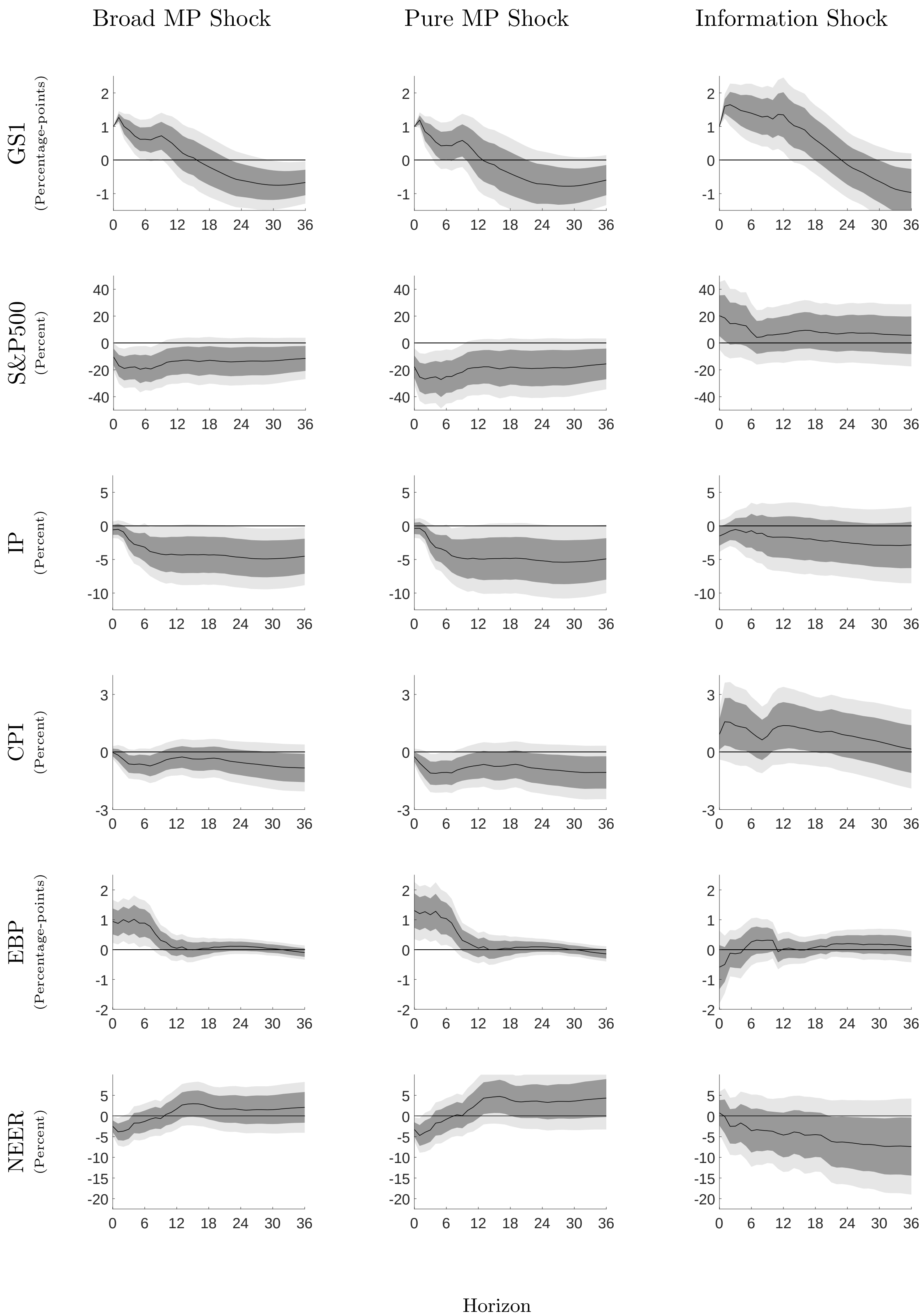
Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12 in case of the first row and from 1986M2 to 2016M12 in case of the last two rows, while instruments are available only from 1990M2 on.

Figure 5: IRFs, 3M UIP residuals



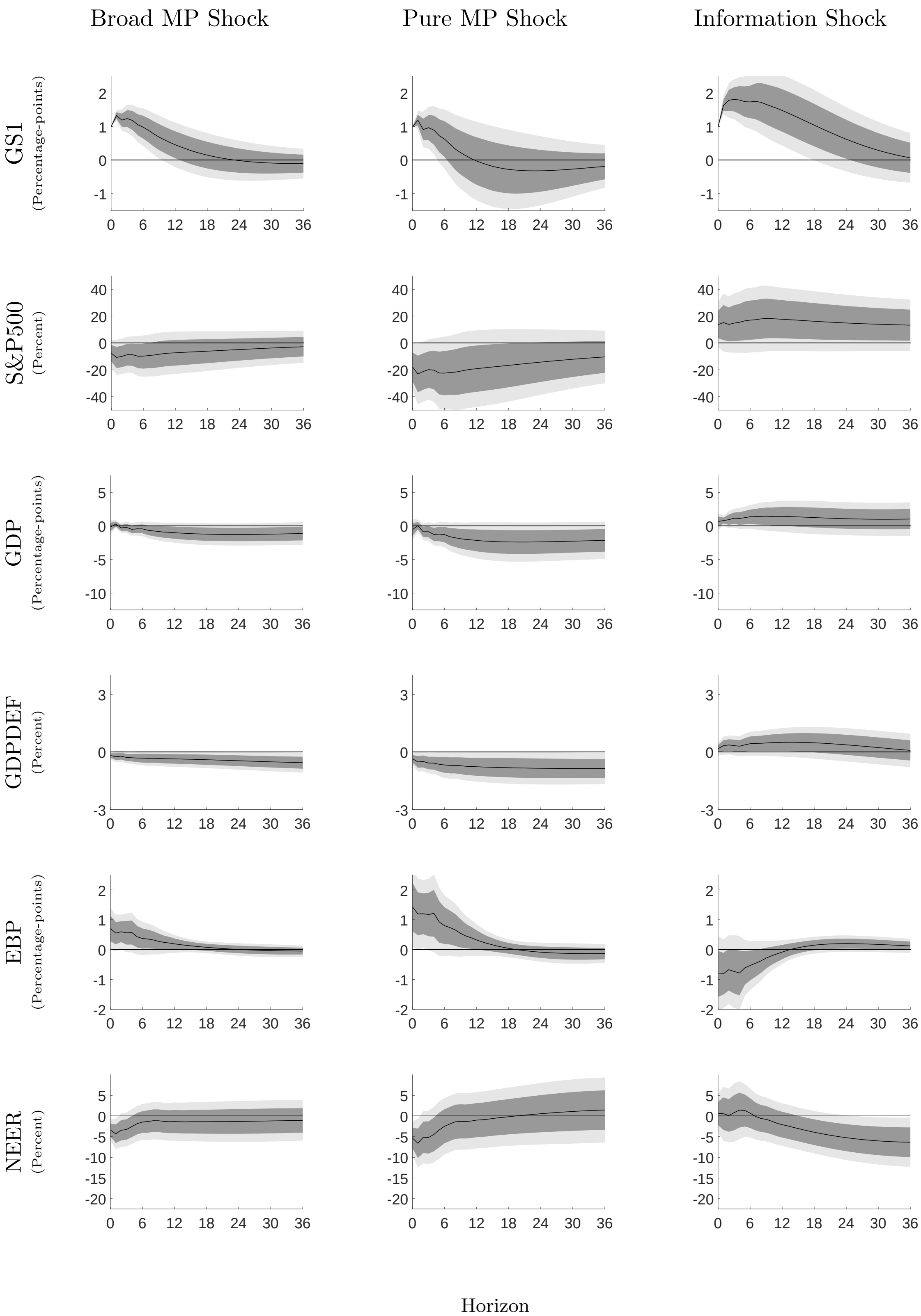
Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12 in case of the first row and from 1986M4 to 2016M12 in case of the last two rows, while instruments are available only from 1990M2 on.

Figure 6: IRFs, Model with 12 lags



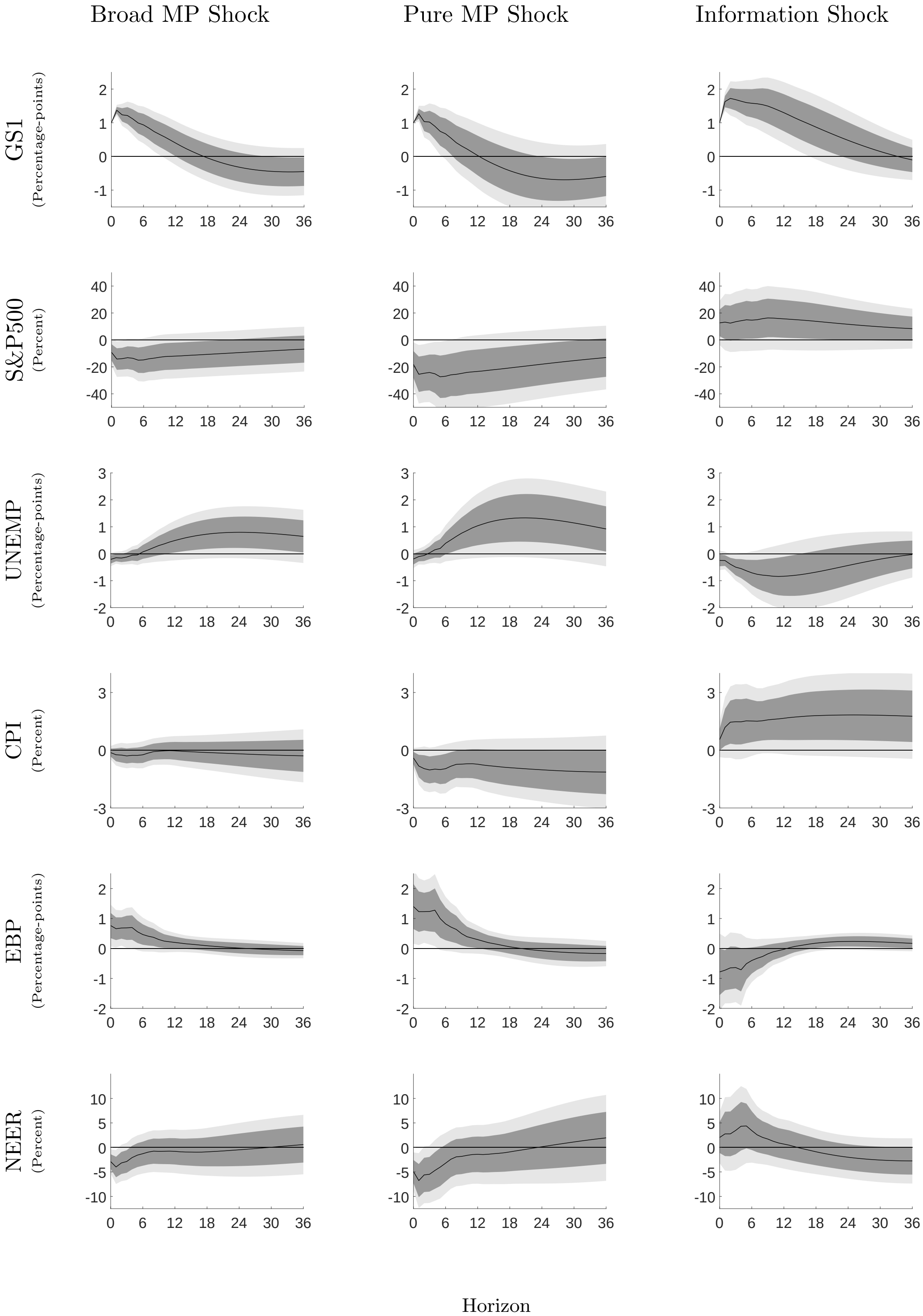
Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12, while instruments are available only from 1990M2 on.

Figure 7: IRFs, Model with GDP and GDP Deflator



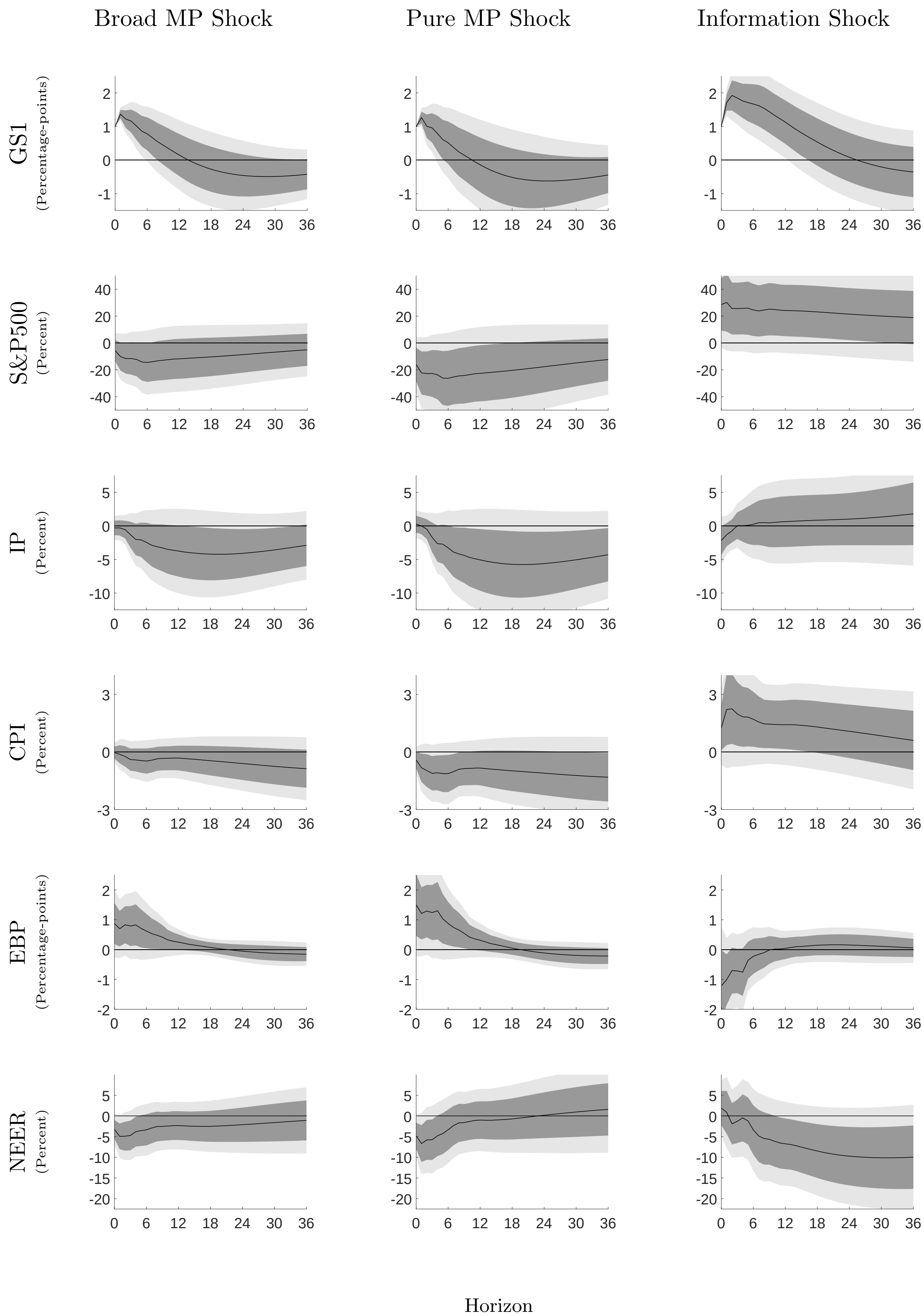
Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12, while instruments are available only from 1990M2 on.

Figure 8: IRFs, Model with unemployment rate



Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12, while instruments are available only from 1990M2 on.

Figure 9: IRFs, Model with principal component of surprises



Notes: The figure shows point-wise median responses (black line) as well as 68%- and 90%-confidence sets (dark- respectively light-shaded area). The first column refers to a broad policy shock, the second column a pure policy shock and the third column to an information shock. The sample is from 1984M2 to 2016M12, while instruments are available only from 1990M2 on.

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Monetary Policy Announcements, Information Schocks, and Exchange Rate Dynamics

Abstract
We study nominal exchange rate dynamics in the aftermath of U.S. monetary policy announcements. Using high-frequency interest rate and stock price movements around FOMC announcements, we distinguish between pure monetary policy shocks and information shocks, which are associated with new information contained in the announcements. Contractionary pure policy shocks give rise to a strong, but transitory, appreciation on impact. Information shocks also appreciate the exchange rate, but the effect builds up only slowly over time and is highly persistent. Thus, we conclude that although the short-run effects on the exchange rate are primarily due to pure policy shocks, the medium-run response is driven by information effects.

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