

SPECIAL ISSUE ARTICLE

Professional forecasters' expectations, consistency, and international spillovers

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Abstract

This paper focuses on the expectation formation process of professional forecasters by relying on survey data on forecasts regarding gross domestic product growth, consumer price index inflation and 3-month interest rates for a broad set of countries. We examine the interrelation between macroeconomic forecasts and also the impact of uncertainty on forecasts by allowing for cross-country interdependencies and time variation in the coefficients. We find that professional forecasts are often in line with the Taylor rule and identify significant expectation spillovers from monetary policy in the USA.

KEYWORDS

expectations, forecasts, survey data, uncertainty

JEL CLASSIFICATION

E47; F37; G17

1 | INTRODUCTION

An increasing amount of research has been devoted to the modeling and understanding of macroeconomic expectations in recent years. This is due to both the changing environment after the emergence of unconventional monetary policy and the increasing availability of survey data over longer periods. The latter allows, for example, testing the validity of noisy and sticky information models in the context of information rigidity among the framework introduced by Coibion and Gorodnichenko (2015). Another strand of literature has focused on the question of whether expectations are consistent with macroeconomic models (Dräger, Lamla, & Pfajfar, 2016).

Expectation effects play a crucial role for monetary policy, in particular since the start of the quantitative easing (QE) policy conducted by many central banks. An important precondition for successful monetary policy in the zero interest rate regime is the credibil-

ity of announcements via the signaling channel. The same wisdom holds for fiscal policy where the effect of anticipated and unanticipated government spending differs (Mertens & Ravn, 2010). Successful signaling allows policymakers to convey information about the future path of interest rates and affect macroeconomic expectations (Haldane, Roberts-Sklar, Wieladek, & Young, 2016). Against this background, understanding the expectation-building process of both macroeconomic fundamentals and future interest rates and also the interlinkage among them is of great interest for policymakers and researchers.

At the same time, there is increasing evidence that fiscal and monetary policy generates significant international spillovers. Several studies have, for example, highlighted international effects of (unconventional) monetary policy in the USA and the euro area for realized macroeconomic and financial variables (Fratzscher, Duca, & Straub, 2018; Neely, 2015).

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A direct transmission channel for international spillovers can arise as a result of the fact that monetary policy reaction functions have been increasingly affected by the international environment. The latter is reflected by a strong comovement among interest rates set by central banks based on Taylor rule functions (Taylor, 2013). It is well established that monetary policy in the USA influences most central banks in their interest rate setting, triggering global cycles in interest rates such as the lowering of interest rates in the early 2000s (Gray, 2013). Spillover effects have also attracted more attention due to financial globalization and the global financial crisis (Chen, Filardo, He, & Zhu, 2016).

It is somehow surprising that the existing literature has failed to analyze the amount of international spillovers in expectations. Our paper closes this gap by adopting a global vector autoregression (VAR) approach to assess spillovers in survey expectations. It is important to highlight that we rely on survey data rather than market-based measures to account for these expectations. We focus on two questions: First, we assess whether expectations are broadly consistent with conventional macroeconomics models such as the Taylor rule.¹ Second, we identify the amount of spillovers in macroeconomic expectations across countries. Our paper connects to a rich literature that has assessed various expectation effects from monetary policy decisions in different settings—for example, without accounting for various expectations simultaneously and/or accounting for international spillovers.

To tackle both issues, we use a novel data set of survey-based expectations provided by FX4casts for 17 countries for a period from January 2003 to December 2016. Our data sample includes emerging and industrial economies and incorporates expectations about the path of gross domestic product (GDP) growth, consumer price index (CPI) inflation, and interest rates. Our empirical analysis is based on the Bayesian panel VAR framework proposed by Canova and Ciccarelli (2009) and incorporates several desirable features such as cross-country lagged interdependencies and time variation in the coefficients. Previous research has illustrated that monetary policy effects should be analyzed in a time-varying fashion (Beckmann & Czudaj, 2018; Belongia & Ireland, 2016; Leeper, Richter, & Walker, 2012).

The remainder of this paper is organized as follows. The next section summarizes previous empirical evidence

and the underlying theoretical considerations. Section 3 presents our data set and provides a preliminary analysis, while Section 4 gives an overview of the empirical approach followed in this paper. Section 5 discusses our results and Section 6 concludes.

2 | LITERATURE REVIEW

2.1 | Expectations and consistency

This section briefly summarizes the existing literature on survey-based expectations to place our investigation in the context of existing studies. Coibion and Gorodnichenko (2012, 2015) have highlighted the importance of information rigidity in terms of the link between forecast revisions and forecast errors for both sticky and noisy information models. These frameworks allow us to assess whether monetary policy shocks trigger such rigidities that materialize in forecast errors. Extensions also allow the assessment of over- and undershooting of expectations (Bordalo, Gennaioli, Ma, & Shleifer, 2018).

Our study is more closely related to the literature that assesses the drivers of expectations building rather than ex post forecast errors. Given that we focus on interest rate, GDP growth and inflation forecasts, it is natural to use a conventional Taylor rule as a starting point. If expectations are formed along the lines of this concept, expected interest rates increase when professionals expect inflation and/or GDP growth to increase. The Taylor rule plays a central role when it comes to the stabilization of expectations via central bank communication, providing an important anchor for forecasts (Eusepi & Preston, 2010).

Some studies have focused on a related question for country-specific expectations. The results by Pierdzioch, Rülke, and Stadtmann (2012) suggest that academics and central banks show stronger belief in the Taylor rule than private-sector economists. Carvalho and Nechio (2014) find that the degree to which households understand monetary policy varies over the business cycle. Dräger et al. (2016) show that both private and professional forecasters form expectations that are broadly in line with conventional theories such as the Fisher equation, the Taylor rule, and the Phillips curve. They also provide evidence that variation in the consistency is affected by central bank communication. However, none of these studies accounts for international spillovers.

Taking the existing literature into account, it is important to highlight that we rely on quantitative survey forecasts in an international framework. Some studies have provided evidence for QE effects on expectations for specific economies at the firm level (Boneva, Cloyne, Weale, & Wieladek, 2016). We assess these forecasts in an impulse response framework that is focused on direction and per-

¹The term “consistency” is used in multiple ways in the context of survey data. While we argue that expectations are consistent when they are formed along the lines of a specific model, a different interpretation is that expectations are consistent if they provide correct forecasts. The latter interpretation is somehow old fashioned given the rich evidence for expectation rigidities and forecast errors.

sistence of effects rather than quantitative estimates. This is justified given the fact that the conventional Taylor rule is not expected to hold in the strict sense for the sample period under investigation while the underlying causalities still bear the potential to affect expectations. Studies focusing on household forecasts frequently use data that provides directional forecasts, for example in terms of whether inflation is expected to go up or down.

Finally, it is worth mentioning that we also account for economic policy uncertainty as a potential driver of expectations. This is justified given the existing evidence of significant effects of uncertainty on expectations (Beckmann and Czudaj, 2017b, 2017c) and the strong increase in uncertainty in recent years.

2.2 | International spillovers

Two kinds of studies are relevant in the context of our analysis. First, various studies have shown that QE results in large international spillovers on financial markets (Neely, 2015). Haldane et al. (2016) provide a comprehensive survey of recent studies on the corresponding effects of QE. Recent work by Kolasa and Wesołowski (2018) pays specific attention to the effects of QE for emerging economies. In addition, several earlier studies have focused on spillover effects in terms of money supply to assess the amount of global liquidity spillovers for the pre-crisis period (Beckmann, Belke, & Czudaj, 2014; Belke, Orth, & Setzer, 2010).

Second, recent studies also deal with expectations spillovers in the context of monetary policy. Expectations are either proxied by market yields or survey data. De la Barrera, Falath, Henricot, and Vaglio (2017) focus on the former with respect to inflation. Evidence on the latter is provided by Beckmann and Czudaj (2018), who assess macroeconomic survey data from Consensus Economics for the G7 and focus on the role of expectations and uncertainty. They illustrate that monetary policy generates significant international spillovers, resulting, for example, in higher forecast errors. The amount of these spillovers differs across countries and does not show a unique pattern.

3 | DATA AND PRELIMINARY ANALYSIS

3.1 | Data

To analyze the expectation formation process we rely on survey data for GDP growth, CPI inflation, and 3-month interest rates provided by FX4casts, formerly known as The Financial Times Currency Forecaster (see <http://www.fx4casts.com/>). The consensus is based on 48 individual responses and is calculated as geometric mean in

order to reduce distortions due to extreme outliers.² The forecasts for GDP growth and CPI inflation are constructed by FX4casts as fixed event forecasts; that is, expectations are provided for the current and the next year at each point in time. This implies that uncertainty regarding the forecast for the current year inherently decreases over time. For instance, uncertainty about this year's GDP growth is much higher in January than in August. To match expectations on interest rates, which are measured as fixed horizon forecasts, we have to transform fixed event into fixed horizon forecasts. Therefore, we adopt the weighted averaging approach suggested by Patton and Timmermann (2011). This straightforward approach is based on the weighted average of fixed event forecasts for the current and the next year with a linearly decreasing (increasing) weight of the former (latter):

$$\hat{f}_{t,t-12} = w\hat{f}_{1,0} + (1-w)\hat{f}_{2,1}, \quad (1)$$

where $\hat{f}_{t,t-12}$ denotes the approximated fixed horizon forecast for t made in $t - 12$, while $\hat{f}_{1,0}$ and $\hat{f}_{2,1}$ give the fixed event forecasts for the current and the next year and w denotes the weight $w = (24 - t)/12$ for $t = 12, 13, \dots, 23$. Expectations for short-term interest rates are already provided as fixed horizon forecasts by FX4casts for three different horizons (i.e., 3-, 6- and 12-month). We use 12-month forecasts to match the horizon of our computed fixed horizon forecasts for GDP growth and CPI inflation.

As our measure of uncertainty we use the newspaper-based economic policy uncertainty (EPU) index provided by Baker, Bloom, and Davis (2016) for the USA and extended to a broader set of countries on their companion website (i.e., <http://www.policyuncertainty.com/>). This index is based on text-searching in articles published in the largest domestic newspapers containing the triple of: “uncertainty” or “uncertain”; “economic” or “economy”; and one of the following six policy terms: “congress,” “deficit,” “Federal Reserve,” “legislation,” “regulation,” or “white house.” Despite the large number of different uncertainty indexes provided in the literature (see, e.g., Jurado, Ludvigson, & Ng, 2015; Manela & Moreira, 2017), we rely on the EPU index since, in contrast to many alternatives, it is available for a broad range of countries. For a robustness check we also rely on stock market volatility proxied by realized standard deviations of stock returns computed from domestic daily stock prices provided by Morgan Stanley Capital International (MSCI).

Our monthly sample period runs from January 2003 to December 2016 and covers 17 economies, comprising Aus-

²See Table A1 in the Appendix for a detailed list of the contributors to FX4casts Consensus Forecasts.

TABLE 1 Descriptive statistics

	Mean	SD	Median	Min.	Max.	Skewness	Kurtosis
<i>2003–2016</i>							
EPU	119.9437	74.2288	102.0348	0.0001	1,141.7955	2.8753	20.8528
MSCI	1.3848	0.8485	1.1683	0.2572	10.9222	3.1963	18.2920
GDP	3.4360	2.2230	3.1167	-5.3250	10.5000	0.3839	0.8032
Inflation	3.0769	2.2095	2.6500	-1.8000	14.0000	1.4741	3.2030
IR	4.2161	3.5704	3.7500	-0.5700	22.3000	1.1857	1.6669
<i>2003–2009</i>							
EPU	96.3558	48.7970	85.4027	0.0001	428.7254	1.7757	5.1523
MSCI	1.5371	1.0305	1.2689	0.3645	10.9222	2.9614	14.0777
GDP	3.6230	2.3437	3.3625	-5.3250	10.5000	0.1184	0.7220
Inflation	3.0875	2.4197	2.5292	-1.8000	14.0000	1.6660	3.7132
IR	5.0554	3.6184	4.4900	0.0800	22.3000	1.3538	2.3472
<i>2010–2016</i>							
EPU	143.5317	86.7697	126.7548	0.0001	1,141.7955	2.7272	18.5181
MSCI	1.2324	0.5762	1.1126	0.2572	5.3736	1.7307	4.6896
GDP	3.2489	2.0794	2.8667	-4.0000	10.0000	0.6956	1.0077
Inflation	3.0663	1.9780	2.7583	-0.8583	12.6333	1.0516	1.2398
IR	3.3767	3.3168	2.2500	-0.5700	15.0000	1.0558	0.3989

Note. The table reports descriptive statistics for the economic policy uncertainty (EPU) index, MSCI stock market volatility, GDP growth expectations (GDP), inflation expectations (Inflation) and interest rate expectations (IR), all pooled across countries for the full sample period (i.e., January 2003 to December 2016) and two subsample periods (i.e., January 2003 to December 2009 and January 2010 to December 2016).

TABLE 2 Panel unit root tests

	Levin, Lin, and Chu (2002)	Im, Pesaran, and Shin (2003)	Maddala and Wu (1999)	Pesaran (2007)	Demetrescu et al. (2006)
EPU	-9.2035	-12.2298	302.8769	-3.5097	-8.8583
<i>p</i> -value	[0.0000]	[0.0000]	[0.0000]	[0.0100]	[0.0000]
MSCI	-18.5239	-19.8411	479.0800	-4.1588	-6.4751
<i>p</i> -value	[0.0000]	[0.0000]	[0.0000]	[0.0100]	[0.0000]
GDP	-1.7368	-4.8209	84.5991	-2.2627	-1.9414
<i>p</i> -value	[0.0412]	[0.0000]	[0.0000]	[0.0442]	[0.0261]
Inflation	-4.6660	-6.6500	122.7731	-2.5789	-5.6082
<i>p</i> -value	[0.0000]	[0.0000]	[0.0000]	[0.0100]	[0.0000]
IR	-0.3509	-1.0625	48.6855	-2.0678	0.0495
<i>p</i> -value	[0.3628]	[0.1440]	[0.0492]	[0.1000]	[0.5197]

Note. The table reports test statistics and *p*-values for five different panel unit root tests, checking the null of a unit root for the economic policy uncertainty (EPU) index, MSCI stock market volatility, GDP growth expectations (GDP), inflation expectations (Inflation), and interest rate expectations (IR). The test equations include lags determined by the Bayesian information criterion and an intercept but not a trend, since the individual time series do not exhibit trending behavior.

tralia, Brazil, Canada, Chile, China, Colombia, the euro area,³ Hong Kong, India, Japan, Korea, Mexico, Russia, Singapore, Sweden, the UK, and the USA. Therefore, our balanced panel includes 2,856 observations ($N = 17$ and $T = 168$).

3.2 | Preliminary analysis

Table 1 reports conventional descriptive statistics that are computed for each variable pooled across countries for the full sample period (i.e., January 2003 to December 2016) and two subsample periods (i.e., January 2003 to

December 2009 and January 2010 to December 2016). GDP growth and CPI inflation forecasts exhibit very similar standard deviations (SD), while the SD for interest rate forecasts is a bit higher. The EPU measure has a much higher mean and also a substantially larger SD compared to the other variables, especially for the 2010–2016 period. This is not surprising given the fact that macroeconomic fundamentals are naturally limited in terms of their expected variation, while uncertainty has displayed strong variation in recent years. All variables are positively skewed and the EPU index is heavily tailed, indicated by the excess kurtosis (>3).

In a preliminary step, we conducted several panel unit root tests to assure that our panel VAR model presented

³The EPU index for the euro area has been constructed by averaging over the EPU indexes for Germany, France, Italy, and Spain.

in Section 4 includes stationary time series. To ensure that these results are not driven by cross-sectional dependence often existent in macroeconomic data, we have also applied two tests, which account for cross-sectional dependence, suggested by Pesaran (2007) and Demetrescu, Hassler, and Tarcolea (2006) (see the last two columns in Table 2). As can be seen in the table, in most cases the null of a unit root is rejected at least at the 5% level. Solely the results for interest rate expectations are mixed since only two tests are able to reject the unit root null at the 5% and the 10% significance level, respectively. However, considering (1) the fact that interest rates theoretically cannot depart from their starting point infinitely far away and should thus be stationary and (2) the generally low power of unit root tests, we do not see the results provided in Table 2 as clear evidence in favor of a unit root.

4 | EMPIRICAL METHODOLOGY

In our empirical analysis we rely on a panel VAR proposed by Canova and Ciccarelli (2009), which is based on the following specification:

$$y_{it} = \sum_{j=1}^{p_1} D_{it,j} Y_{t-j} + \sum_{j=1}^{p_2} C_{it,j} W_{t-j} + e_{it}, \quad (2)$$

with $i = 1, \dots, N$ and $t = 1, \dots, T$,

where y_{it} represents a 4×1 vector of variables for each i ,

$$y_{it} = (\text{GDP}_{it}, \text{Inflation}_{it}, \text{IR}_{it}, \text{EPU}_{it})', \quad (3)$$

GDP_{it} , Inflation_{it} and IR_{it} denote expectations of professionals regarding GDP growth, CPI inflation, and the 3-month interest rate, respectively, and EPU_{it} stands for the economic policy uncertainty index.⁴ y_{it} is combined to a $4N \times 1$ vector $Y_t = (y'_{1t}, \dots, y'_{Nt})'$ in the following. W_t denotes a $q \times 1$ vector of exogenous variables that only includes a constant term in our case, and e_{it} stands for a 4×1 vector of random errors. $D_{it,j}$ and $C_{it,j}$ are coefficient matrices of orders $4 \times 4N$ and $4 \times q$ for each lag j .⁵

The main benefit of the model given by Equation (2) is its high degree of flexibility, accounting for cross-unit lagged interdependencies and time variation in the coefficients. However, the problem associated with this flexibility is that without imposing any restrictions there are many more coefficients to estimate than observations available ($k = NGp_1 + qp_2$ per equation and per t) (Beckmann & Czudaj, 2018). To circumvent this problem, we impose a factor structure on the model provided in Equation (2). To do this

the rows of the matrices $D_{it,j}$ and $C_{it,j}$ are stacked in the $k \times 1$ vector δ_{it}^g . Accordingly, $\delta_{it} = (\delta_{it}^{1'}, \dots, \delta_{it}^{G'})'$ is a $4k \times 1$ vector and $\delta_t = (\delta_{1t}', \dots, \delta_{Nt}')'$ a $4Nk \times 1$ vector based on the following factor structure:

$$\delta_t = \sum_{f=1}^F \Xi_f \theta_{ft} + u_t, \quad \text{with } u_t \sim \mathcal{N}(0, \Omega \otimes V), \quad (4)$$

where θ_{ft} is a vector of much lower dimension compared to δ_t describing the factor and Ξ_f is the corresponding matrix for each factor f . u_t is a $4Nk \times 1$ vector of unmodeled and idiosyncratic error terms present in δ_t , and its covariance matrix consists of the $4N \times 4N$ matrix Ω and the $k \times k$ matrix $V = \sigma^2 I_k$. Our empirical model follows Beckmann and Czudaj (2017a) and relies on a factorization with $F = 3$ factors:

$$\delta_t = \Xi_1 \theta_{1t} + \Xi_2 \theta_{2t} + \Xi_3 \theta_{3t} + u_t, \quad (5)$$

where θ_{1t} is a 2×1 vector of common factors, one for industrial countries (IC) and one for emerging countries (EC),⁶ θ_{2t} is an $N \times 1$ vector of country-specific factors, and θ_{3t} is a 4×1 vector of variable-specific factors. Following this logic the so-called indices are constructed based on the data: $\chi_{11t} = \sum_{i \in \text{IC}} \sum_j y_{ig,t-j}$, $\chi_{12t} = \sum_{i \in \text{EC}} \sum_j y_{ig,t-j}$, $\chi_{2it} = \sum_j y_{ig,t-j}$, $i = 1, \dots, N$, and $\chi_{3gt} = \sum_i \sum_j y_{ig,t-j}$, $g = 1, \dots, 4$. Then, $\theta_t = (\theta'_{1t}, \theta'_{2t}, \theta'_{3t})'$ is a vector of order $(2 + N + 4) \times 1$.

To present a reparametrized version of Equation (2) in a more compact form, we define $\mathbf{X}_t = (Y'_{t-1}, \dots, Y'_{t-p_1}, W'_{t-1}, \dots, W'_{t-p_2})'$, $X_t = I_{NG} \otimes \mathbf{X}'_t$, and $\Xi = (\Xi_1, \Xi_2, \Xi_3)$. Then, Equation (2) can be rewritten as

$$Y_t = X_t \delta_t + E_t = X_t (\Xi \theta_t + u_t) + E_t \equiv \chi_t \theta_t + \zeta_t, \quad (6)$$

where E_t is an $NG \times 1$ vector of normally distributed error terms with zero mean and variance-covariance matrix Ω , $\chi_t \equiv X_t \Xi$ is a matrix of constructed indices that are also observable, and $\zeta_t \equiv X_t u_t + E_t$ is a vector of the reparametrized error terms. The overparametrization problem of the panel VAR presented in Equation (2) is circumvented as the reparametrized version of the model includes a substantially smaller number of regressors and the factors θ_{it} load on these.

Finally, we also allow for time variation in the factors and apply the law of motion given by

$$\theta_t = \theta_{t-1} + \eta_t, \quad \text{with } \eta_t \sim \mathcal{N}(0, B_t), \quad (7)$$

where η_t does not depend on E_t or u_t , and $B_t = \text{diag}(B_1, \dots, B_F) = \gamma_1 B_{t-1} + \gamma_2 B_0$. For the entire Markov chain Monte Carlo (MCMC) algorithm to estimate the

⁴For a robustness check, we use a different uncertainty measure and therefore substitute the EPU index by MSCI stock market volatility, as already mentioned in Section 3.

⁵In our empirical part, we use two lags due to the minimization of the Akaike criterion.

⁶To estimate these two common factors, we have subdivided our panel into IC (Australia, Canada, the euro area, Japan, Russia, Sweden, the UK and the USA) and EC (Brazil, Chile, China, Colombia, Hong Kong, India, Korea, Mexico, and Singapore).

panel VAR model given in Equation (6) and for the calculation of impulse response functions based on the latter, we refer to Canova and Ciccarelli (2009).

5 | EMPIRICAL FINDINGS

First, we start our empirical analysis by plotting the time-varying point estimates for the common factors for industrial and emerging countries given in the vector θ_{1t} . Second, we turn to assessing the role of expected fundamentals for the expectation formation process of professional forecasters by focusing on the Taylor rule as a theoretical guideline and then finally proceed by analyzing uncertainty effects on professional expectations. In doing so, we rely on impulse responses of individual shocks based on the panel VAR model presented in the previous section. As conventionally done, impulse responses are visualized together with their 95% and 68% confidence intervals to make inference about the significance of the corresponding reaction.

5.1 | Common factors

Figure 1 shows the time-varying estimates of θ_{1t} , which are given by the median of the posterior distribution. These are plotted together with their 95% confidence interval and the US recession period running from December 2007 to June 2009. As can be seen in Figure 1a, prior to the global financial crisis (GFC) that started in 2007 the first common factor stemming from industrial economies had a significantly positive impact on the variables in the model—that is, expectations and uncertainty. However, since the GFC the effect became insignificant. The second common factor stemming from emerging economies and displayed in Figure 1b is less important but also showed a significantly positive effect during a short period prior to the GFC. The fact that common factors are less important after the crisis potentially reflects country-specific policy responses and the different economic recoveries across countries.

5.2 | Taylor rule expectations effects

According to the Taylor rule the interest rate is set in reaction to the output and the inflation gap. Therefore, we examine the effect of expectations regarding GDP growth and CPI inflation on expected short-term interest rates. It is important to keep in mind that the Taylor rule is unable to provide a fully adequate description of monetary policy in recent years, in which interest rates have been close to zero. However, expectations related to future interest rates reflect expectations about the policy stance, in particular about the exit from unconventional monetary policy. Such expectations are potentially driven by expectations

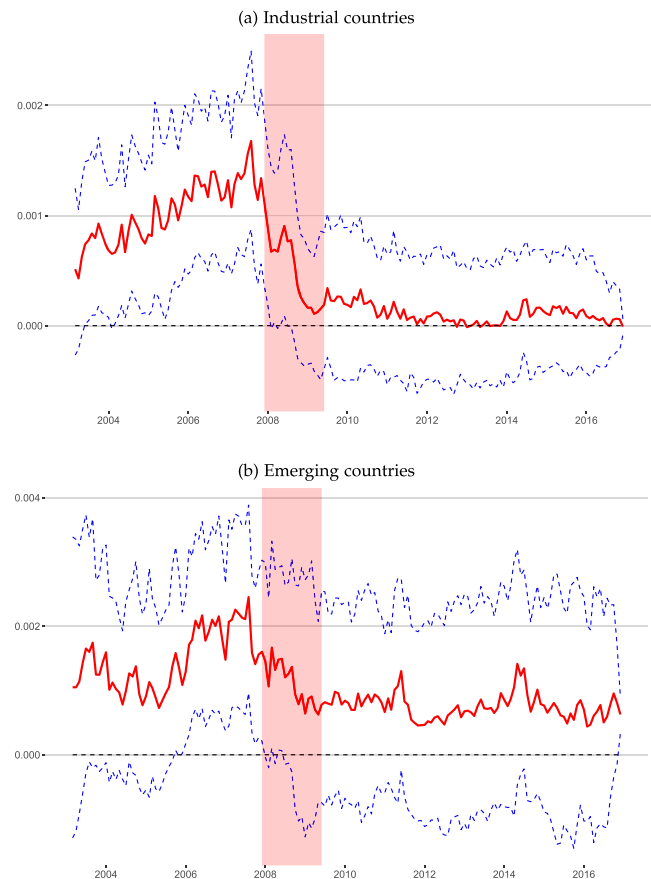


FIGURE 1 Time-varying common factors: (a) industrial countries; (b) emerging countries. The plots show the time-varying coefficients of the two common factors in the vector θ_{1t} . Point estimates of the coefficients are represented by the solid red line and the corresponding 95% confidence band by blue dashed lines. The red area highlights the US recession period running from December 2007 to June 2009 according to the classification of the National Bureau of Economic Research [Colour figure can be viewed at wileyonlinelibrary.com]

related to the path of the economy, following the spirit of a conventional Taylor rule.

The corresponding reactions of the interest rate forecast to a shock on the GDP growth and the CPI inflation forecast for each individual country are provided in Figures 2 and 3, respectively. Although we account for international spillovers and uncertainty effects within our panel VAR model, we start by analyzing the effects on interest rate expectations for each economy separately.

Although the persistence of the shock differs to some extent, Figure 2 clearly shows that the effect of GDP growth expectations on expectations of the 3-month interest rate is significantly positive for most of the economies. Contradictory findings can solely be observed for four industrial economies: Canada, Sweden, the euro area, and Japan. For the former two we find significantly negative short-run effects, which become positive in the second month after

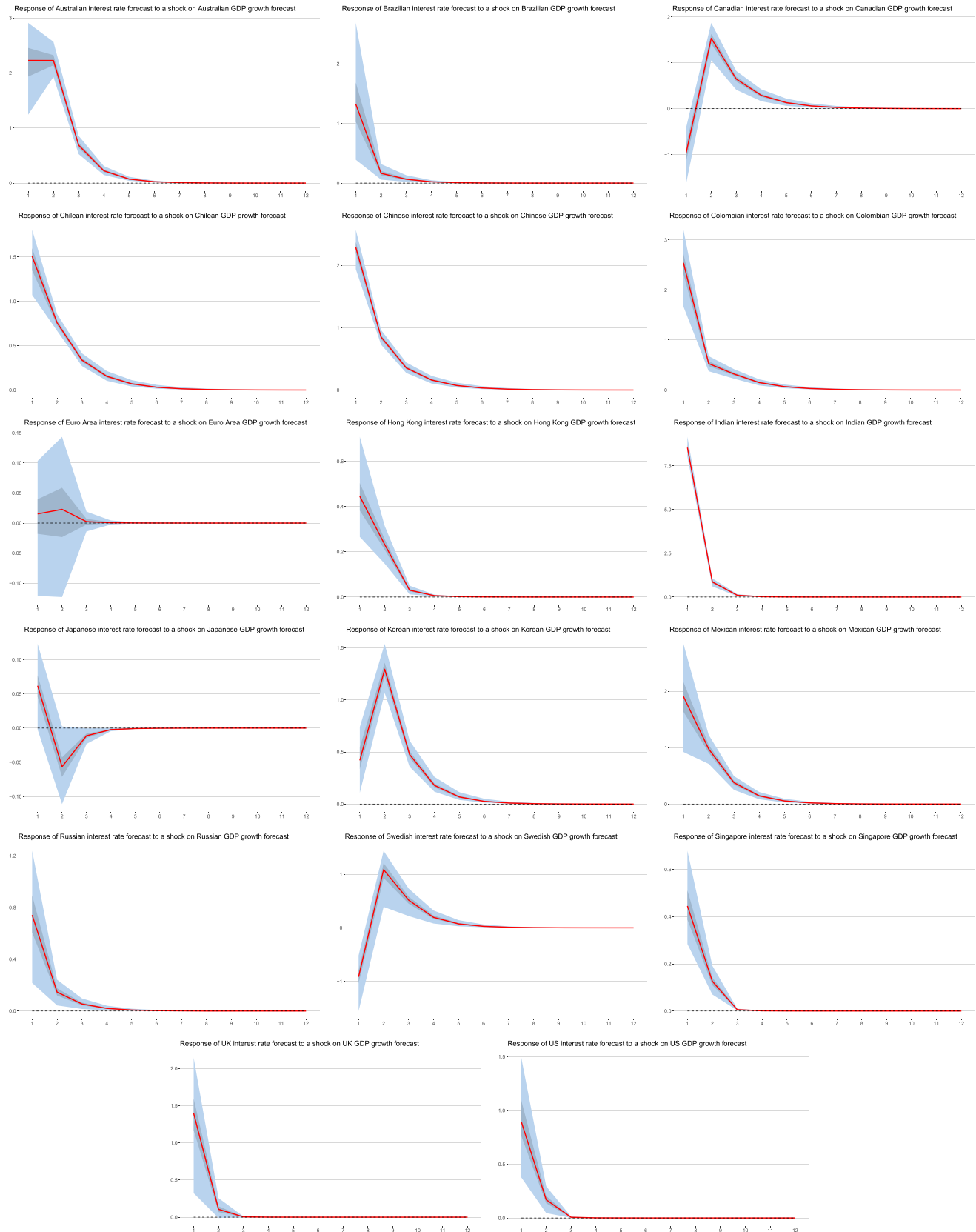


FIGURE 2 Response of domestic interest rate forecast to a shock on domestic GDP growth forecast. The plots show the reaction of expected 3-month interest rate to a shock on expected GDP growth for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

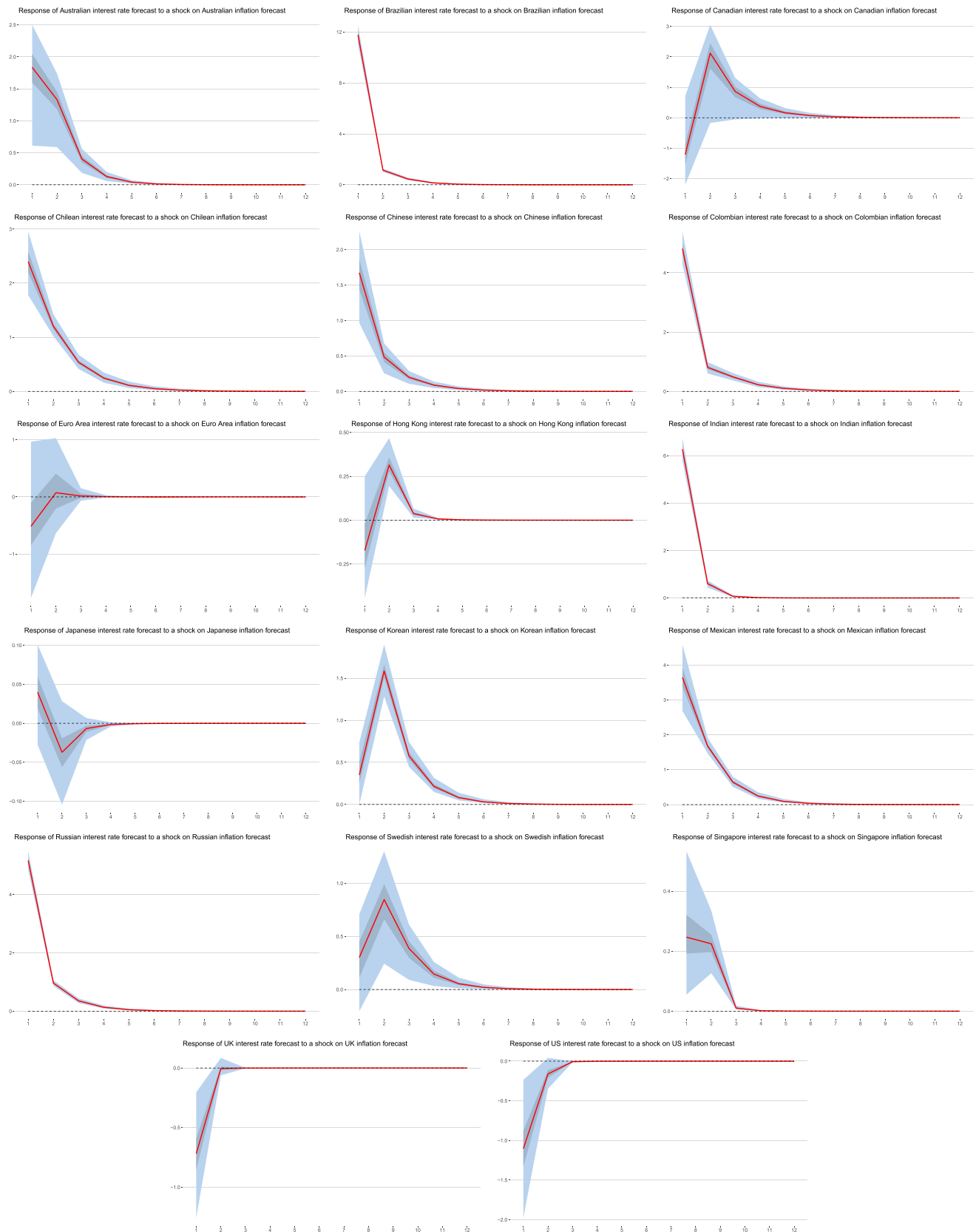


FIGURE 3 Response of domestic interest rate forecast to a shock on domestic inflation forecast. The plots show the reaction of expected 3-month interest rate to a shock on expected CPI inflation for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

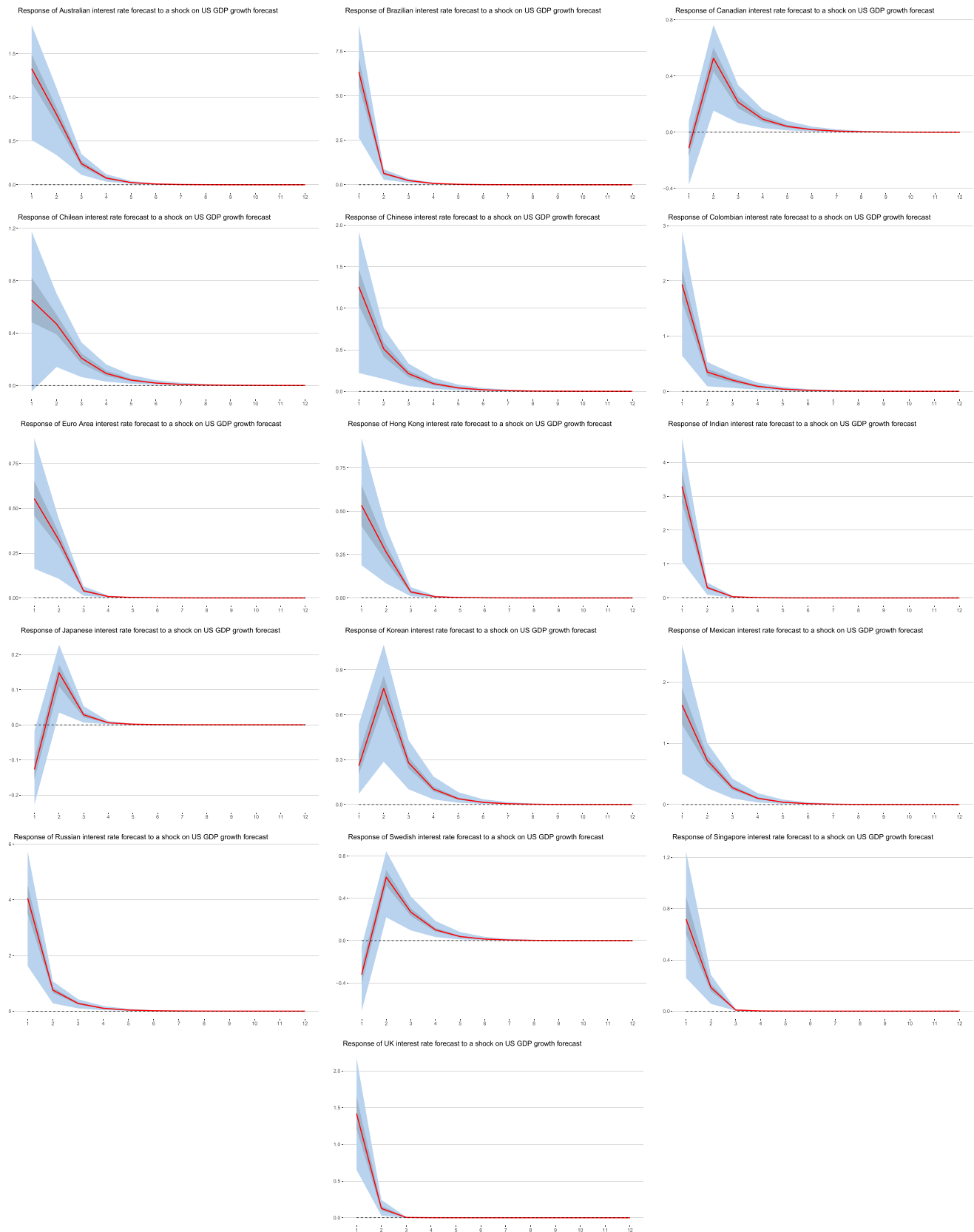


FIGURE 4 Response of domestic interest rate forecast to a shock on US GDP growth forecast. The plots show the reaction of expected 3-month interest rate to a shock on expected US GDP growth for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

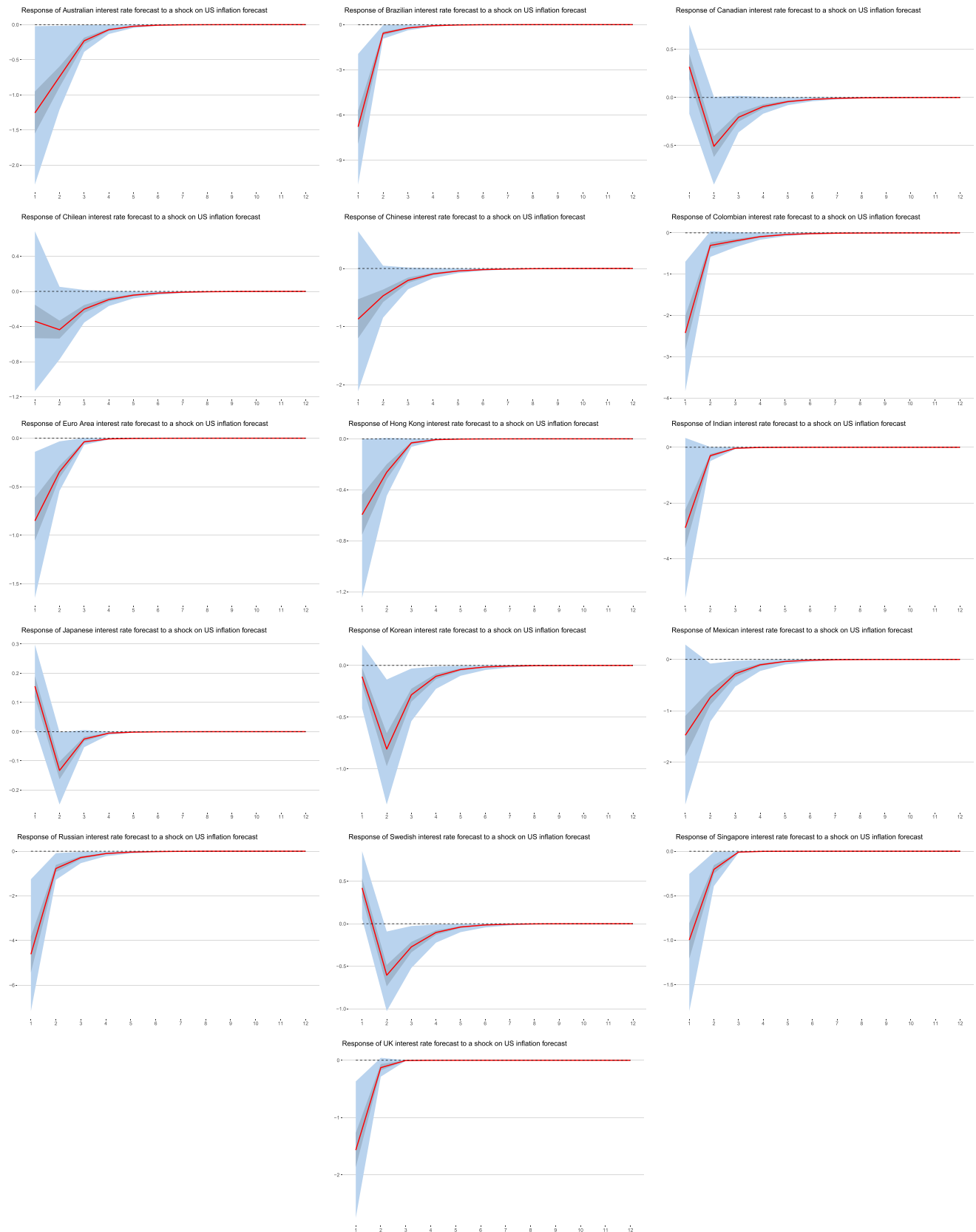


FIGURE 5 Response of domestic interest rate forecast to a shock on US inflation forecast. The plots show the reaction of expected 3-month interest rate to a shock on expected US CPI inflation for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

the shock. This might simply reflect the belief that monetary policy will follow the Taylor rule with delay due to the danger that a fast increase in interest rates might turn out to be contradictory. For the euro area and Japan the reaction is either insignificant or slightly significantly negative. The euro area is naturally a special case given the heterogeneity across eurozone countries and the fact that the ECB policy is often driven by country-specific dynamics, for example referring to Greece. Japan and the euro area also have in common that they have yet to exit from the (close to) zero interest rate policy. This fact is reflected by our findings in the sense that professionals do not believe that an economic recovery will lead to increasing interest rates.

Figure 3 displays the reaction of the expected interest rate to a shock on expected CPI inflation and again in most cases we observe a significantly positive effect. However, in this case we see more evidence for a significantly negative short-run effect, especially observed for the UK, the USA and the euro area at the 68% level. The reversed link for these countries is potentially due to the effect of unconventional monetary policy measures. Interest rates have been close to or equal to zero for several years (i.e., for more than half of our sample period). This has not only been achieved through the official interest rate but also via policy announcements and the purchasing of bonds. Major central banks have also aimed to convince markets that interest rates will stay low for the foreseeable future even if inflation increases, resulting in an (expected) negative real interest rate. This policy has been accommodated by an environment where all major central banks succeed in achieving price stability. Therefore, our findings suggest that professionals realize that major central banks have little incentive to exit the zero interest rate policy if inflation is expected to increase only slightly and within the range of the inflation range set by central banks. As outlined in Table 1, the average expected inflation rate is only around 3% over the full sample as well as for the latest period. Finally, it is important to keep in mind that we assess 3-month interest rate forecasts. This implies that a decrease in interest rate expectations can also reflect a lower interest rate pass-through to short-term interest rates in case of a constant central bank rate.

As a next step, we also examine expectation spillovers across countries. Therefore, we have considered the reaction of the interest rate forecast to a shock of GDP growth and CPI inflation forecasts in the USA. The results of the former are reported in Figure 4 for all countries and basically confirm the reactions to domestic shocks illustrated in Figure 2. The reaction to a shock on US inflation expectations reported in Figure 5 differs compared to the domestic shock for many countries since the reaction to a

US shock is negative for Australia, Brazil, Colombia, Russia, Singapore, and the UK. Positive effects at the 68% level are only obtained for Japan and Canada. This aligns with our findings for shocks on domestic inflation forecasts displayed in Figure 3. An expected increase in US inflation is not sufficient to convince professionals that domestic central banks will tighten their monetary policy. This is plausible given that our previous results have shown that US interest rates are also expected not to increase in case of a shock to US inflation expectations. The positive effects of an expected increase in US GDP growth on domestic GDP growth expectations seems to reflect the belief that global business cycle dynamics triggered by the USA provide a stronger incentive to tighten monetary policy.

In the following we have also considered reactions to shocks of euro area GDP growth and CPI inflation forecasts. The corresponding findings are reported in Figures 6 and 7 and show that the euro area is not a transmitter of professional expectations since the reactions are insignificant in nearly all cases.

5.3 | Effects of uncertainty on expectations

In this subsection we focus on the effect of economic policy uncertainty (EPU) on expectations regarding GDP growth, CPI inflation, and short-term interest rates, and we again start with reactions to domestic EPU shocks. Figures 8–10 report the results for each economy. In Figure 8 we clearly observe a statistically significant positive effect of an EPU shock on GDP growth expectations for nearly all countries. Only for the euro area and Japan do we also find significantly negative short-run effects. Figure 9 draws a similar picture, domestic EPU shocks raise inflation expectations in most countries. Figure 10 also shows a positive effect of domestic EPU shocks to expected interest rates for most economies. Only for Canada, Japan, and Sweden we also find significantly negative short-run effects.

This finding is slightly puzzling given the intuitive idea that uncertainty should have negative effects on economic activity. However, there are some potential explanations for this pattern. As outlined previously, uncertainty displays a much higher volatility compared to expectations. This suggests that professionals do not revise their forecast downwards in the case of a brief increase in uncertainty. The theoretical literature has highlighted that forecasters often receive different signals and/or display a sluggish adjustment in expectations. Another explanation for the positive effect is that uncertainty not only increases in bad times. Over the sample under investigation, an economic recovery has coincided with a significant increase in economic policy uncertainty. At the same time, interest rates have been (close to) zero, implying that profession-

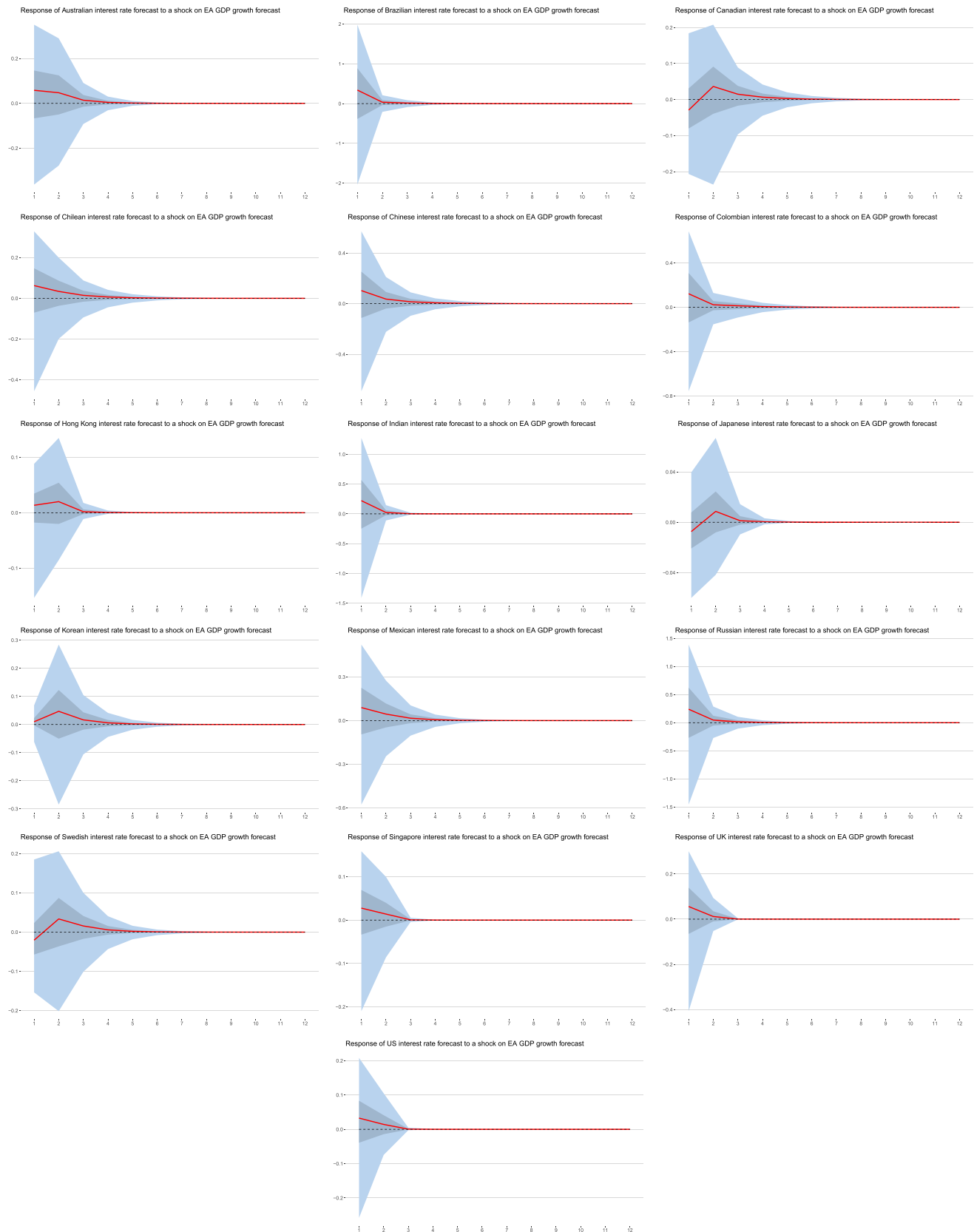


FIGURE 6 Response of domestic interest rate forecast to a shock on euro area (EA) GDP growth forecast. The plots show the reaction of expected 3-month interest rate to a shock on expected EA GDP growth for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

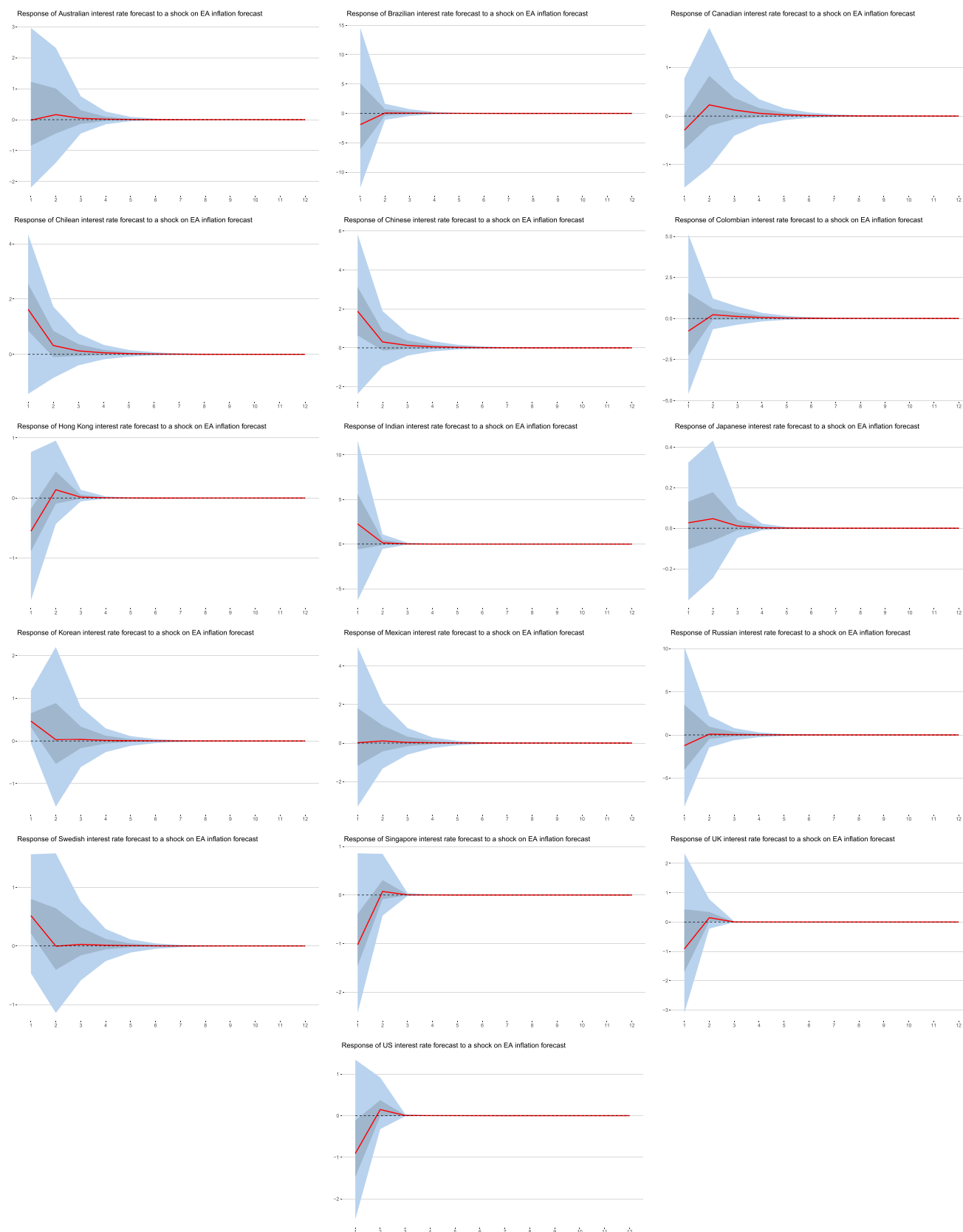


FIGURE 7 Response of domestic interest rate forecast to a shock on euro area (EA) inflation forecast. The plots show the reaction of expected 3-month interest rate to a shock on expected EA CPI inflation for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

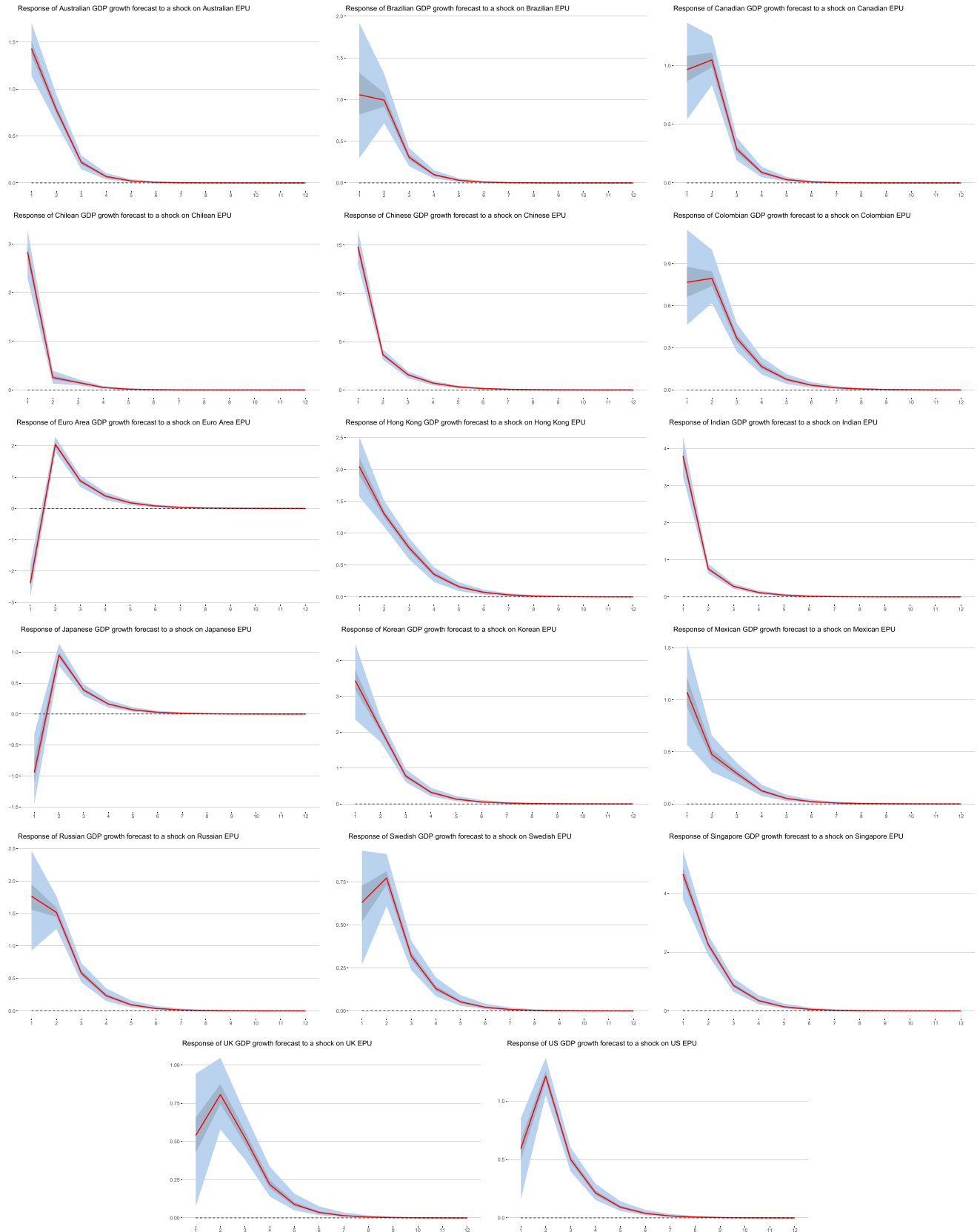


FIGURE 8 Response of domestic GDP growth forecast to a shock on domestic economic policy uncertainty (EPU). The plots show the reaction of expected GDP growth to a shock on EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

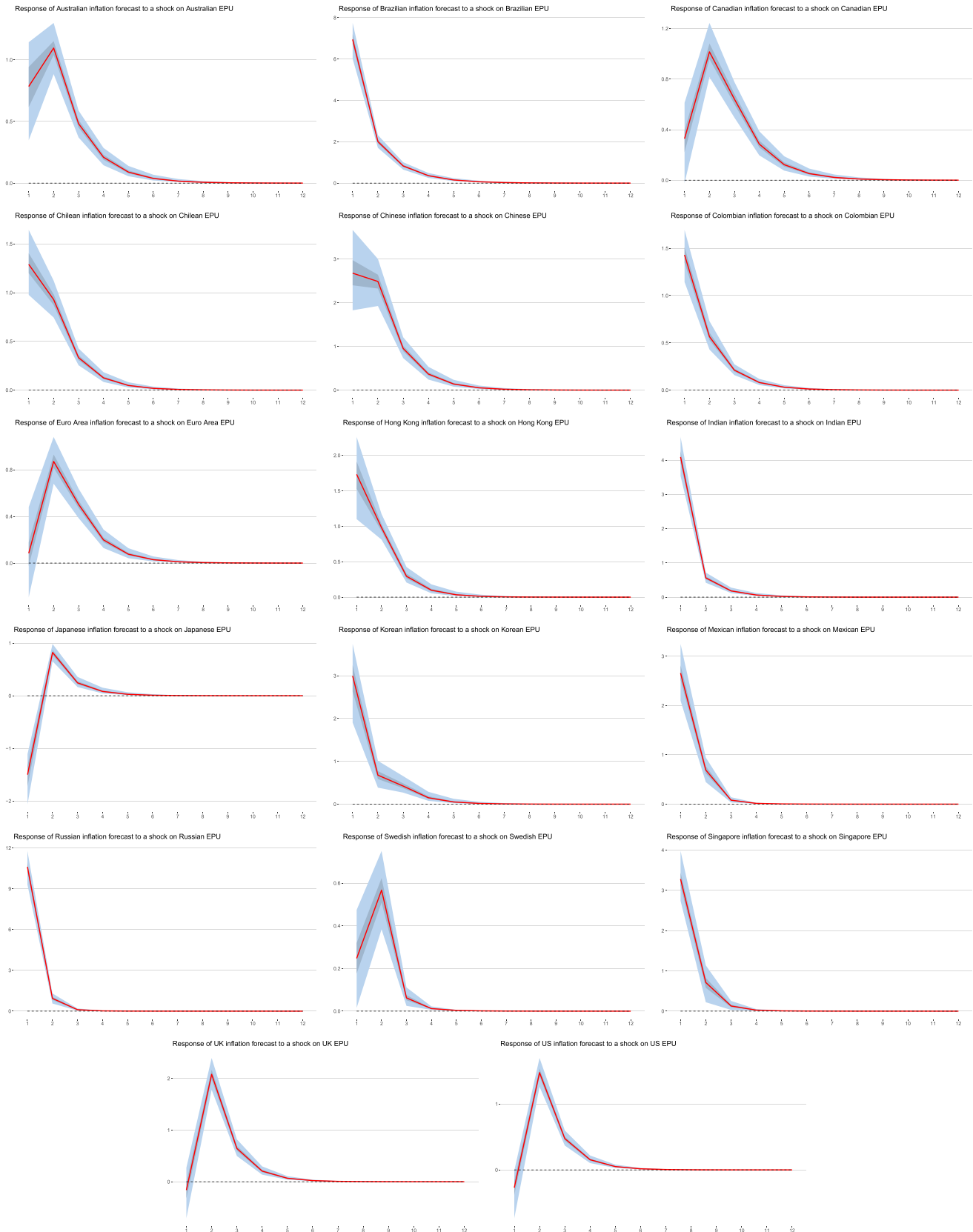


FIGURE 9 Response of domestic inflation forecast to a shock on domestic economic policy uncertainty (EPU). The plots show the reaction of expected CPI inflation to a shock on EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

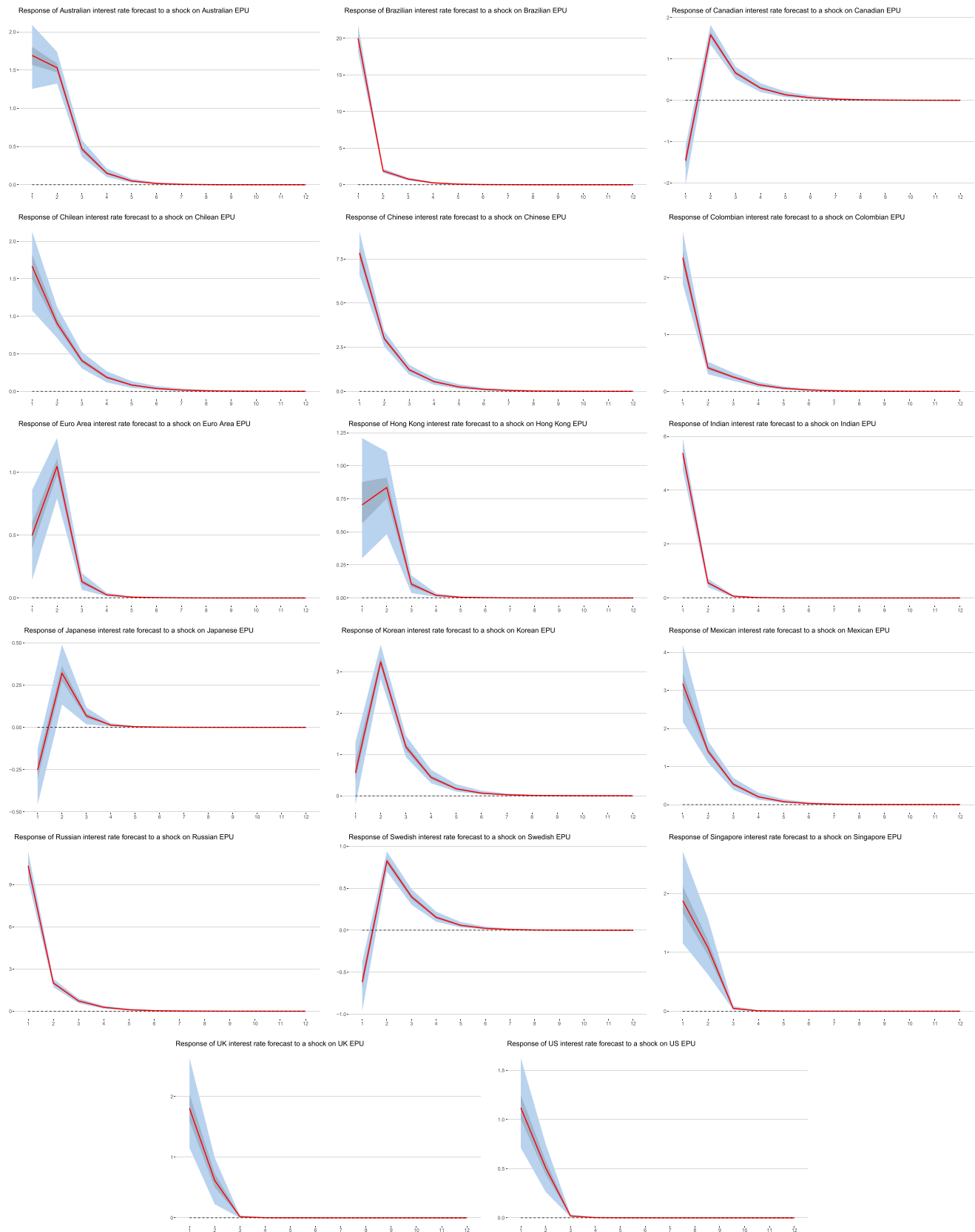


FIGURE 10 Response of domestic interest rate forecast to a shock on domestic economic policy uncertainty (EPU). The plots show the reaction of expected 3-month interest rate to a shock on EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

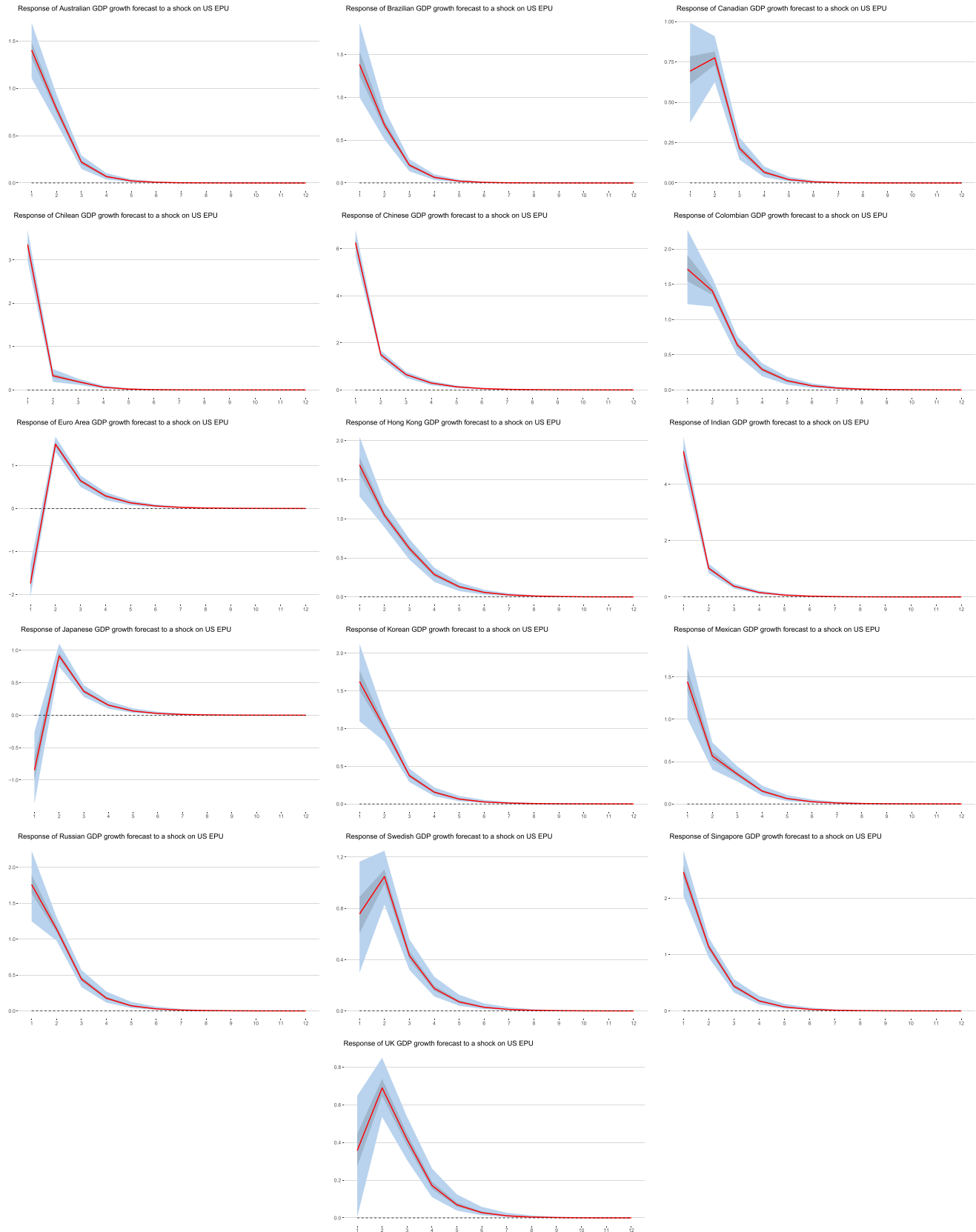


FIGURE 11 Response of domestic GDP growth forecast to a shock on US economic policy uncertainty (EPU). The plots show the reaction of expected GDP growth to a shock on US EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

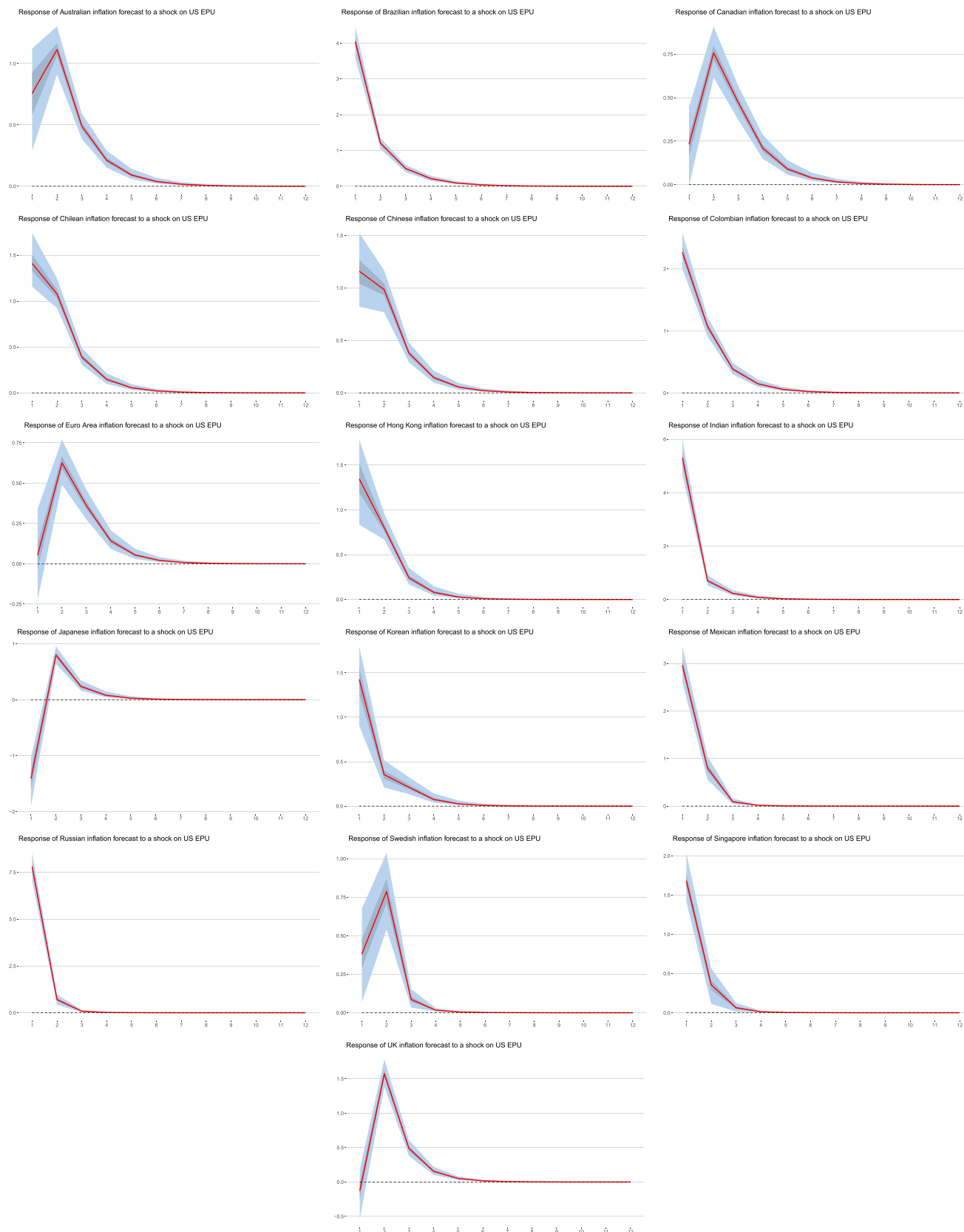


FIGURE 12 Response of domestic inflation forecast to a shock on US economic policy uncertainty (EPU). The plots show the reaction of expected CPI inflation to a shock on US EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

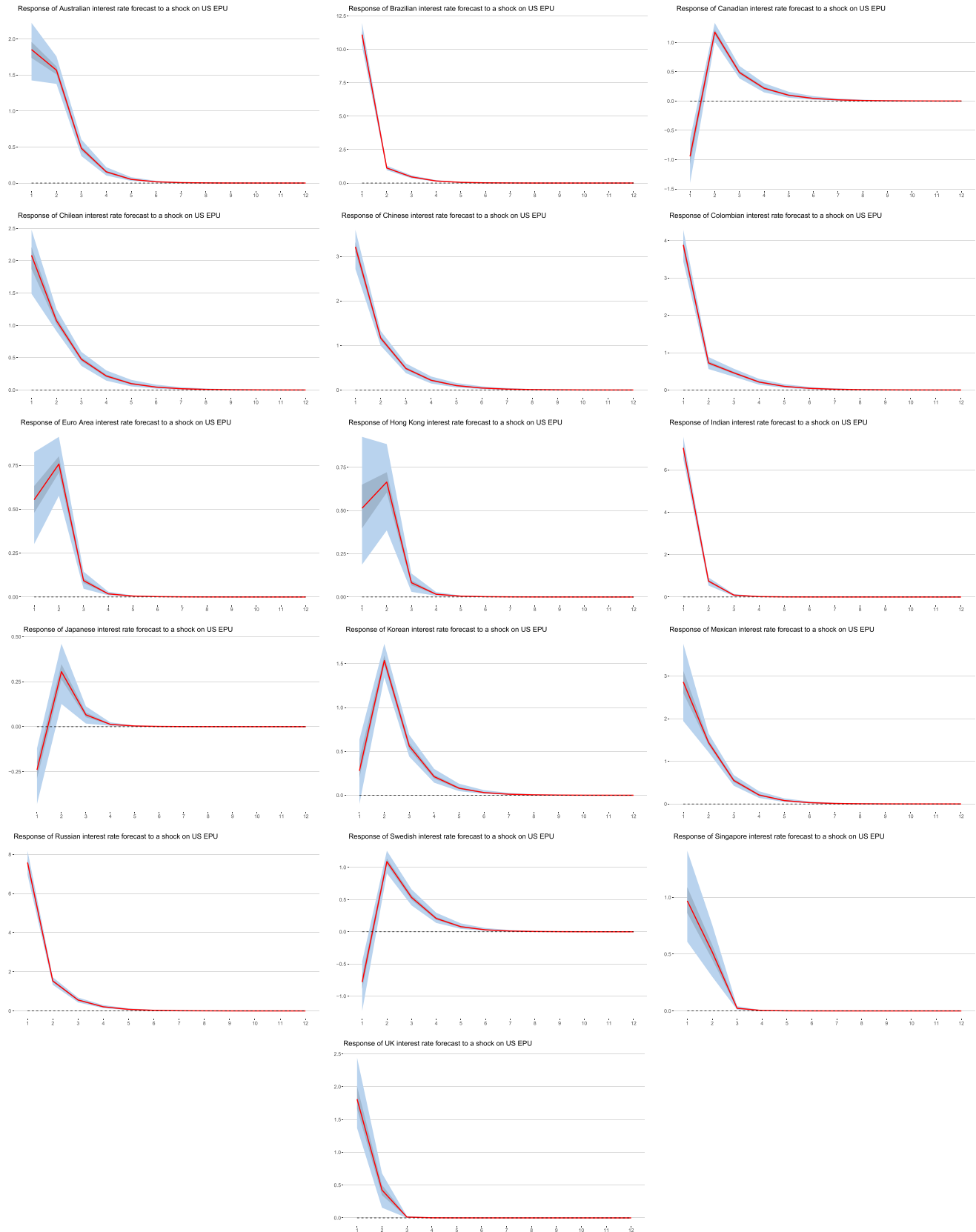


FIGURE 13 Response of domestic interest rate forecast to a shock on US economic policy uncertainty (EPU). The plots show the reaction of expected 3-month interest rate to a shock on US EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

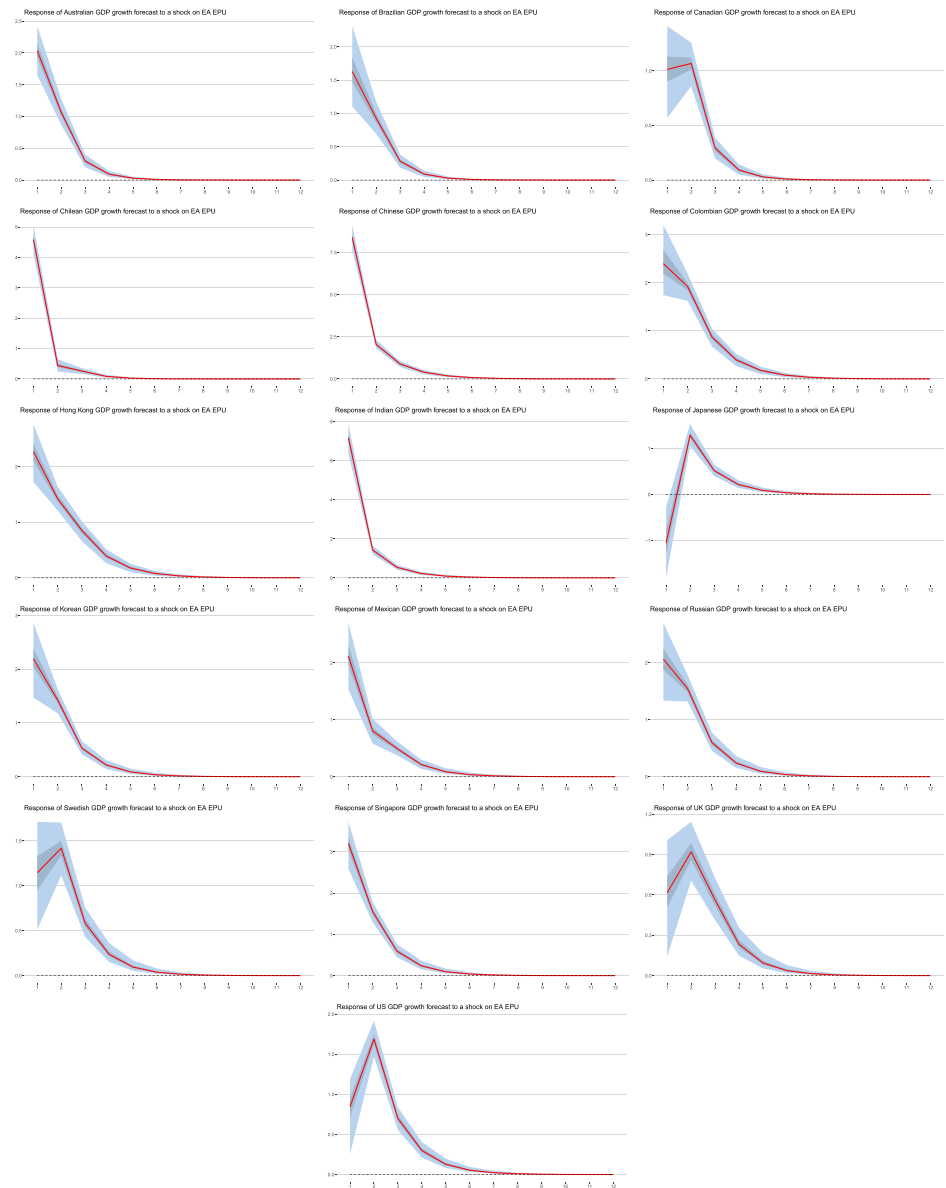


FIGURE 14 Response of domestic GDP growth forecast to a shock on euro area (EA) economic policy uncertainty (EPU). The plots show the reaction of expected GDP growth to a shock on EA EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shadings. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

als hardly expected interest rates to drop if uncertainty increases.

The existence of international uncertainty spillovers is confirmed by the results presented in Figures 11–16, where we illustrate the reactions of expectations in all countries to US EPU shocks (see Figures 11–13) and euro area EPU shocks (see Figures 14–16). The reactions are mostly similar to the responses to domestic EPU shocks. This is not surprising given the strong correlation among the different uncertainty measures.

5.4 | Robustness checks

As a robustness check, we use a different uncertainty measure and therefore substitute the EPU index by MSCI stock market volatility as already mentioned in Section 4. The main findings, in particular the degree of international spillovers in expectations and the consistency of expecta-

tions, remain unaffected by this choice. This confirms that expectation spillovers materialize regardless of the kind of uncertainty. This finding might be explained by comovements of different uncertainty measures or by the fact that expectations we analyze incorporate different dimensions of global uncertainty. The corresponding results are not provided in the paper to save space but are available upon request.

In addition, we have also performed other variations in order to check for robustness of our findings. We have changed the lag length of our panel VAR model and we have also slightly varied the classification of countries as industrial and emerging economies. However, our findings have not changed qualitatively. Therefore, we believe that our findings are robust with regard to the mentioned variations. The corresponding results are also available upon request.

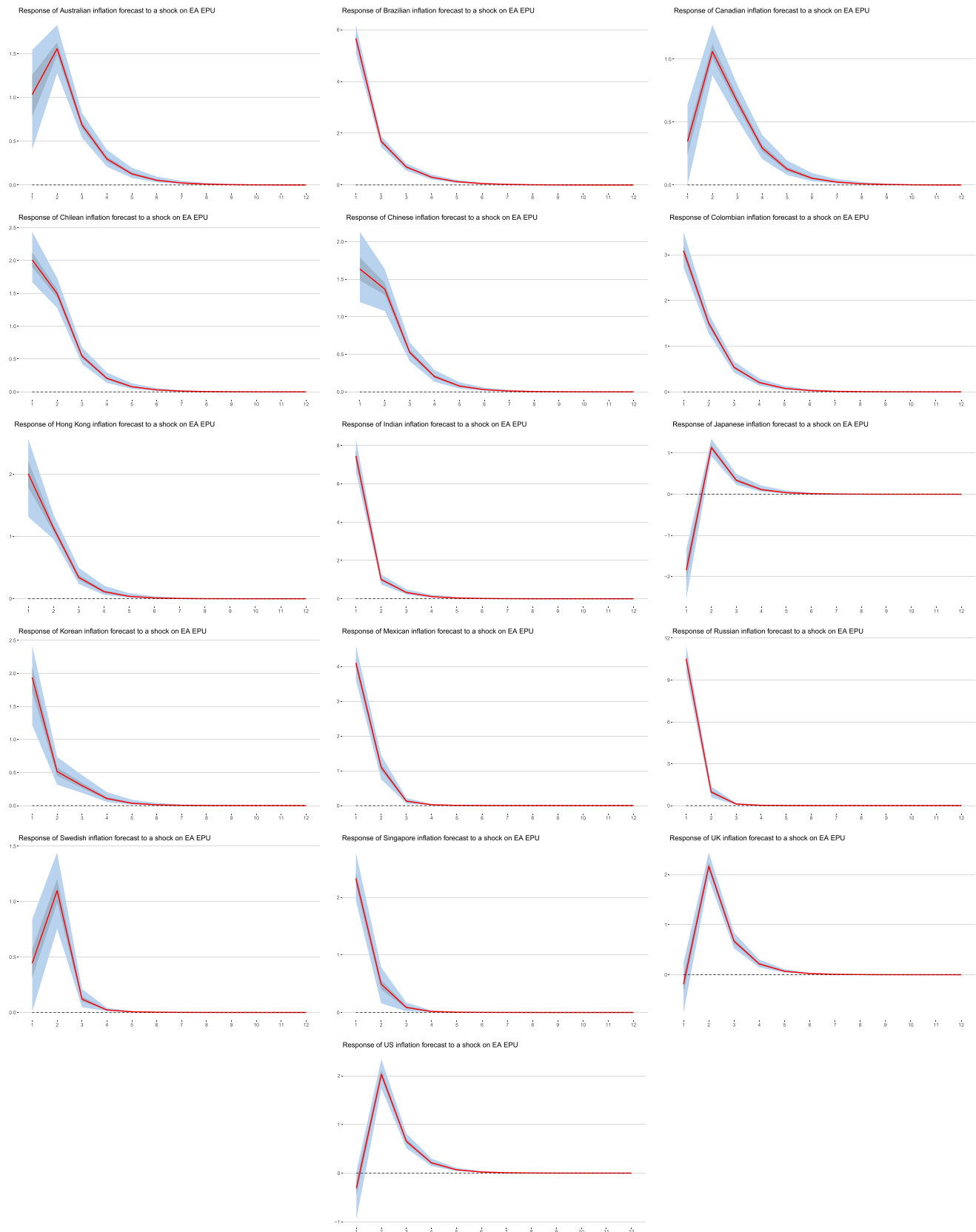


FIGURE 15 Response of domestic inflation forecast to a shock on euro area (EA) economic policy uncertainty (EPU). The plots show the reaction of expected CPI inflation to a shock on EA EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

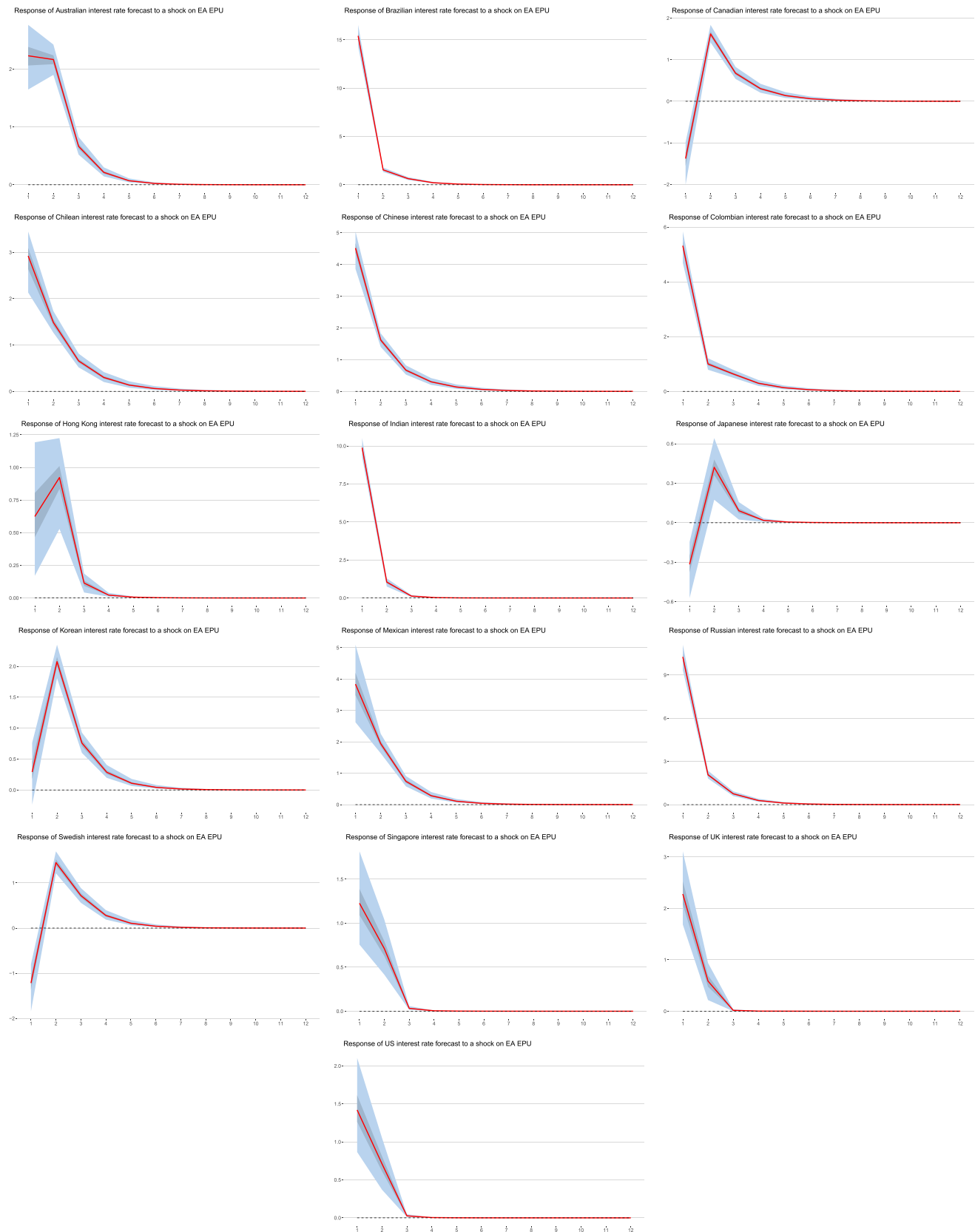


FIGURE 16 Response of domestic interest rate forecast to a shock on euro area (EA) economic policy uncertainty (EPU). The plots show the reaction of expected 3-month interest rate to a shock on EA EPU for each economy. The reaction is represented by the solid red line and the corresponding 95% (68%) confidence bands by blue (dark-blue) shading. The dashed black line displays the zero line [Colour figure can be viewed at wileyonlinelibrary.com]

6 | SUMMARY AND CONCLUDING REMARKS

This paper has analyzed whether professionals form their expectations in line with macroeconomic models. Relying on a broad international data set of surveys, we have also assessed the amount of spillovers in expectations. We also include uncertainty as an additional control variable.

Professional forecasts are often in line with standard models referring to expectations regarding future monetary policy among the Taylor rule playing a key role. Our results also highlight the importance of accounting for expectation spillovers. In particular, we identify strong effects from expectations related to the US economy which differ for inflation and GDP expectations. Effects from euro area monetary policy are also identified but turn out to be less significant.

Our results are also important for monetary policymakers in the current environment. The fact that professionals expect an increase in interest rates in the case of an expected GDP growth increase implies that an exit from unconventional monetary policy during or after an economic recovery is not unexpected. This is in line with the experience of recent interest rate increases by the Federal Reserve and suggests that the negative effects of an exit from unconventional monetary policy might be overstated since markets expect a tightening of monetary policy in the case of an economic recovery. Our findings with regard to inflation expectations show that market participants do not believe that higher inflation in a low-inflation environment will change the path of monetary policy.

Moreover, our findings point to several important issues for further research. Since we have identified significant spillovers in expectations, a straightforward extension is the analysis of spillovers in disagreement across forecasters for a comprehensive set of international countries. Unfortunately, such measures are not available for the data set under consideration. Finally, a time-varying analysis of uncertainty effects on expectations could shed some light on the propagation mechanism of uncertainty shocks.

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DATA AVAILABILITY STATEMENT

The data used in the present study has been provided by FX4casts and is available from the corresponding author upon request.

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APPENDIX A: DATA

TABLE A1 List of the 48 contributors to FX4casts Consensus Forecasts

Allied Irish Bank	ANZ Bank	Bank of America/Merrill Lynch	Bank of New York Mellon
Barclays Capital	Bayerische Landesbank	BNP Paribas	Canadian Imperial Bank of Commerce
Credit-Agricola	Citigroup	Commerzbank	Credit Suisse—First Boston
Danske Bank	Deka Bank	Deutsche Bank	DnBNOR
The Economist—Intelligence Unit	Goldman Sachs	Handelsbanken	HSBC
IHS Global Insight	ING Bank	Intesa Sanpaolo	JP Morgan Chase
Julius Baer	Lloyds TSB	Macquarie Capital Securities	Moody's Economy.com
Morgan Stanley	National Australia Bank	Nomura	Nordea
Rabobank	Royal Bank of Canada	Royal Bank of Scotland	Scotiabank
SEB	Société Générale	Standard Chartered	Suntrust
Swedbank	Bank of Tokyo-Mitsubishi UFJ	Toronto Dominion	UBS Warburg
UniCredit	Vontobel	Wachovia	Westpac