# Perceived monetary policy uncertainty

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# Perceived Monetary Policy Uncertainty*

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**Abstract**

This paper examines whether media attention affects the macroeconomic effects of monetary policy uncertainty. We combine survey data from Consensus Economics and data on media attention from MarketPsych to distinguish between uncertainty and perceived uncertainty among the public. We assess the corresponding nonlinear effects on stock returns, the growth of industrial production, and inflation. Our results confirm that monetary policy uncertainty tends to have negative effects on production growth and stock returns. In particular for industrial production, such effects tend to be stronger in case of higher media coverage which acts as a propagation mechanism.

*Keywords*: Expectations, Media, Monetary policy, Survey data, Uncertainty
*JEL*: E43, E47, E52

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# 1 Introduction

Unconventional policy measures have transformed monetary policy in several ways. Especially, the signaling and communication channel emphasizes the role of expectations among households, financial markets, and professionals for the transmission of monetary policy decisions (Melosi, 2017). Inflation expectations have attracted considerable interest as an indicator of central bank credibility and there is a consensus that clear and cohesive communication is a key ingredient of monetary policy communication (Coibion *et al.*, 2020; Bems *et al.*, 2021). Successful forward guidance can affect expectations and reduce uncertainty about the path of monetary policy (Coenen *et al.*, 2017).

Recent research has shown that media coverage affects the way financial markets react to monetary policy communication and news about monetary policy (Picault *et al.*, 2022). Households and financial markets pay attention to media reports which gives rise to a media channel for monetary policy transmission (Blinder *et al.*, 2008; Hayo and Neuenkirch, 2015). According to Hayo and Neuenkirch (2015) the media channel exists due to the tendency of many financial market participants to react to media coverage of central banks' communication instead of relying on a self-monitoring of central banks' communication. Such a channel also entertains the possibility that media coverage of monetary policy communication results in narrative monetary policy surprises (Ter Ellen *et al.*, 2022).

At the same time, understanding and modelling uncertainty dynamics has become an important research topic and there is rich evidence that uncertainty has adverse effects on financial markets and the real economy (Bloom, 2009; Bachmann *et al.*, 2013; Jurado *et al.*, 2015; Baker *et al.*, 2016). Monetary policy has not only to deal with substantial model and parameter uncertainty when making decisions, monetary policy decisions also have the potential to generate uncertainty among market participants via the signalling channel. Credible monetary policy announcements can reduce uncertainty but communication with an imperfectly informed public can also result in substantial uncertainty (Tang, 2015). From a general view, the rich evidence on information rigidity and rational inattention has illustrated that forecast errors and disagreement among market participants can arise as a response to various shocks (Andrade and Le Bihan, 2013; Coibion and Gorodnichenko, 2015; Czudaj, 2022). Further evidence suggests, for example, that households do not respond systematically to monetary policy announcements (Lamla and Vinogradov, 2019).

This paper brings together both strands of the literature by analyzing whether media coverage acts as a propagation mechanism for monetary policy uncertainty. We combine survey data from Consensus Economics and data on media coverage by MarketPsych. The former is used to calculate survey-based uncertainty measures, while the latter provides us with the intensity of media coverage on monetary policy and interest rates in newspapers and social media. Both indicators reflect professional opinions since the survey conducted by Consensus Economics is done with professional forecasters, while our media attention measure also includes professional opinions.

The key question we tackle is whether the effects of monetary policy uncertainty on stock returns, industrial production growth, and inflation depend on media coverage. We hypothesize that more media coverage increases the effect of (survey-based) uncertainty given that agents and financial markets pay greater attention to news surrounding monetary policy since the costs of acquiring new information are reduced. We do not focus solely on monetary policy announcements but study monetary policy uncertainty in general. The survey-based uncertainty measure we construct follows Istrefi and Mouabbi (2018) and includes both the disagreement among professionals as ex ante uncertainty and the volatility of forecast errors as ex post uncertainty.

In doing so, we rely on forecast survey data on both 3-month money market interest rates and 10-year government bond yields separately in order to capture uncertainty surrounding interest rates. We implicitly argue that monetary policy uncertainty is (primarily) reflected in short-term interest rate uncertainty. In addition, monetary policy decisions also have the potential to affect interest rates over longer horizons and yield curve dynamics, but uncertainty surrounding bond yields is obviously also driven by other factors, such as government solvency. An alternative would be to use the term interest rate uncertainty, but estimating separate models for 3-month interest rates and 10-year government bond yields enables us to compare uncertainty effects and the role of media dynamics for both. Analyzing both interest rates also provides an implicit robustness test and assures a good match with our media attention measure which conveys media coverage for both kinds of interest rate.

Our sample period runs from 1998 until 2021 for nine industrialized economies and we rely on country-by-country VAR models to investigate whether media coverage amplifies effects of monetary policy across countries.

The remainder of this paper is organized as follows: The next section summarizes the existing literature. Section 3 describes the dataset, paying specific attention to the main characteristics of Consensus Economics and MarketPsych data, and our empirical methodology. Section 4 discusses our empirical findings, while Section 5 concludes.

# 2 Literature Review

Our paper is closely related to both the literature on monetary policy uncertainty and monetary policy communication.

Several studies have already analyzed the role of monetary policy uncertainty. Based on the considerations of Lahiri and Sheng (2010), Istrefi and Mouabbi (2018) rely on Consensus Economics forecasts of short- and long-term interest rates as a measure of monetary policy uncertainty and analyze the effects of shocks to the corresponding measure for nine industrialized economies. In the present paper we follow a similar approach for modelling uncertainty based on survey data, also combining forecast error variance and disagreement among forecasters. Husted *et al.* (2020) propose an alternative measure of US monetary policy uncertainty inspired by the rich literature which established uncertainty proxies using textual analysis (Baker *et al.*, 2016). Besides the focus on the US, the major difference to our approach is that Husted *et al.* (2020) use the joint mentioning of monetary policy and uncertainty in the media as a proxy for monetary policy uncertainty. In the present paper we argue that the coverage of monetary policy and interest rate related discussions in the media acts as a potential propagation mechanism for monetary policy shocks we derive from survey data.[1]

Consensus Economics data has also been used in various other studies to assess the behavior of professional forecasters. Ozturk and Sheng (2018) rely on data from Consensus Economics to assess country-specific and global uncertainty measures for 45 economies. Lahiri and Zhao (2019) use Consensus Economics data for international spillover modeling. Finally, economic surprise and uncertainty measures have also been proposed based on economic indicators and business condition indexes (Scotti, 2016).

Another strand of the literature focuses on the question whether monetary policy communication has a direct impact on financial markets. Early studies assess this question by analyzing the behavior of financial markets around announcement dates, providing evidence that announcements can generate substantial movements in stock and exchange rate markets (Fischer and Ranaldo, 2011; Lucca and Moench, 2015). Recent work has focused on the actual content of announcements and the media response.

[1]Bennani (2018) uses a computational linguistic approach to extract uncertainty from media coverage of the ECB's policy decisions and also studies its impact on future interest rate setting. Earlier work on uncertainty surrounding monetary policy has relied on volatility of market-based proxies such as interest rate futures (Swanson, 2006; Bauer, 2012; Bauer *et al.*, 2022).

Picault and Renault (2017) quantify the content of European Central Bank (ECB) press conferences using linguistic techniques and show that such measures for monetary policy and the economic outlook affect stock markets. Masciandaro *et al.* (2021) focus on monetary policy announcements by the ECB, the US Federal Reserve and the Bank of England and assess whether announcements and the corresponding tweets display similar language. An increase in such a similarity around the time of the announcement coincides with stock market volatility and jumps in sovereign yields. Ter Ellen *et al.* (2022) show that, contrary to monetary policy shocks, narrative monetary policy surprises tend to increase stock prices, consumer confidence, house prices, and industrial production.

The work by Picault *et al.* (2022) explicitly incorporates sentiment dynamics, showing that both press conferences and inter-meeting communications of the ECB president significantly affect the media sentiment. These sentiments affect inflation expectations and financial markets. In the present paper, we do not explicitly focus on sentiment indicators since we are interested in overall media attention, regardless of the kind of media coverage.

# 3 Data and Empirical Methodology

## 3.1 Data

Our monthly sample period runs from January 1998 to May 2021 and includes nine economies: Canada, France, Germany, Italy, Japan, Spain, Sweden, the UK, and the US. The selection of countries includes the G7 + Spain and Sweden and is motivated by the willingness to consider the most important industrial countries also studied by Istrefi and Mouabbi (2018).

To compute the proxy for monetary policy uncertainty for each of the nine economies following Istrefi and Mouabbi (2018) based on forecast errors made by professionals, we rely on 3- and 12-month-ahead forecasts of 3-month money market interest rates and 10-year government bond yields taken from Consensus Economics (see `https://www.consensuseconomics.com/`). The survey provided by Consensus Economics is based on a wide range of participants from banks, research institutes, and government agencies. Names of participants are published which tends to increase the incentive to provide accurate forecasts. Forecasts are provided in the first half of each month.

We use the corresponding publication date to match survey forecasts with the textual data on media coverage. The corresponding data is taken from MarketPsych (see `https://www.marketpsych.com/`) and is provided for different content sets: news, social media, and the combined content. Press releases are excluded from news. Exclusively English-language text is used until February 2020. Since that point in time, Arabic, Chinese, Japanese, Dutch, French, German, Indonesian, Italian, Korean, Russian, Spanish and Portuguese language news sources were included.

Reuters news is present in the entire historical news dataset. Additional mainstream news sources are also collected by MarketPsych. The social media collection process which starts in 1998 covers internet forum and message board content. LexisNexis social media content was added in 2008 while tweets were included in 2009. Using popularity ranks measured by incoming links, this includes generally the top 20 percent of blogs, microblogs, and other financial and ESG social media content. MarketPsych data also covers content from hundreds of less-popular asset-specific blogs and forums. The data collection is based on an algorithm which includes complex grammatical framework with traits specific to different text sources such as social media, earnings conference call transcripts, financial news, and regulatory filings. The root idea is to use supervised machine learning to avoid misinterpretation.[2]

[2]This could, for example, occur if coverage regarding gold and silver medals is counted as reference

Sentiments are provided for various terms and are usually scaled between -1 and +1. We do not use these sentiments but focus on a measure of media coverage relative to other terms. Buzz is essentially a ratio for a given topic which indicates how popular a specific topic has been over a given time period. The term ratesBuzz we adopt summarizes all references in news and social media which incorporate information regarding the ‘central bank’, ‘debt default’, ‘interest rates’, ‘interest rates forecast’, and ‘monetary policy loose vs. tight’.

We rely on ratesBuzz as a proxy to measure how the public perceives monetary policy uncertainty based on media appearances of interest rate discussions (in the news and in social media). The corresponding measure is available from January 1998 to May 2021, which marks the sample period for this study. This measure is provided on a daily basis and has been converted to a monthly frequency in two different ways: by using monthly averages and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts mentioned above. For this we have used the survey dates provided by Consensus Economics.

Figure 1 illustrates the time series patterns of the ratesBuzz for the nine economies under observation. The degree of media attention has clearly increased over time for all countries under investigation. We also see large peaks of media attention regarding interest rates around the global financial crisis (2008/2009) and during the COVID-19 pandemic (2020/2021). For European countries such as France, Italy and Spain the peak is observed during the euro debt crisis around 2012. It is important to keep in mind that our measure also differs across Euro Area countries since monetary policy of the ECB has to be mentioned jointly with corresponding countries to generate Buzz. The differences in media attention across Euro Area member states can reflect either different

to commodities.

perceptions of monetary policy decisions or ECB policies for individual countries or coverage regarding other country-specific factors which drive interest rates. They also include coverage of sovereign bond yields of the corresponding country. Table 1 provides arithmetic means and standard deviations for the two interest rates (Panels (a) and (b)) and the ratesBuzz (Panel (c)). The means show that the level of public attention of interest rate dynamics clearly varies across countries. It is most pronounced in the US and has its lowest level in Sweden.

*** Insert Figure 1 about here ***

*** Insert Table 1 about here ***

Finally, to assess the effect of monetary policy uncertainty on financial markets and the real economy, we also consider MSCI stock prices indices, annual growth of industrial production, and inflation rates taken from Thomson Reuters Datastream and the OECD. Stock indices have been used to compute percentage stock returns as the first difference of the natural logarithm. Production growth and inflation are given in percent per annum. As an additional exogenous variable we also use WTI crude oil prices taken from Federal Reserve Economic Data (FRED), which have also been used as percentage returns.

## 3.2 Monetary Policy Uncertainty

As mentioned above, we rely on four different measures of monetary policy uncertainty derived from survey data to study their impact on financial markets and the real economy. Following Lahiri and Sheng (2010), Istrefi and Mouabbi (2018), and Ozturk and Sheng (2018) we measure common or aggregated uncertainty $U_t^h$ by the sum of ex ante uncertainty given by the disagreement among forecasters $D_t^h$ and ex post uncertainty proxied by the volatility of forecast errors based on mean forecasts $V_t^h$:

$$U_t^h = D_t^h + V_t^h, \tag{1}$$

where $h = 3, 12$ denotes the forecast horizon. We use two different interest rates, i.e., 3-month money market rates as short-term interest rates and 10-year government bond yields as long-term interest rates, and consider two different forecast horizons ($h = 3, 12$), which results in four different measures of monetary policy uncertainty. Consulting both disagreement and forecast errors is useful to capture two dimensions of uncertainty. Other uncertainty proxies such as Jurado *et al.* (2015) focus on joint forecast errors from empirical models for a broad range of variables to proxy uncertainty. The use of survey data is useful for our topic of investigation given that disagreement among forecasters provides a direct measure of uncertainty about the future path of monetary policy.

Forecast errors for interest rates are computed by taking the difference between forecasts made by professionals and realized end-of-month values taken from Thomson Reuters Datastream:

$$\varepsilon_{t-h,t} = E_{t-h}(i_t) - i_t, \quad \text{for } h = 3, 12, \tag{2}$$

where $E_{t-h}(.)$ denotes expectations made in period $t - h$ for period $t$ and $i_t$ represents any interest rate (3-month or 10-year) realized in period $t$. Forecast errors are computed using the mean of forecasts made by professionals.

$D_t^h$ is proxied by the standard deviation of forecasts across forecasters made in $t-h$. To approximate $V_t^h$, we fit a stochastic volatility (SV) model of forecast errors and take its estimated volatility $e^{h_t}$.[3] The SV model can be written in hierarchical form as:

$$\varepsilon_{t-h,t}|h_t \sim N(0, \exp(h_t)), \tag{3}$$

$$h_t|h_{t-1}, \mu, \phi, \sigma_\eta \sim N(\mu + \phi(h_{t-1} - \mu), \sigma_\eta^2), \tag{4}$$

$$h_0|\mu, \phi, \sigma_\eta \sim N(\mu, \sigma_\eta^2/(1 - \phi^2)), \tag{5}$$

where $h_t$ denotes the log-variance and $N(a, b)$ refers to a Gaussian with mean $a$ and variance $b$. $\theta = (\mu, \phi, \sigma_\eta)'$ is the vector of parameters consisting of the level $\mu$, the persistence $\phi$, and the volatility $\sigma_\eta$ of the log-variance $h_t$, which is estimated by a Bayesian Markov chain Monte Carlo (MCMC) algorithm.[4]

Figures 2 and 3 illustrate the time series patterns for the monetary policy uncertainty measure for the two interest rates and the two forecast horizons considered. Short-term monetary policy uncertainty peaks around the global financial crisis for each economy but also turns out to be high around 2002 for Canada, the US and Japan. In contrast, long-term monetary policy uncertainty exhibits many more spikes but is observed to be relatively low around the global financial crisis. The fluctuation of this uncertainty measure tends to be lower compared with textual based uncertainty measures.

Unsurprisingly, in both cases the uncertainty is always much higher for a horizon of 12 months compared with 3 months. This is simply due to the fact that forecast errors for larger horizons are hit by more shocks. Panels (a) and (b) in Table 1 also verify this

[3]We rely on a stochastic volatility model instead of GARCH-type models, otherwise we would be unable to separate first-moment shocks from second-moment shocks (Ozturk and Sheng, 2018). However, we have also consulted several different GARCH models to check for the sensitivity of our results, which remained robust to this choice.

[4]In line with Kim *et al.* (1998), we use an independent prior for each parameter: $p(\theta) = p(\mu)p(\phi)p(\sigma_\eta)$ with rather uninformative priors $\mu \sim N(0, 100)$, $(\phi + 1)/2 \sim B(5, 1.5)$ and $\sigma_\eta^2 \sim \chi_1^2$. We run an MCMC sampler with 10,000 draws, a burn-in period of 1,000 and a thinning of 10.

by reporting means and standard deviations for the four different measures. According to the means, the level of monetary policy uncertainty is relatively high for the US and relatively low for Japan. The latter is due to the relatively long period of low interest rates in Japan compared with the other economies.

*** Insert Figures 2 and 3 about here ***

A comparison between Figures 2 and 3 (and the descriptive statistics in Table 1) also shows that uncertainty tends to be higher for 10-year government bond yields. This is plausible given that interest rates with longer maturities incorporate additional information regarding inflation expectations and government solvency.

## 3.3 Impulse Response Analysis

As a next step, we compute impulse response functions based on the estimation of a Bayesian VAR model using a recursive Cholesky identification strategy. The model is specified as follows

$$A_0 Y_t = \sum_{i=1}^{p} A_i Y_{t-i} + \sum_{i=0}^{s} B_i X_{t-i} + CD_t + u_t, \quad u_t \sim N(0, \Sigma), \tag{6}$$

where $Y_t = (MPU, MPU \cdot Buzz, MSCI, IP, \pi)'$ including monetary policy uncertainty ($MPU$), an interaction term between $MPU$ and the ratesBuzz ($MPU \cdot Buzz$), stock returns ($MSCI$), the growth of industrial production ($IP$) and inflation ($\pi$). $MPU \cdot Buzz$ allows for a potential nonlinearity in the uncertainty effect stemming from media attention.[5] We refer to this term as perceived uncertainty. $X_t$ and $D_t$ solely include WTI

[5]We have decided to add an interaction term between $MPU$ and the ratesBuzz into the VAR model instead of considering the ratesBuzz as a transition variable within a threshold or a smooth transition VAR model as the ratesBuzz measures the intensity of media attention by taking only positive values. Therefore, the interpretation of a threshold or a smooth transition VAR model would be complicated by the problem of selecting a plausible threshold value for the ratesBuzz.

crude oil returns and a constant term, respectively.[6] $A_0$ is a lower triangular matrix using the Cholesky ordering reported above. This implies that uncertainty ($MPU$) shocks do not contemporaneously respond to shocks of other variables, which is reasonable within our dataset as $MPU$ is constructed from forecasts made by professionals based on the information set available at the date the forecasts had to be submitted. The latter three variables included in our VAR model ($MSCI$, $IP$, $\pi$) are realized values that become available after the forecasts have been made by professionals. Our reasoning in this context basically refers to the arguments already raised by Istrefi and Mouabbi (2018). The second variable within our VAR model is the interaction term between $MPU$ and the ratesBuzz, which has been either measured as monthly average of daily data or for the date forecasts had been submitted. In both cases it is also reasonable that $MPU$ does not contemporaneously respond to ratesBuzz shocks. The ordering of the latter three variables does not play any role within our study as we solely focus on the effect of uncertainty ($MPU$) and perceived uncertainty ($MPU \cdot Buzz$) on the other three variables.

First, the model given in Eq. (6) is estimated by an MCMC algorithm with 1,000 draws and a burn-in period of 250 using normal priors for all coefficients with a zero mean and a precision of 1 and an inverse Wishart prior for the variance-covariance matrix of the errors $\Sigma$, where the degrees of freedom are set equal to the number of endogenous variables. Second, we use the estimated model to compute impulse responses as the median response and the corresponding quantiles to get 68% and 95% confidence bands.

[6] We have considered several different information criteria to select the lag lengths $p$ and $s$. Most of them suggest the choice of $p = 2$ and $s = 0$ for most of the economies. To achieve comparability, we have used this choice for all models. However, we have also verified that our findings are not sensitive to this choice.

# 4 Empirical Findings

First, the discussion of our empirical findings starts in Section 4.1 with the United States (US) as the largest and most widely studied economy. Second, in Section 4.2 we compare the results for the US with those for the other eight economies. Finally, in Section 4.3 we present sensitivity checks of our findings for the US while considering recession periods and forward guidance policies.

Figure 4 shows the orthogonalized impulse responses for the US based on the Bayesian VAR model described in the previous section illustrating the effect of monetary policy uncertainty (left plot) and the additional uncertainty effect stemming from media coverage (right plot) on stock returns (Panel (a)), production growth (Panel (b)), and inflation (Panel (c)). Therefore, the total effect is the sum of both.[7] Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (denoted by IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (denoted by Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics (denoted by Date). Therefore, each reaction is provided based on eight different specifications, which are plotted together in one graph to save space and to check the robustness of the effect. The results for the other eight economies under observation are presented in the same way in Section 4.2. Figures 5 to 8 also provide the individual reactions for the different specifications in the US with their 68% and 95% confidence bands to make inference. To save space, the individual confidence bands are solely provided for the model specifications

[7]It is important to take the scaling of both graphs into account. The additional effects stemming from media coverage do not reverse the baseline effects. In most cases we see an amplification effect of media attention but in some cases a dampening of the uncertainty effect is observed.

including the ratesBuzz matching the deadline date for the survey of professional forecasters (denoted by Date) as reactions and confidence bands are mostly very similar for the two ratesBuzz measures considered (Date and Mean). All other confidence bands are provided in the Appendix.

*** Insert Figures 4 to 8 about here ***

## 4.1 United States

The left plot in Panel (a) of Figure 4 shows a negative short-term effect of monetary policy uncertainty on stock returns in the US. Most of the effect dies out relatively quickly in the first few months. Panel (a) in Figures 5 and 6 shows that this effect is significantly different from zero when considering the 68% confidence band for uncertainty stemming from short-term interest rates (denoted by IR3M) at both horizons. For uncertainty surrounding long-term interest rates (IR10Y) this reaction is even significant at the 5% level, as can be seen in Figures 7 and 8.

The right plot in Panel (a) of Figure 4 indicates that this negative uncertainty effect seems to be amplified by media attention to monetary policy related discussions. Figures 5 to 8 convey that the negative amplification is at least significantly different from zero at the 68% confidence level. For uncertainty stemming from long-term interest rates measured at the 12-month horizon the amplification is even significant when considering the 95% confidence band.

In Panel (b) of Figure 4 we also see a negative production growth effect, which lasts longer and which is also amplified by media coverage according to our hypothesis of a media channel of monetary policy. Figures 5 and 6 illustrate that both the baseline uncertainty effect and its amplification through media coverage are significantly different from zero at the 5% level for short-term interest rate uncertainty, especially for uncertainty measured over the 12-month horizon (see Figure 6). For long-term interest rate uncertainty, both effects are also significant when considering the 68% confidence level (see Figures 7 and 8).

The effect of monetary policy uncertainty on inflation presented in Panel (c) of Figure 4 is less clear-cut. According to Figures 5 to 8 both the baseline effect and its amplification by media coverage show different patterns across the model specifications and are hardly significant for the US.

Overall, the negative growth effect is generally in line with the previous literature (Jurado *et al.*, 2015; Istrefi and Mouabbi, 2018) and can be explained by precautionary savings made by households in times of uncertainty. Additionally, we also provide evidence in favor of an amplification effect through a media channel, i.e., an effect of perceived monetary policy uncertainty. We also find a negative short-lived effect on the stock market, which is also amplified by media coverage. Effects on inflation are not clear-cut for the US. Given the relatively low variation of inflation over the sample period, this is not surprising.

It is important to keep in mind that a reduction of monetary policy uncertainty also has the capacity to improve production growth and stock returns. In such a scenario, media coverage also acts as an amplifier which is in line with the great efforts central banks put into their communication stance to achieve coordination effects among market participants.

## 4.2 Cross-Section of Countries

In this subsection we compare the findings discussed for the US across all economies considered. The corresponding impulse responses are reported in Figures 9 to 16 for the remaining eight economies. The negative effects on stock returns and on production growth are relatively robust across countries, especially referring to uncertainty regarding the short-term interest rates. However, there are also notable differences between uncertainty surrounding short-term and long-term interest rates.

*** Insert Figures 9 to 16 about here ***

The latter also results in positive effects for some countries. Such an effect materializes for stock returns in case of Canada as well as the UK and for industrial production growth for Germany and the UK. There is no unambiguous explanation for the positive effect but the fact that long-term expectations are driven by other factors related to the outlook of the economy suggests that uncertainty is more likely to also arise in 'good' times compared with short-term interest rates. A simple example corresponds to the case of uncertainty surrounding higher inflation. Higher inflation will also increase long-term interest rates so that the related uncertainty can have positive effects. Another explanation is that, unlike short-term uncertainty, long-term uncertainty makes longer maturities less attractive for investors. This leads to an increase in term premia which can increase long-term interest rates (Tillmann, 2020) while demand for short-term assets, such as stock prices, raises.

In contrast, the negative effects of uncertainty regarding short-term interest rates are observed much more frequently. The effects are also stronger and much more persistent compared with the aforementioned (sometimes) positive effects of long-term interest rate uncertainty. As already discussed for the US, the observed negative effects of short-term interest rate uncertainty are weaker and die out more quickly for stock returns, while effects on industrial production growth are remarkably persistent for most countries, for example, Canada, Germany and the UK. The only exception is Japan where stock returns and production growth in some specifications also tend to respond positively to higher monetary policy uncertainty. This finding might be due to the fact that our sample period includes the end of the deflationary period in Japan and frequent interventions in the foreign exchange market by the Bank of Japan. These factors might drive the effects and the nature of monetary policy uncertainty in Japan. The negative effects are in line with the theoretical literature on monetary policy which has, for example, emphasized the role of uncertainty in the context of the cost channel (Tillmann, 2009). They also confirm the general results that uncertainty has adverse effects on the real economy.

The additional uncertainty effect on production growth stemming from media attention also exhibits notable differences between short-term and long-term interest rates. In most cases we observe an amplification of the initial effect through media coverage, which is much stronger for short-term interest rate uncertainty. This significantly decreases industrial production growth in Canada, France, Germany, and Italy, as already discussed for the US. In quantitative terms, we find that the initial effects are mostly amplified by 5-10 percent. In some cases, the additional effect via media attention also dampens the initial effect. This is the case for long-term interest rate uncertainty in Canada and for short-term interest rate uncertainty in Spain and the UK. The additional uncertainty effects on stock returns stemming from media coverage are less pronounced and more erratic but in general also suggest an additional negative effect for most countries. The corresponding effects show little persistence.

Similar to the US, effects on inflation are frequently not statistically significant although some negative effects for Canada, France, Sweden and the UK are also observed. Negative effects on inflation can also result from precautionary savings in times of higher uncertainty. The somehow weaker effect potentially reflects the relatively slow fluctuations in inflation rates over the sample period.

Overall, the results verify a negative effect of monetary policy uncertainty on stock returns and production growth, which is amplified by media attention. The effect on inflation is not clear-cut and mostly either negative or insignificant. Cross-country comparisons across all measures confirm that industrial production growth responds more strongly and more persistently to monetary policy uncertainty shocks compared with stock returns, a plausible result given the higher volatility of stock prices compared with the real economy.

The stronger response in case of higher media coverage can be explained via different channels. Our results are, for example, related to the large body of research which has emphasized the role of information rigidities for expectations (Coibion and Gorodnichenko, 2015). In a nutshell, the key argument is that firms or households often remain inattentive after shocks due to the costs of acquiring new information. The work by Carroll (2003) has shown that market participants only occasionally pay attention to news reports and that consumer expectations are influenced by opinions of professionals. Our results align with these findings in the sense that uncertainty derived from professional opinions has stronger effects on the real economy and financial markets if media attention is high. Higher media attention is likely to reduce the costs of processing new information, in our case an increase in monetary policy uncertainty, which reduces the sluggishness of expectations. Such stronger effects on expectations and beliefs in turn affect industrial production and stock prices.

The finding of both amplified and weakened effects via media attention can be explained by the fact that we do not consider the sentiment related to the news coverage. Even in the presence of monetary policy uncertainty, media coverage can reflect both negative and a positive sentiment.

In addition, these results provide a new perspective on the role of monetary policy surprises. The findings of Ter Ellen *et al.* (2022) suggest positive effects of monetary policy surprises on industrial production, while our results suggest that stronger media coverage often tends to amplify the negative effects of monetary policy uncertainty on both industrial production and stock returns.

## 4.3 Robustness Checks

As a final step of our analysis we consider two different sensitivity checks to verify the robustness of our findings. In doing so, we consider the role of recessions and forward guidance policies in the context of our analysis.

First, we have extended our set of exogenous variables $X_t$ in Eq. (6) by dummy variables taking a value of unity in periods classified as recessions and zero otherwise. In doing so, we rely on OECD based recession indicators measuring recessions based on turning points from the period following the peak through the trough. The corresponding data has been downloaded from FRED. The additional results are provided in Figure 17 for the US and clearly show the robustness of our initial findings. These are basically unchanged. The same holds for all other economies. The corresponding results are reported in the Appendix. Our VAR model also includes industrial production growth. Therefore, our empirical setup already accounts for the path of the real economy. This explains that the results are not sensitive to the inclusion of recession dummies. Hence, we argue that the monetary policy uncertainty shocks we measure are neither capturing demand effects nor blurred by recessions.

*** Insert Figure 17 about here ***

As a second robustness test we account for forward guidance policies conducted by the US Federal Reserve. Forward guidance has been implemented by the US Fed and other central banks to provide further stimuli by reducing interest rate expectations although current nominal interest rates hit the zero lower bound. Therefore, forward guidance policies aim to reduce monetary policy uncertainty but at the same time they might also enhance media attention. To allow for forward guidance policies we have included the forward guidance factor, which has been estimated by Swanson (2021), into our set of exogenous variables $X_t$ in Eq. (6). The corresponding impulse responses are reported in Figure 18 for the US and verify that our initial findings are robust to this change.

*** Insert Figure 18 about here ***

# 5 Summary and Concluding Remarks

This paper has analyzed whether media attention acts as a propagation mechanism for monetary policy uncertainty. We have combined survey data and data on media coverage to link survey based monetary policy uncertainty and the intensity of media attention on interest rates in newspapers and social media.

In line with the literature, our results show that monetary policy uncertainty derived from surveys tends to have negative effects on industrial production growth and stock returns. We also find that media attention affects the transmission of uncertainty shocks. This finding is robust across different uncertainty measures and for several countries. In particular for industrial production growth, the results also show that such effects tend to be stronger in case of higher media coverage for most countries. Both the initial effect and the amplification via media coverage tend to be stronger for uncertainty surrounding 3-month interest rates compared with 10-year government bond yields. Differences between uncertainty regarding both interest rates can be explained by the stronger relevance of monetary policy for 3-month interest rates and a rich set of other determinants which drive government bond yields. Given that our uncertainty measure is based on surveys, our results shed some new light on the role of expectations for monetary policy transmission via uncertainty.

Our results offer several avenues for further research. We have focused on survey based monetary policy uncertainty in general, while an event study which explicitly takes monetary policy announcements into account might shed some light on the question whether media attention also amplifies uncertainty shocks after monetary policy announcements. This would also imply the need to distinguish between monetary policy surprises and monetary policy uncertainty shocks. We have not followed up on this route given that the survey we adopt is only provided once a month. Given the findings of Masciandaro *et al.* (2021), an interesting question is also whether the similarity of monetary policy announcements and media coverage surrounding these announcements matters for the role of media coverage intensity. Intuitively, monetary policy communication should be most successful if the underlying messages are both perceived and intensively covered. On the other hand, our results also show that intensive coverage can amplify negative effects, illustrating the difficult task of central bank communication and forward guidance.

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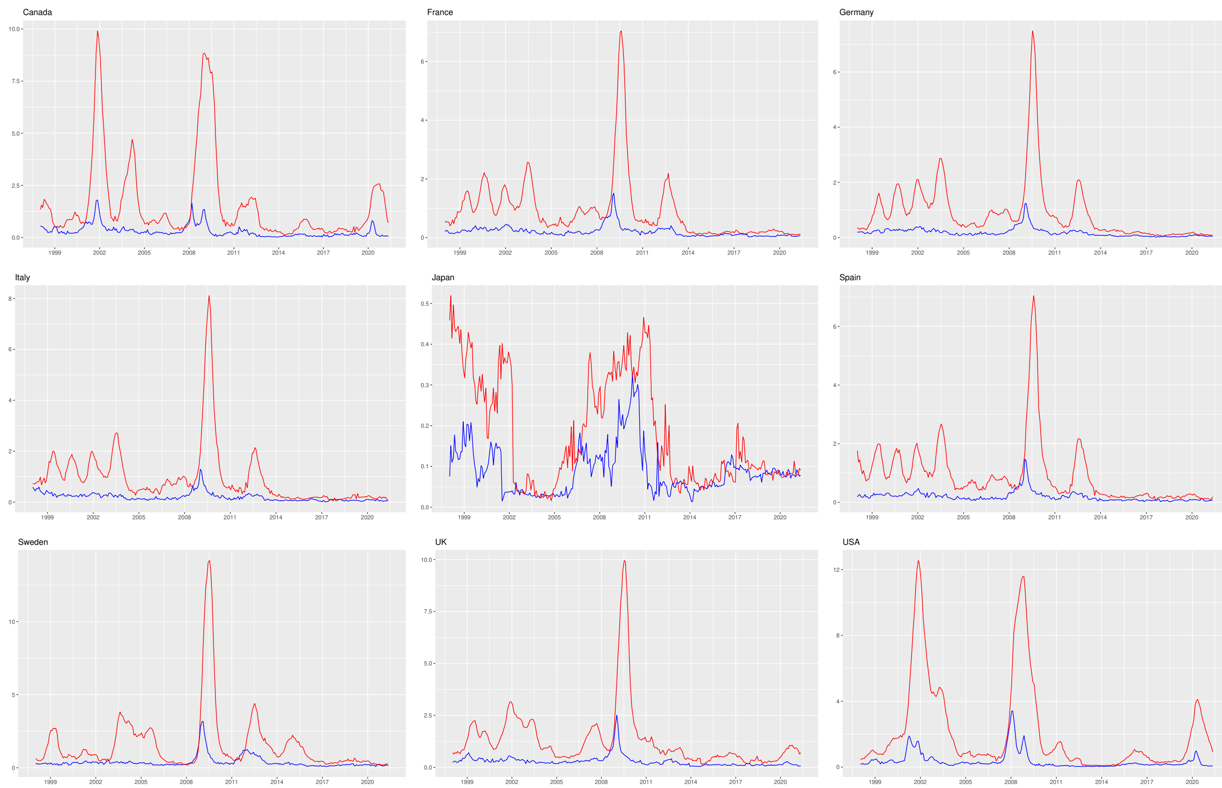
# Figures and Tables

Figure 1: **RatesBuzz**

The graph shows monthly time series of the ratesBuzz – an indicator measuring media appearance (news and social media) of interest rate discussions – for the period from January 1998 to May 2021 for nine economies: Canada, France, Germany, Italy, Japan, Spain, Sweden, the UK, and the US. The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (blue line) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (red line).

Figure 2: **Short-term monetary policy uncertainty**

The graph shows monthly time series of ex post mean subjective monetary policy uncertainty following Istrefi and Mouabbi (2018) based on 3-month- (blue line) and 12-month-ahead (red line) forecasts of short-term (3-month) interest rates made by professional forecasters for the period from January 1998 to May 2021 for nine economies: Canada, France, Germany, Italy, Japan, Spain, Sweden, the UK, and the US.



## Figure 3: **Long-term monetary policy uncertainty**

The graph shows monthly time series of ex post mean subjective monetary policy uncertainty following Istrefi and Mouabbi (2018) based on 3-month- (blue line) and 12-month-ahead (red line) forecasts of long-term interest rates (i.e., 10-year government bond yields) made by professional forecasters for the period from January 1998 to May 2021 for nine economies: Canada, France, Germany, Italy, Japan, Spain, Sweden, the UK, and the US.

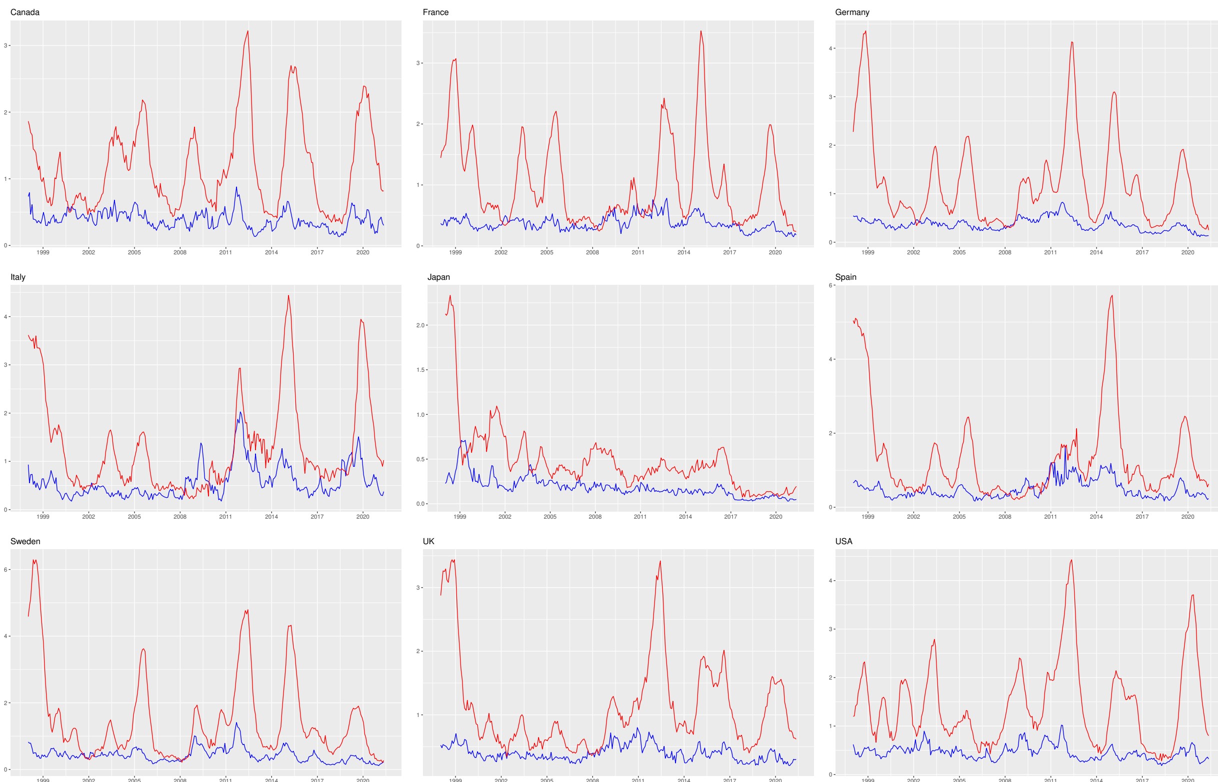
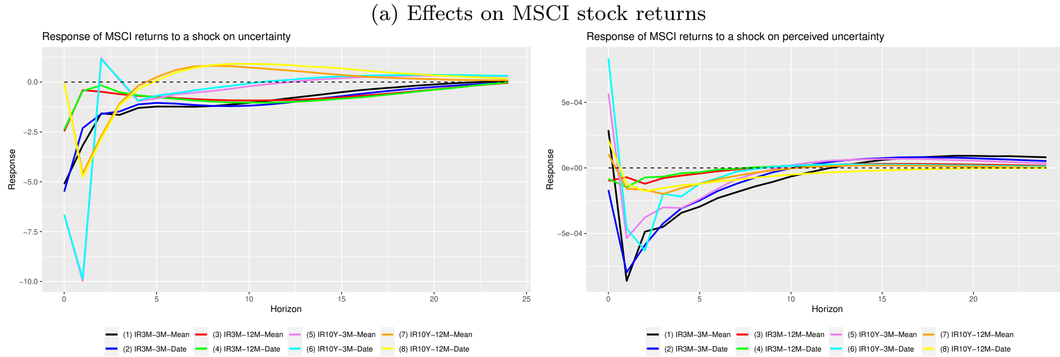


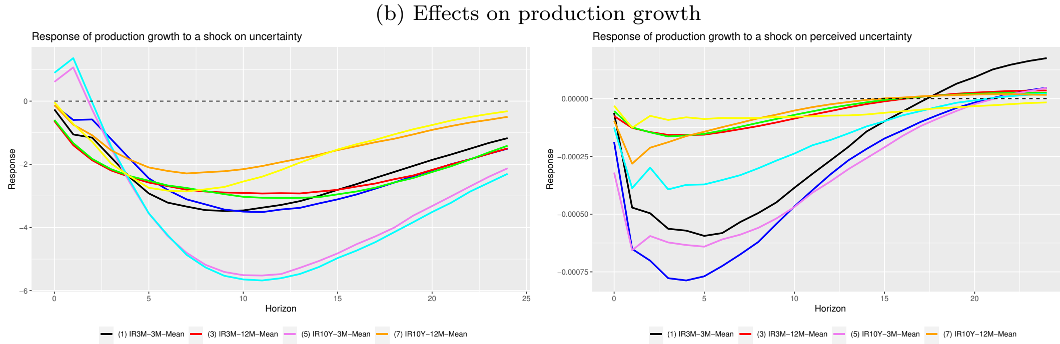
Figure 4: **Effects of monetary policy uncertainty for the USA**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

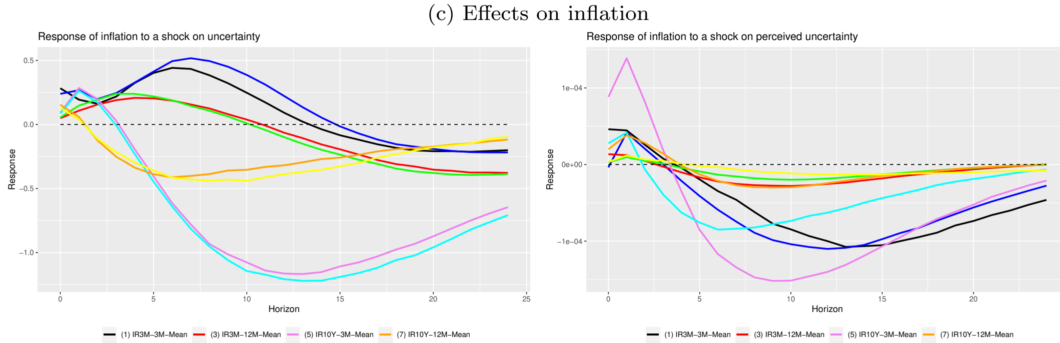
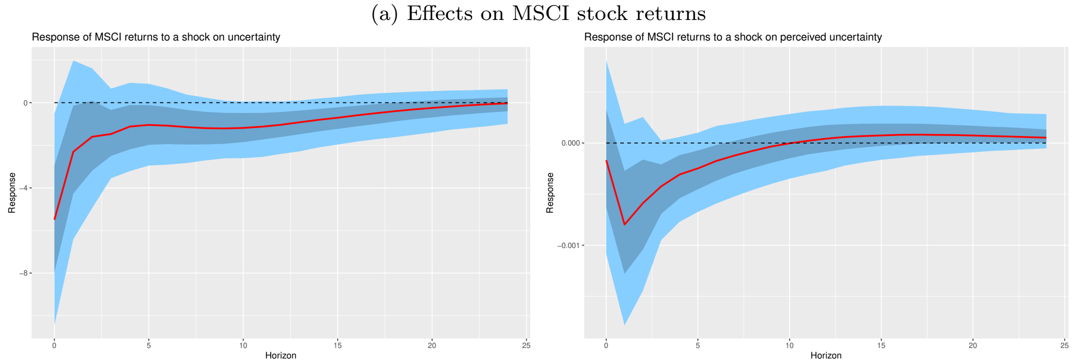


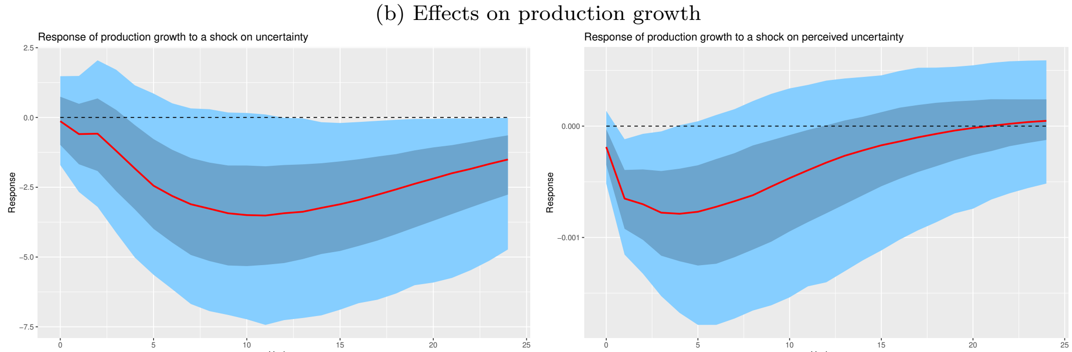
Figure 5: **Effects of monetary policy uncertainty for the USA (IR3M-3M-Date)**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month-ahead (3M) forecasts for short-term interest rates (IR3M). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). 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 is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

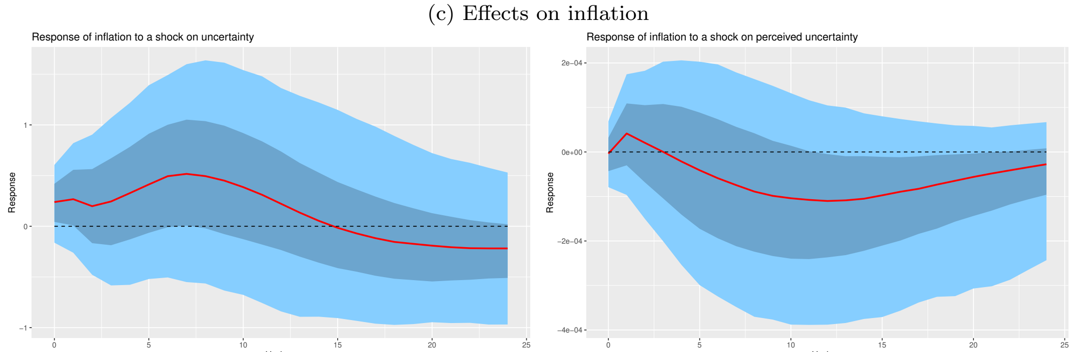
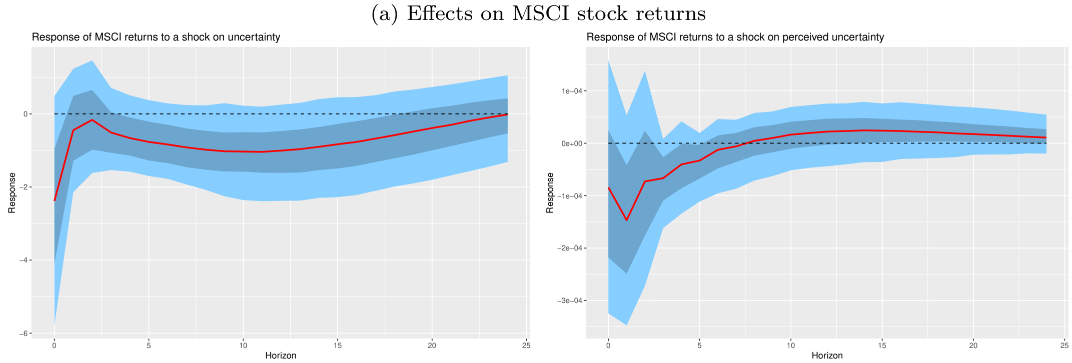


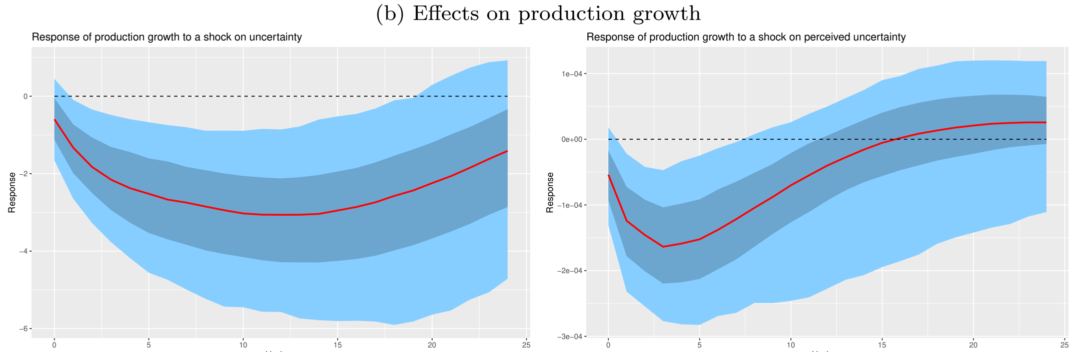
Figure 6: **Effects of monetary policy uncertainty for the USA (IR3M-12M-Date)**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 12-month-ahead (12M) forecasts for short-term interest rates (IR3M). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). 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 is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

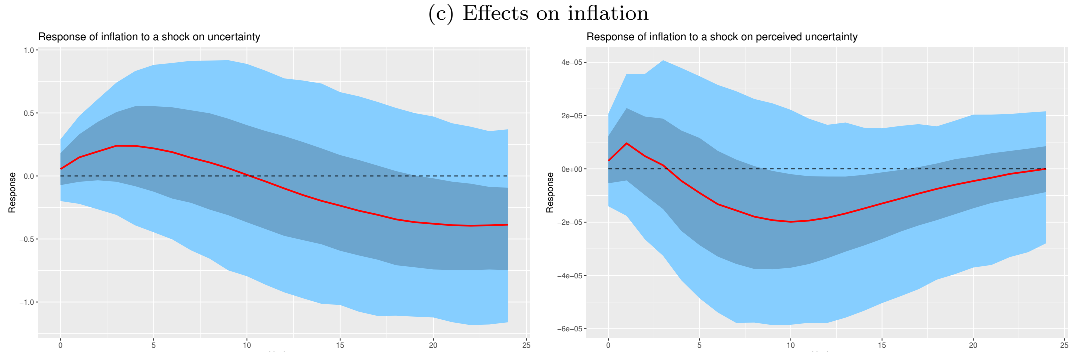
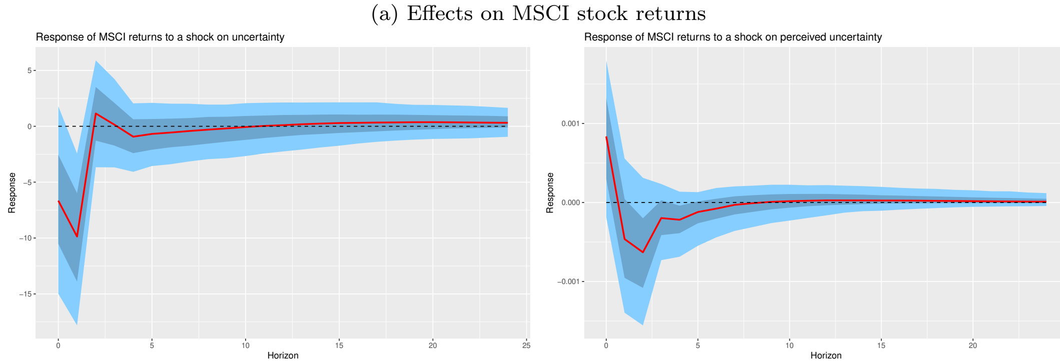


Figure 7: **Effects of monetary policy uncertainty for the USA (IR10Y-3M-Date)**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month-ahead (3M) forecasts for long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). 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 is the zero line.

(a) Effects on MSCI stock returns

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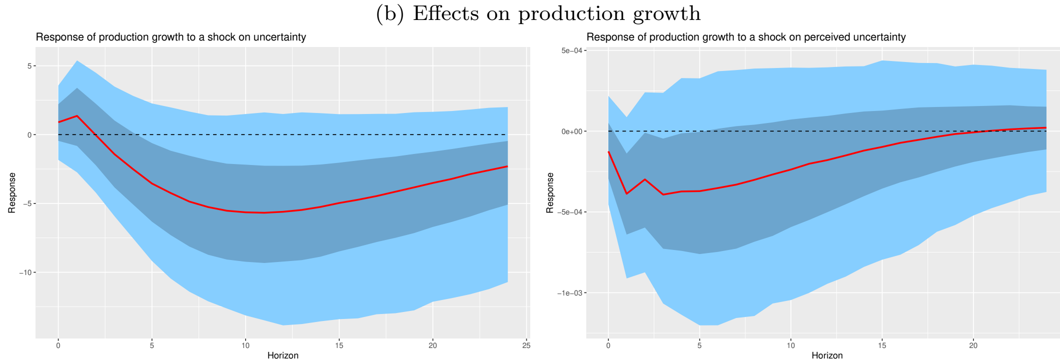



(c) Effects on inflation

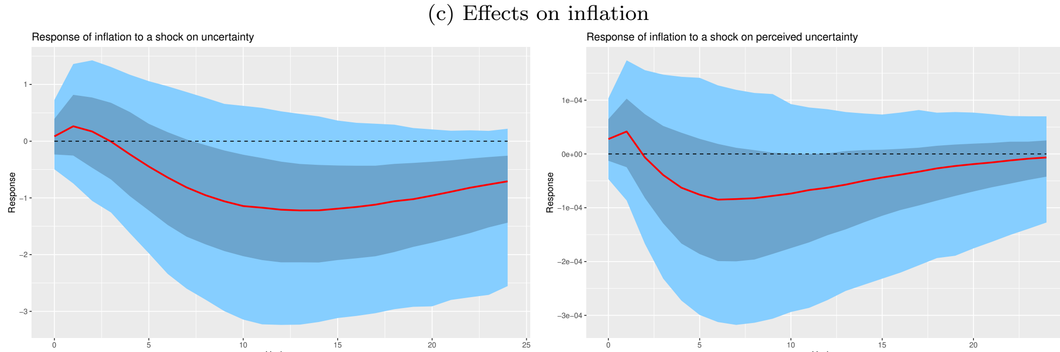
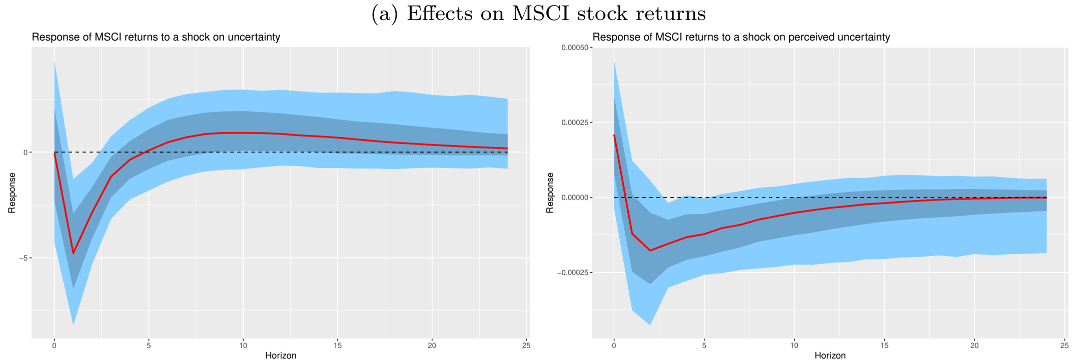


Figure 8: **Effects of monetary policy uncertainty for the USA (IR10Y-12M-Date)**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 12-month-ahead (12M) forecasts for long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). 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 is the zero line.

(a) Effects on MSCI stock returns

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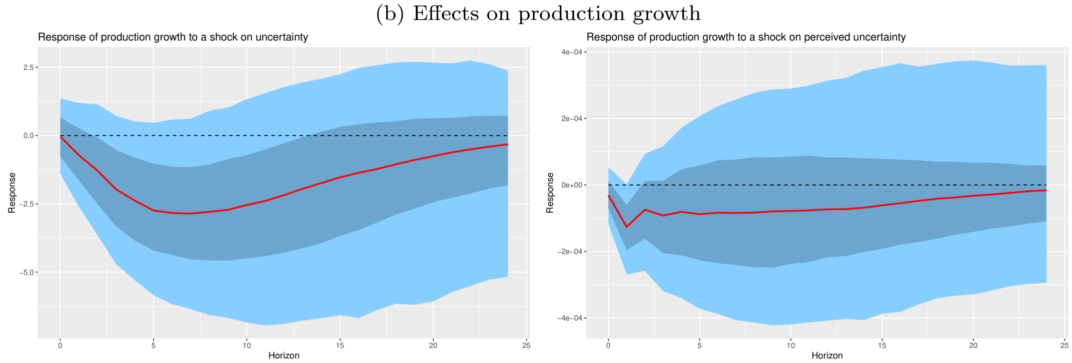
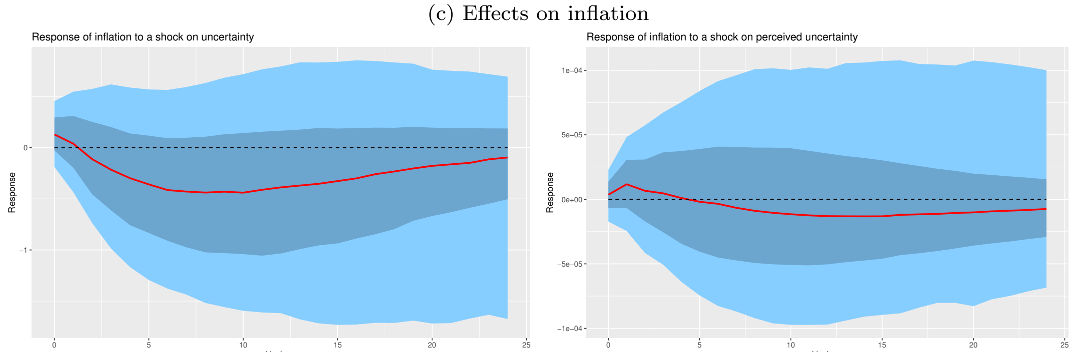


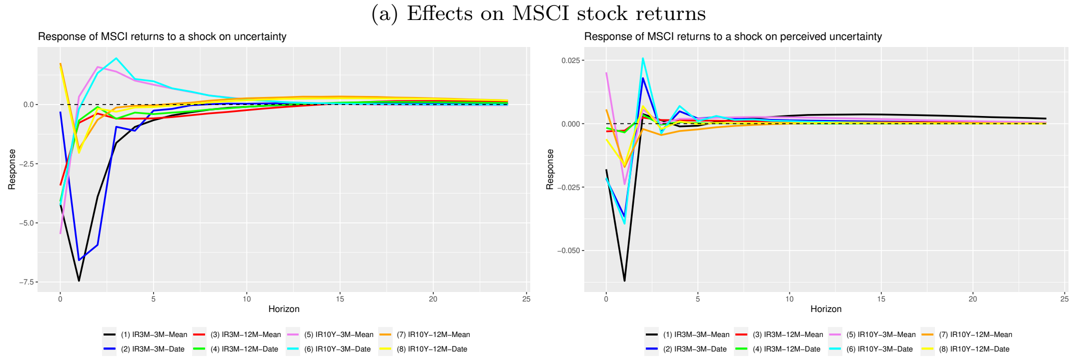

(c) Effects on inflation



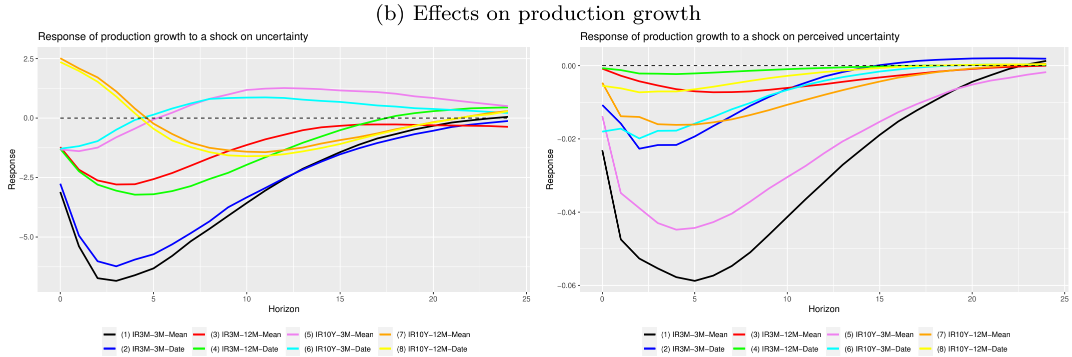
## Figure 9: **Effects of monetary policy uncertainty for Canada**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

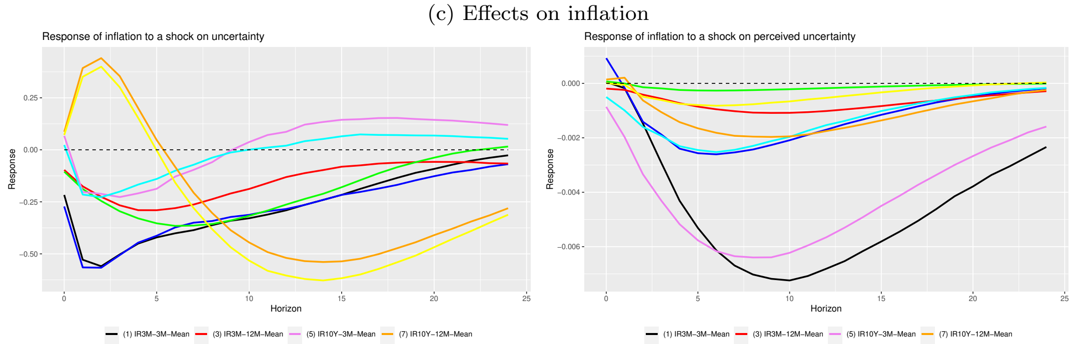
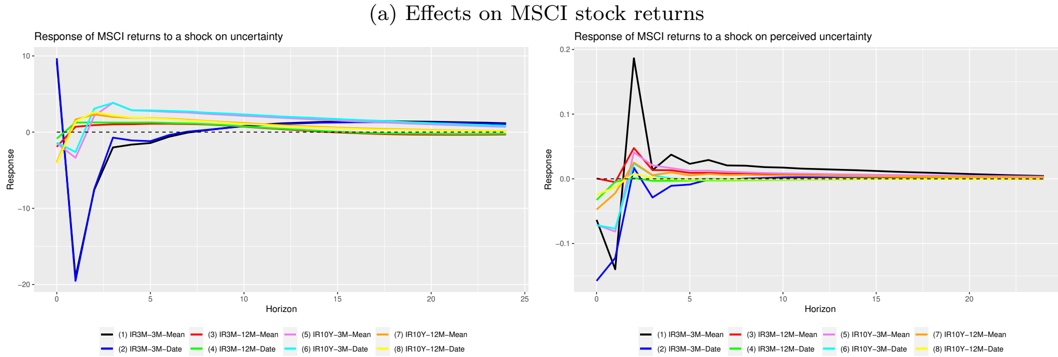


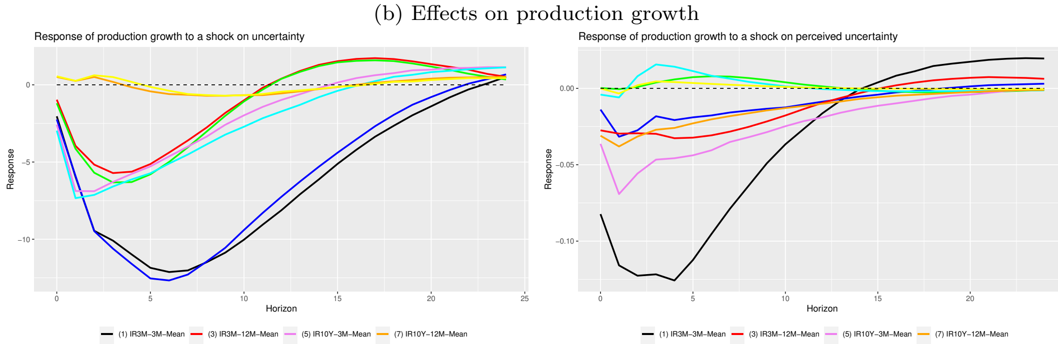
Figure 10: **Effects of monetary policy uncertainty for France**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

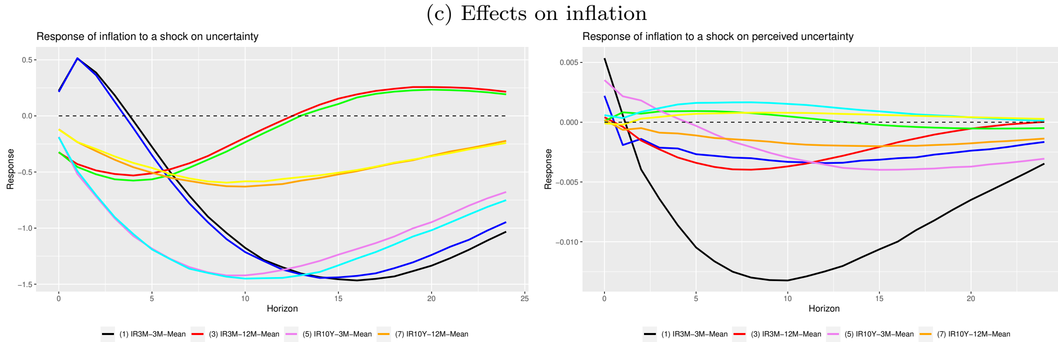
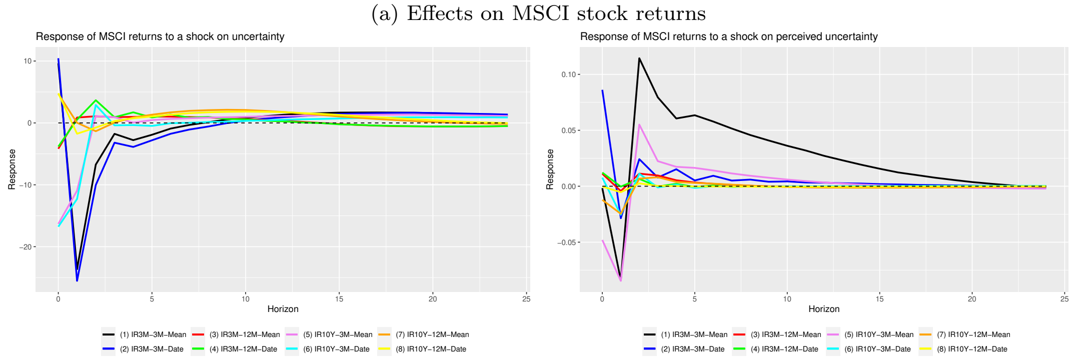


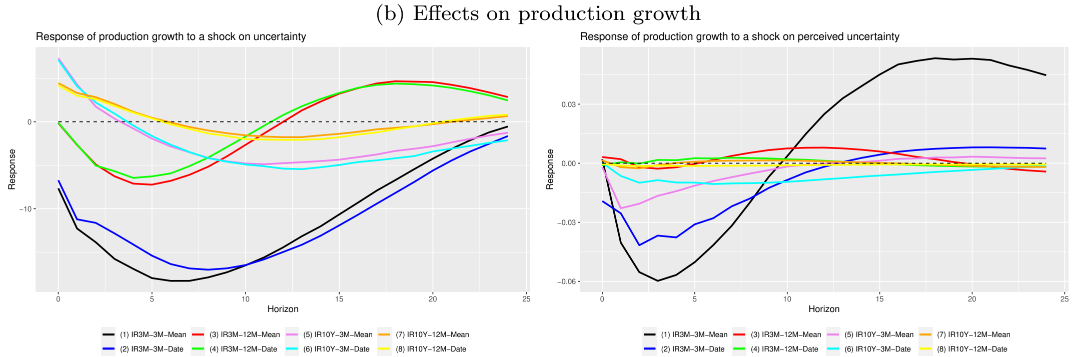
Figure 11: **Effects of monetary policy uncertainty for Germany**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

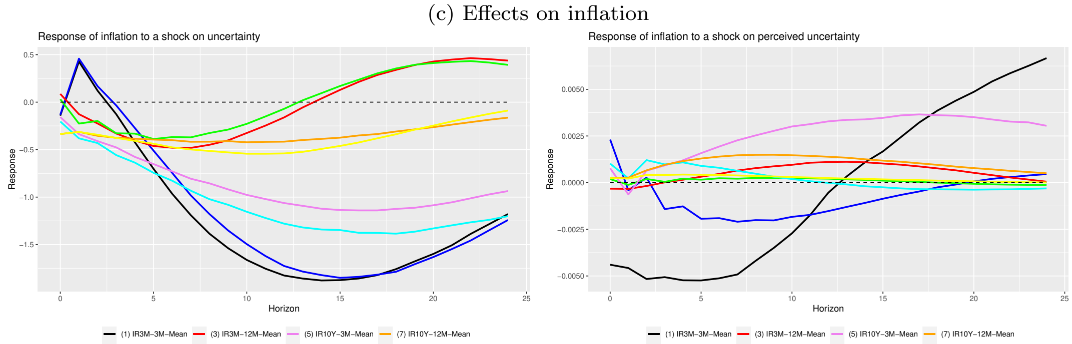
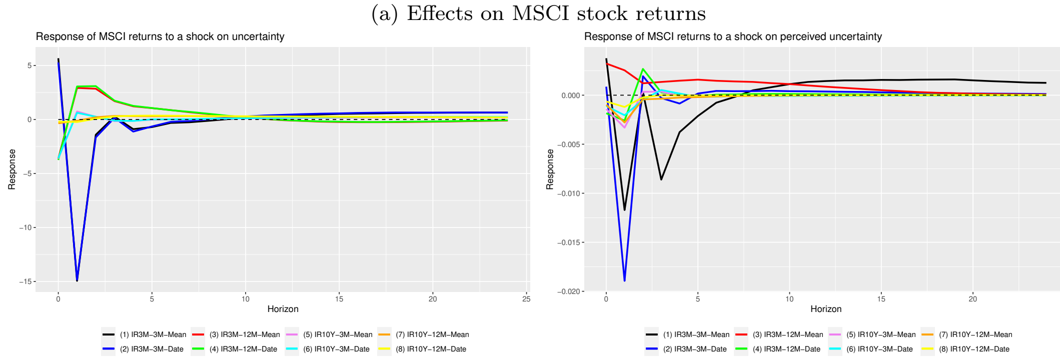


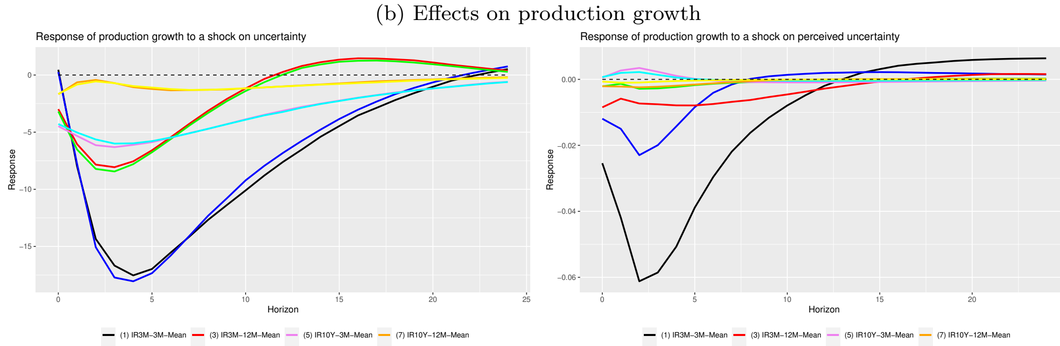
Figure 12: **Effects of monetary policy uncertainty for Italy**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

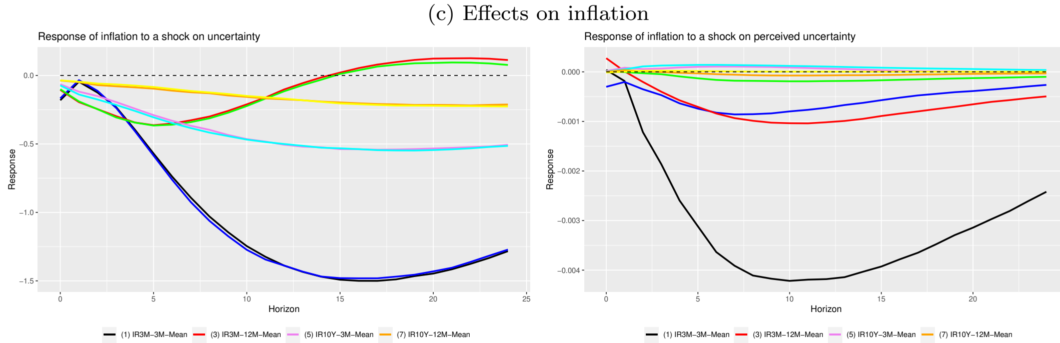
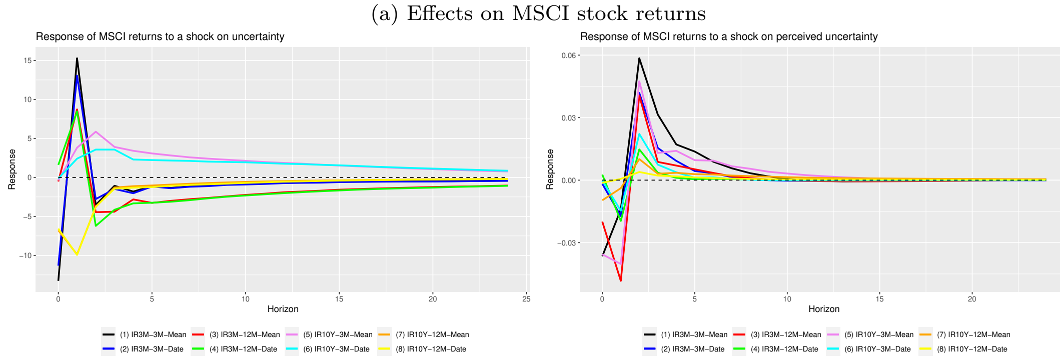


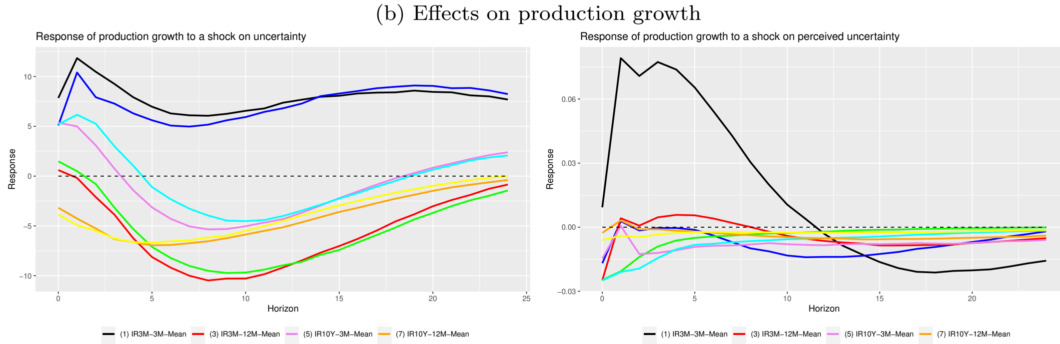
Figure 13: **Effects of monetary policy uncertainty for Japan**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

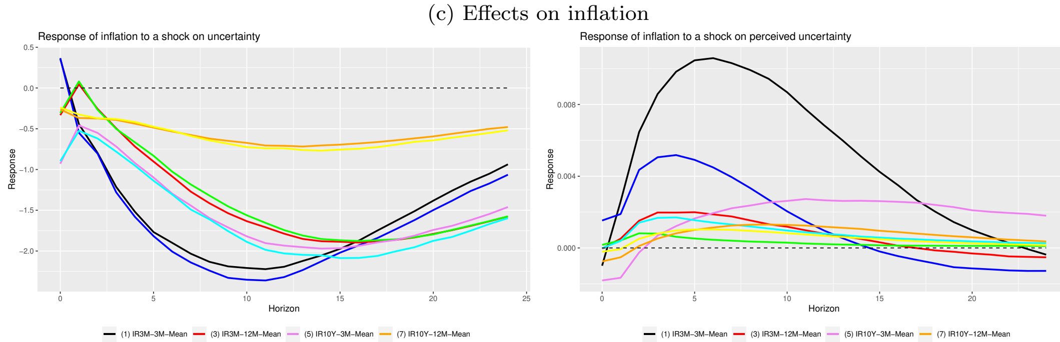
(a) Effects on MSCI stock returns




(b) Effects on production growth



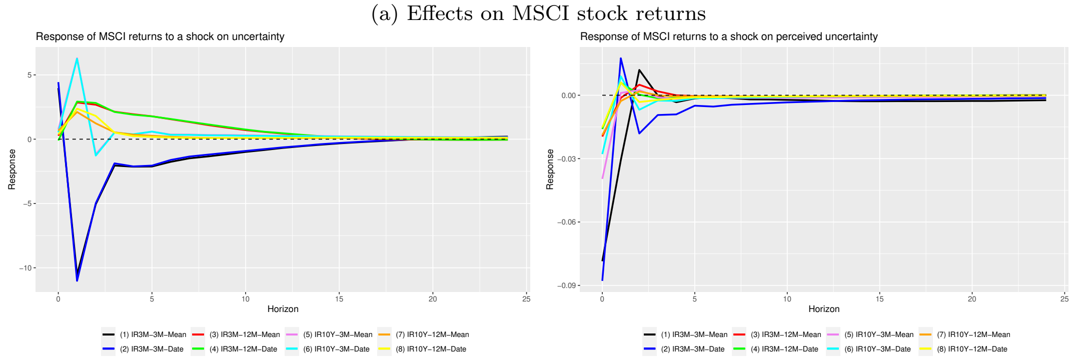

(c) Effects on inflation



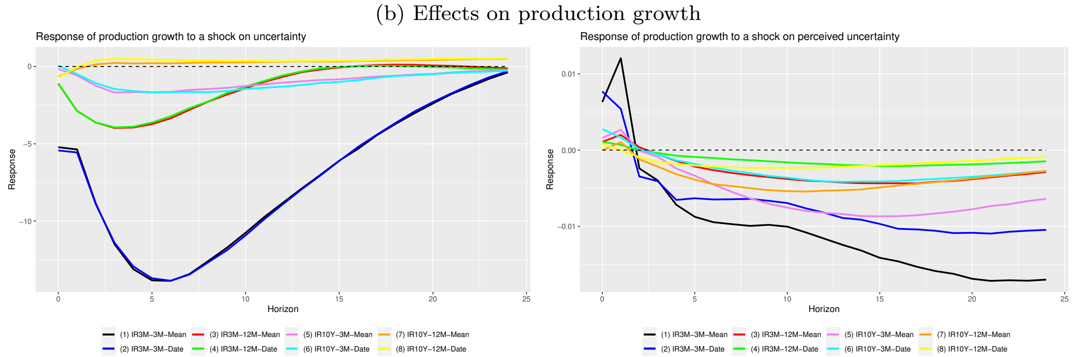
# Figure 14: **Effects of monetary policy uncertainty for Spain**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

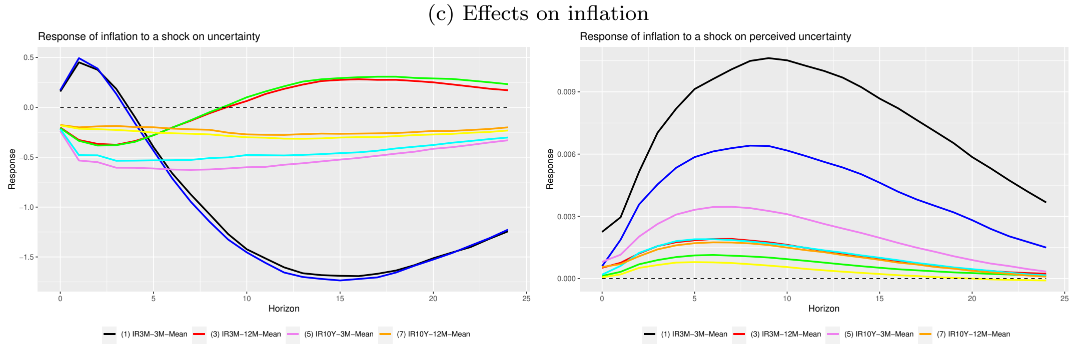
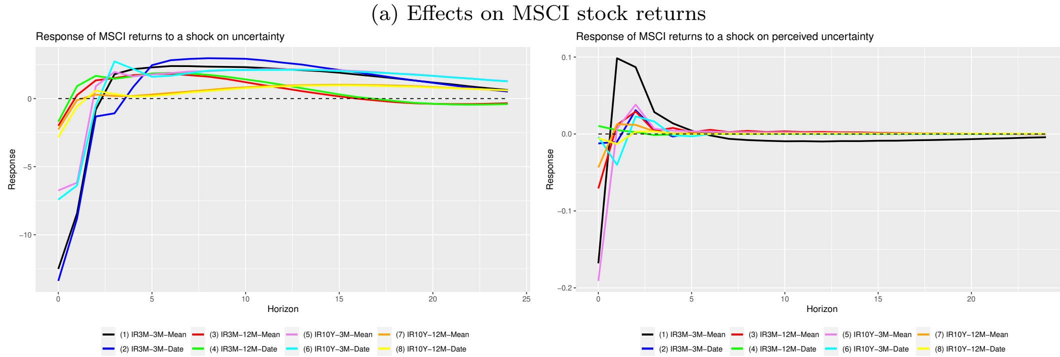


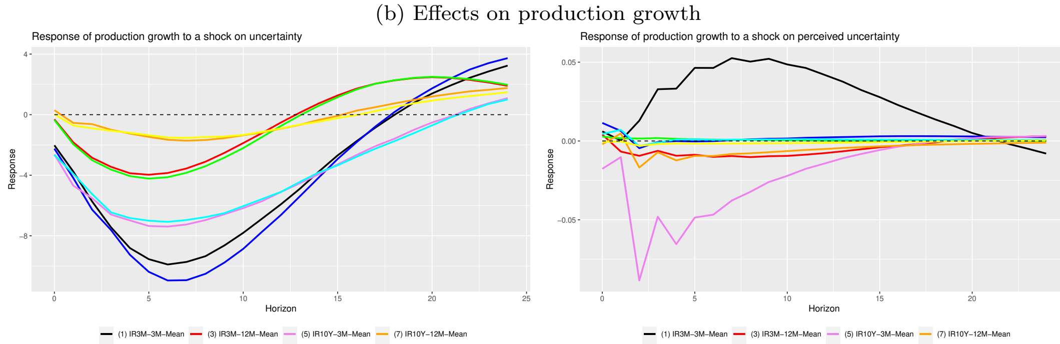
Figure 15: **Effects of monetary policy uncertainty for Sweden**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

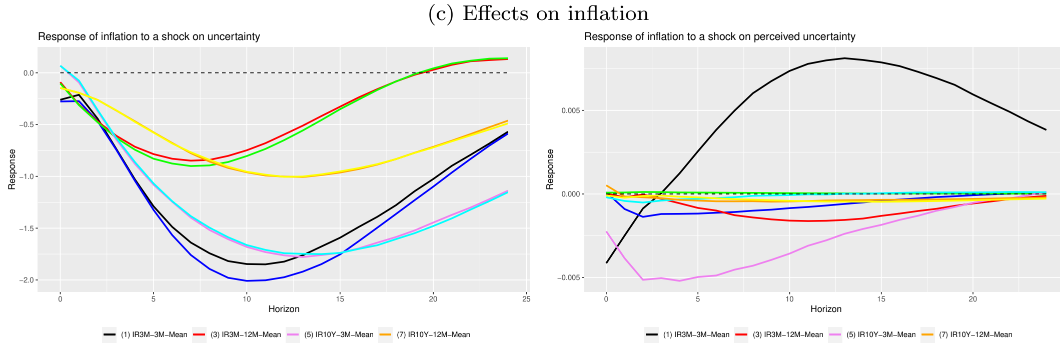
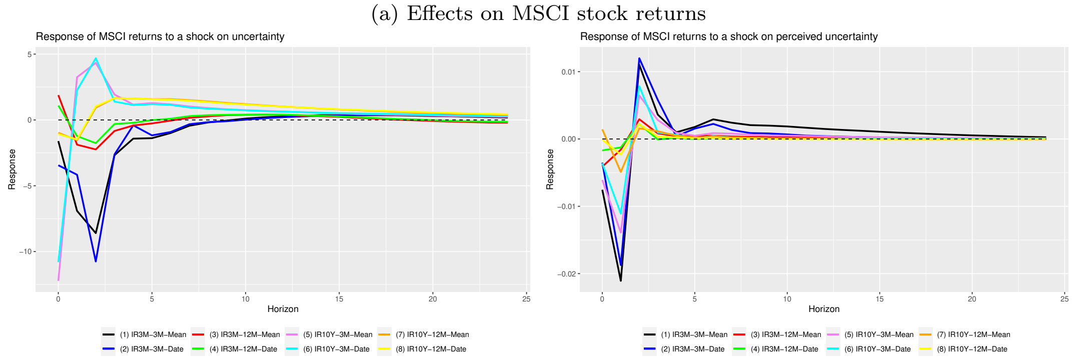


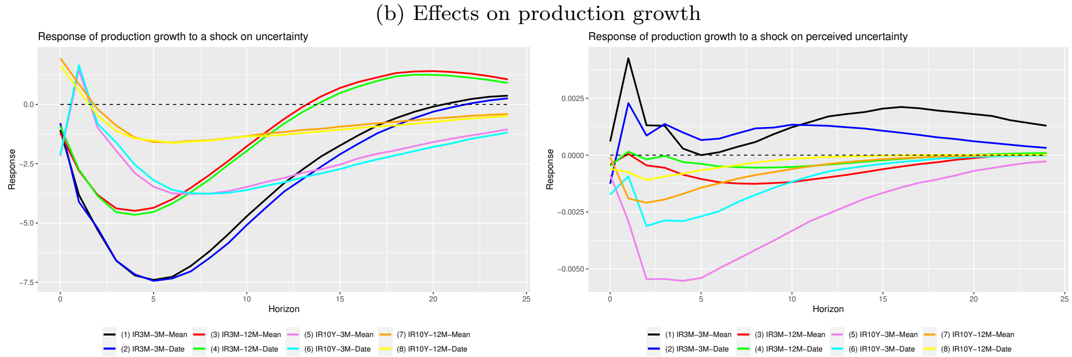
Figure 16: **Effects of monetary policy uncertainty for the UK**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

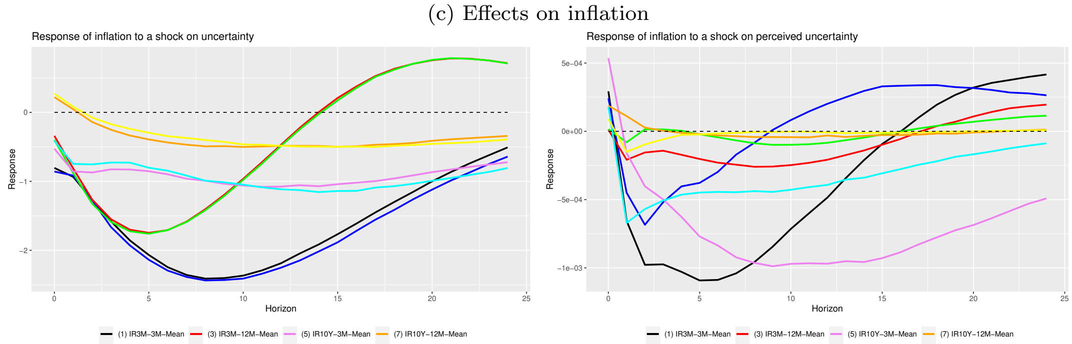
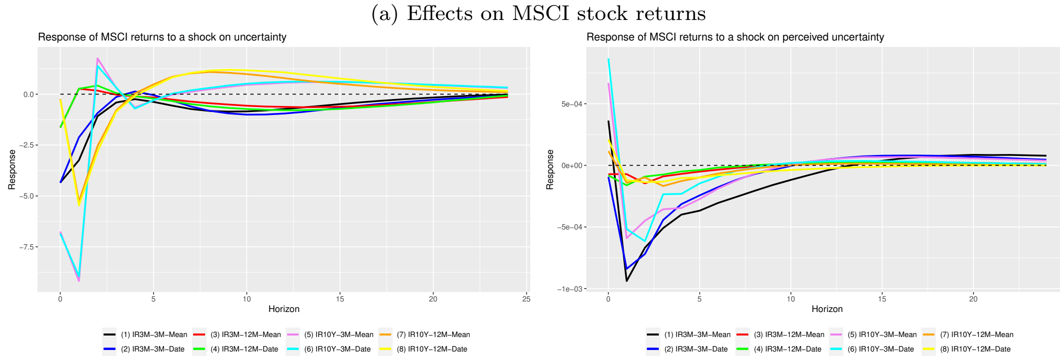


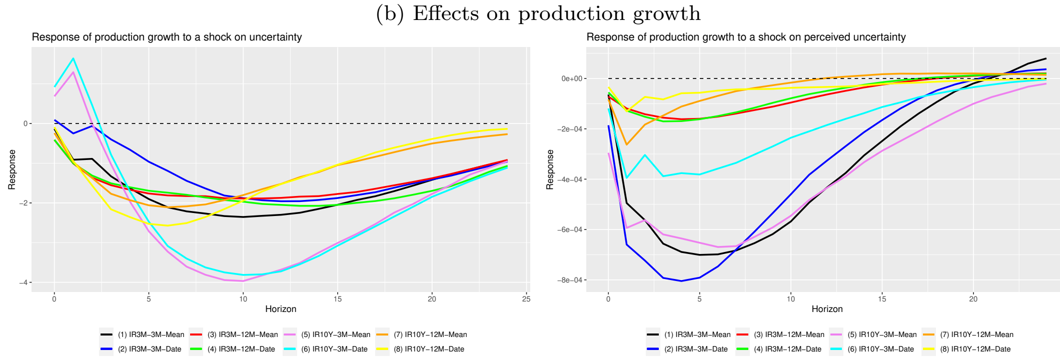
Figure 17: **Effects of monetary policy uncertainty for the USA controlling for recessions**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line. The model has been extended by a dummy variable for recession periods classified by the OECD based on turning points from the period following the peak through the trough.

(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation

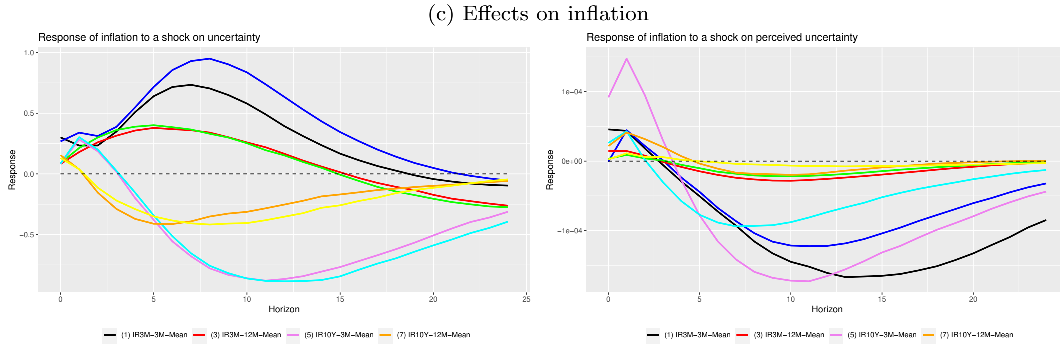
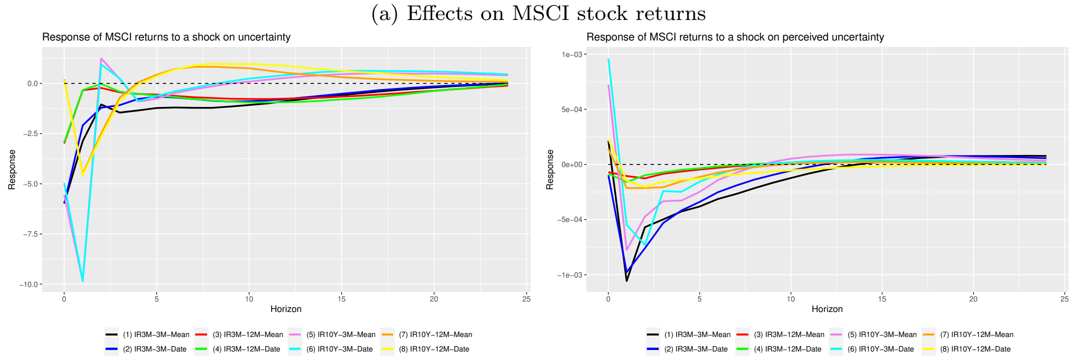


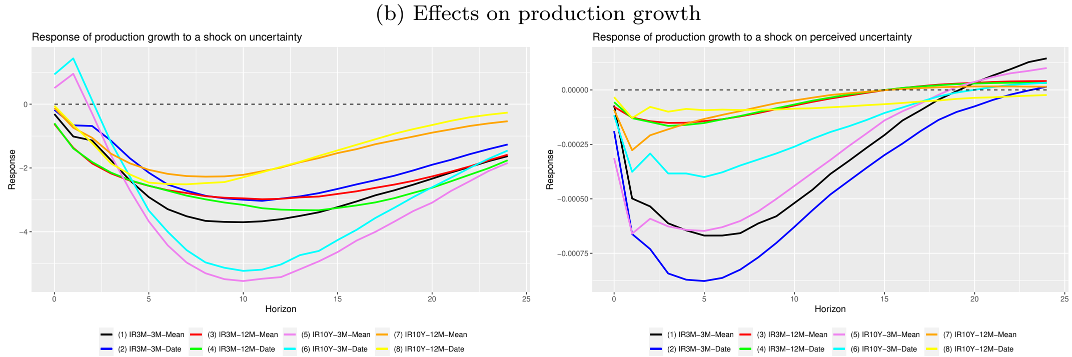
Figure 18: **Effects of monetary policy uncertainty for the USA controlling for forward guidance**

The graphs show different orthogonalized impulse responses based on a Bayesian VAR model including the monetary policy uncertainty measure, an interaction term of the uncertainty measure and the ratesBuzz (uncertainty*ratesBuzz), MSCI stock returns, the growth of industrial production, and CPI inflation. Uncertainty is proxied by the sum of ex post mean forecast error volatility and ex ante forecast disagreement for 3-month- (3M) and 12-month-ahead (12M) forecasts for short-term (IR3M) and long-term interest rates (IR10Y). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date). Therefore, each reaction is provided based on eight different specifications. The dashed black line is the zero line. The model has been extended by the forward guidance factor estimated by Swanson (2021) as an additional exogenous variable.

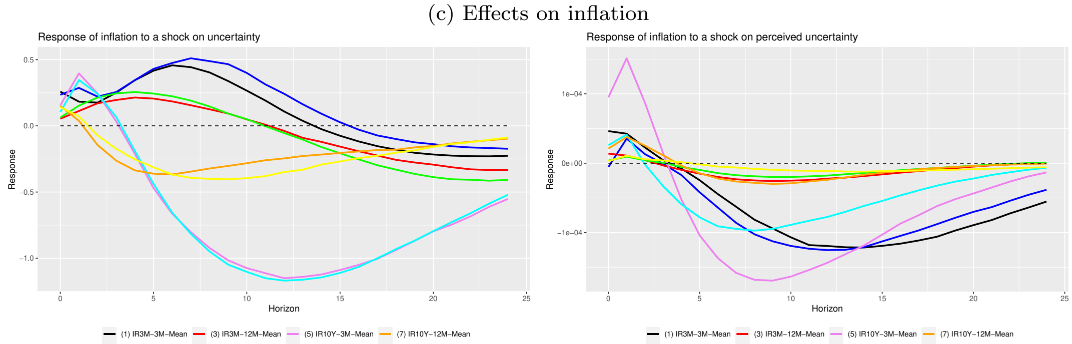
(a) Effects on MSCI stock returns




(b) Effects on production growth




(c) Effects on inflation



## Table 1: **Descriptive statistics**

| | | Canada | France | Germany | Italy | Japan | Spain | Sweden | UK | USA |
|---|---|---|---|---|---|---|---|---|---|---|
| **(a) Short-term interest rates** | | | | | | | | | | |
| **IR3M-R** | **Mean** | 2.1056 | 1.6806 | 1.6775 | 1.7417 | 0.2010 | 1.7090 | 1.6580 | 2.8065 | 1.8260 |
| | **SD** | 1.6346 | 1.7841 | 1.7806 | 1.8770 | 0.2723 | 1.8207 | 1.7900 | 2.4303 | 1.9318 |
| **IR3M-3M-F** | **Mean** | 2.2018 | 1.6788 | 1.6842 | 1.7141 | 0.2608 | 1.7145 | 1.9618 | 2.7834 | 1.9744 |
| | **SD** | 1.6544 | 1.7250 | 1.7445 | 1.7828 | 0.2441 | 1.7648 | 1.7703 | 2.3534 | 1.9450 |
| **IR3M-3M-D** | **Mean** | 0.1587 | 0.1360 | 0.1198 | 0.1270 | 0.0721 | 0.1286 | 0.1590 | 0.1802 | 0.1619 |
| | **SD** | 0.0929 | 0.0805 | 0.0784 | 0.0790 | 0.0452 | 0.0846 | 0.0804 | 0.0914 | 0.0951 |
| **IR3M-3M-V** | **Mean** | 0.1295 | 0.0654 | 0.0563 | 0.0668 | 0.0163 | 0.0589 | 0.2194 | 0.1046 | 0.2024 |
| | **SD** | 0.2364 | 0.1213 | 0.0974 | 0.1090 | 0.0200 | 0.0998 | 0.3558 | 0.2114 | 0.4656 |
| **IR3M-3M-U** | **Mean** | 0.2904 | 0.2029 | 0.1772 | 0.1975 | 0.0887 | 0.1891 | 0.3793 | 0.2868 | 0.3656 |
| | **SD** | 0.2909 | 0.1850 | 0.1612 | 0.1677 | 0.0596 | 0.1728 | 0.4047 | 0.2683 | 0.5117 |
| **IR3M-12M-F** | **Mean** | 2.5492 | 1.8081 | 1.8347 | 1.8541 | 0.3179 | 1.8760 | 2.2680 | 2.9259 | 2.3330 |
| | **SD** | 1.6071 | 1.7335 | 1.7613 | 1.7799 | 0.3081 | 1.7686 | 1.8222 | 2.1896 | 1.8473 |
| **IR3M-12M-D** | **Mean** | 0.3521 | 0.2545 | 0.2270 | 0.2296 | 0.1182 | 0.2333 | 0.2964 | 0.3777 | 0.3427 |
| | **SD** | 0.1464 | 0.1298 | 0.1210 | 0.1179 | 0.0793 | 0.1116 | 0.1320 | 0.1471 | 0.1670 |
| **IR3M-12M-V** | **Mean** | 1.2699 | 0.6340 | 0.6587 | 0.6835 | 0.0537 | 0.6649 | 1.2591 | 0.9084 | 1.7691 |
| | **SD** | 2.0495 | 1.0115 | 1.0414 | 1.1348 | 0.0612 | 0.9998 | 2.1516 | 1.4425 | 2.7778 |
| **IR3M-12M-U** | **Mean** | 1.6383 | 0.9013 | 0.8947 | 0.9302 | 0.1806 | 0.9144 | 1.5656 | 1.2972 | 2.1245 |
| | **SD** | 2.0781 | 1.0759 | 1.1087 | 1.1747 | 0.1341 | 1.0648 | 2.1846 | 1.4923 | 2.8393 |
| **(b) Long-term interest rates** | | | | | | | | | | |
| **IR10Y-R** | **Mean** | 3.3475 | 2.8941 | 2.5843 | 3.7797 | 0.9529 | 3.5570 | 2.8532 | 3.3531 | 3.4605 |
| | **SD** | 1.5855 | 1.7596 | 1.8942 | 1.4478 | 0.6555 | 1.6844 | 1.8582 | 1.6685 | 1.4233 |
| **IR10Y-3M-F** | **Mean** | 3.4952 | 2.9774 | 2.7304 | 3.7754 | 1.0273 | 3.6055 | 2.9962 | 3.4162 | 3.6300 |
| | **SD** | 1.5744 | 1.7447 | 1.8731 | 1.3573 | 0.6810 | 1.5979 | 1.8418 | 1.6372 | 1.4036 |
| **IR10Y-3M-D** | **Mean** | 0.2100 | 0.2096 | 0.1834 | 0.2987 | 0.1260 | 0.2629 | 0.2134 | 0.2300 | 0.2247 |
| | **SD** | 0.0802 | 0.0803 | 0.0526 | 0.1668 | 0.0693 | 0.1435 | 0.0790 | 0.0759 | 0.0728 |
| **IR10Y-3M-V** | **Mean** | 0.1741 | 0.1618 | 0.1825 | 0.2718 | 0.0591 | 0.2204 | 0.2137 | 0.1673 | 0.2311 |
| | **SD** | 0.0858 | 0.0662 | 0.1046 | 0.2275 | 0.0672 | 0.1555 | 0.1764 | 0.0700 | 0.1222 |
| **IR10Y-3M-U** | **Mean** | 0.3863 | 0.3716 | 0.3667 | 0.5725 | 0.1865 | 0.4840 | 0.4278 | 0.3976 | 0.4570 |
| | **SD** | 0.1310 | 0.1180 | 0.1306 | 0.3426 | 0.1182 | 0.2483 | 0.2061 | 0.1205 | 0.1488 |
| **IR10Y-12M-F** | **Mean** | 3.8174 | 3.2141 | 3.0116 | 3.9248 | 1.1748 | 3.7853 | 3.3204 | 3.6266 | 4.0018 |
| | **SD** | 1.5061 | 1.7292 | 1.8699 | 1.3185 | 0.7455 | 1.5197 | 1.7815 | 1.5552 | 1.3342 |
| **IR10Y-12M-D** | **Mean** | 0.3338 | 0.3057 | 0.2893 | 0.3751 | 0.2051 | 0.3500 | 0.3224 | 0.3711 | 0.3778 |
| | **SD** | 0.1002 | 0.0859 | 0.0758 | 0.1504 | 0.1076 | 0.1137 | 0.1043 | 0.1003 | 0.1004 |
| **IR10Y-12M-V** | **Mean** | 0.8415 | 0.7200 | 0.9230 | 0.9299 | 0.2650 | 0.9838 | 1.1692 | 0.7500 | 1.0513 |
| | **SD** | 0.6536 | 0.7107 | 0.9269 | 0.9522 | 0.3306 | 1.1879 | 1.3122 | 0.7149 | 0.8564 |
| **IR10Y-12M-U** | **Mean** | 1.1822 | 1.0363 | 1.2168 | 1.3072 | 0.4814 | 1.3406 | 1.4997 | 1.1262 | 1.4361 |
| | **SD** | 0.6538 | 0.7150 | 0.9118 | 0.9813 | 0.3817 | 1.2162 | 1.3218 | 0.7415 | 0.8565 |
| **(c) RatesBuzz** | | | | | | | | | | |
| **ratesBuzz-Mean** | **Mean** | 75.6661 | 15.6602 | 47.6956 | 40.9311 | 134.5629 | 20.2063 | 10.5694 | 214.4992 | 1909.1268 |
| | **SD** | 56.7821 | 15.7463 | 37.9309 | 79.3943 | 122.0971 | 57.3015 | 10.2559 | 150.0656 | 1330.9912 |
| **ratesBuzz-Date** | **Mean** | 60.8416 | 17.8612 | 55.1708 | 64.0053 | 147.9359 | 19.5107 | 8.8826 | 203.6993 | 1847.2473 |
| | **SD** | 65.7316 | 24.9991 | 63.3993 | 185.8660 | 180.5112 | 65.9217 | 17.2479 | 167.9763 | 1481.9676 |

*Note:* The table reports arithmetic means and standard deviations (SD) for the interest rates and the ratesBuzz for nine economies: Canada, France, Germany, Italy, Japan, Spain, Sweden, the UK, and the US. The acronyms stand for: IR3M – 3-month interest rates, IR10Y – 10-year government bond yields, R – realized value, 3M – 3-months-ahead, 12M – 12-months-ahead, F – mean forecast across forecasters, D – disagreement among forecasters (i.e., standard deviation across forecasters), V – estimated volatility of forecast errors, U – uncertainty (= D + V). The ratesBuzz is provided on a daily basis and has been converted to monthly frequency by using monthly averages (Mean) and by exactly matching the deadline date for the survey of professional forecasters conducted by Consensus Economics, i.e., the date at which forecasters had to submit their (interest rate) forecasts (Date).