# Monetary Policy Uncertainty in the Banking Sector*

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**Abstract**

This paper introduces a novel measure of uncertainty about monetary policy in the banking sector. First, I build a dictionary of bi-grams related to monetary policy based on the TealBooks A. Second, I employ this dictionary to measure monetary policy uncertainty using earnings call transcripts for US banks since 2002. Uncertainty about monetary policy in the banking sector is then introduced in Structural vector autoregression (SVAR), using daily variations of uncertainty around FOMC announcements as instruments. Evidence suggests that monetary policy uncertainty is an important driver of macro-economic aggregates. The paper reveals that uncertainty about monetary policy in the banking sector predicts drops in industrial production and surges in the credit spread. The findings remain robust to using the level of uncertainty as instruments and orthogonalizing with bank fundamentals. Looking at the cross-section, the paper finds that banks with high perceived monetary policy uncertainty increase the interest rate charged in the syndicated loan market compared to low uncertainty banks. Beliefs about monetary policy uncertainty thus have important implications for credit markets and business cycle fluctuations.

**Keywords:** Monetary Policy, sentiment analysis, textual analysis

**JEL Codes:** G21; G30; G40; D83; M1.

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# 1 Introduction

Monetary policy communication is at the core of the monetary policy toolkit. The effects of monetary policy communication and forward guidance have been extensively researched (Handlan, 2020; Hansen and McMahon, 2016; Jarociński and Karadi, 2020). Evidence is unclear on the effect of central bank communication on the economy. Hansen and McMahon (2016) find that shocks to forward guidance do not have an impact on real economic activity. In contrast, Handlan (2020) reports that the impact of forward guidance is twice as large as traditional monetary policy shocks when measured using text-shocks based on FOMC statements. The evidence is thus largely inconclusive and exclusively focuses on the supply of information given by monetary policy to the public. This paper studies monetary policy in a new way. Instead of looking at the supply of information from the central bank, the paper measures banks' perceptions about monetary policy directly.

Literature shows that uncertainty about public policy has an impact on economic activity. Baker et al. (2016) build an index of economic policy uncertainty and find that it predicts drops in economic activity. Recent research focuses on the role of monetary policy uncertainty in news. Husted et al. (2020) present an index counting economic policy uncertainty bi-grams in big US news papers and document that it foresees a fall in industrial production. While these news-based indices illustrate the impact of aggregate uncertainty in news, they assume a high and constant attention to newspapers in the public. The news-based measures therefore ignore the role of the public's perception of monetary policy despite its role in the monetary policy transmission. Indeed, recent studies argue that perception of monetary policy impacts its transmission mechanism (Masolo and Monti, 2021). Bauer et al. (2023) show that perception about monetary policy changes over time and influences the reaction to interest rate changes. To fully capture the role of monetary policy uncertainty, a sound empirical approach therefore needs to incorporate the evolution of monetary policy perception across time.

The empirical evidence thus far exclusively uses survey data or stock returns to capture perception of monetary policy. Bauer et al. (2023) uses the Blue Chip Financial Forecasts (BCFF) which mainly focuses on financial markets participants and might not relate to commercial banks fundamentals. Other studies capture perceptions through the reaction of the stock market (Gati and Handlan, 2021; Hattori et al., 2016). Combining both, Elenev et al. (2024) report that stock market sensitivities are impacted by the survey of professional forecasters perceptions of monetary policy. Such approaches, however, ignore the perception of real decision-makers in the economy, such as banks and firms managers. On top of this, a common assumption behind the use of surveys is that attention to the macro-economic environment by firms is constant. This is nonetheless not true since it varies with the business cycle (Flynn and Sastry, 2023). By using text-mining techniques to capture monetary policy beliefs and perception, the empirical approach developed in this paper does not assume constant attention to the environment. This paper thus contributes to the literature by building an index of monetary policy uncertainty at the bank level that allows for change in attention across time. Furthermore, it is the first paper using daily variations of beliefs elicited in earnings calls to causally identify monetary policy uncertainty shocks. The contribution is thus also methodological because it offers a stronger identification scheme than the literature thus far using market-based measures as instruments to identify monetary policy uncertainty shocks.

First, I analyze the evolution of attention to monetary policy. A raw count of the words 'monetary policy' and 'interest rate' reveals that monetary policy is, more than ever, at the center of banks' managers discussions with analysts. With this in mind, I build a dictionary of monetary policy words by isolating sections of the Tealbooks A (formerly know as Greenbooks) based on their titles. When a title refers to monetary policy, the text following the title is extracted to create a dictionary of monetary policy words. Evidence highlights that

banks pay more attention to monetary policy when they are large and inflation and rates are elevated.

Second, I build a new proxy of uncertainty about monetary policy based on transcript of conversations between managers and analysts in bank earnings conference calls. Following Hassan et al. (2019), I compute the sentiment of words appearing 10 words before or after a monetary policy bi-gram. To capture uncertainty at the bank level, I employ Hassan et al. (2021) algorithm and count the occurrence of risk words within 10 words of the monetary policy bi-gram. Regressions on fundamentals highlights that banks perceive more monetary policy uncertainty if they have few deposits to fund their loan portfolio. Third, I compute the cross-sectional average of monetary policy sentiment and sum uncertainty words for banks. I find that bank monetary policy uncertainty peaks around shifts in the monetary policy regime, at the end of the forward guidance period for example. Bank uncertainty also aligns with the inter-quartile range of interest rate forecast in the Survey of Professional Forecasters and correlates with the news-based measure of Husted et al. (2020). This serves as a sense-check of the bank indices and illustrates how aggregate forecasts and uncertainty in the banking sector are consistent.

The empirical results are divided in three parts. First, I am interested in the impact of monetary policy uncertainty at the bank level. The earnings calls dataset is merged with bank fundamentals and Dealscan to understand how monetary policy uncertainty impacts lending conditions. The evidence shows that high monetary policy at the bank level impact interest rate costs when controlling for credit demand. Second, I run a VAR a la Gertler and Karadi (2015) at the monthly frequency using bank monetary policy uncertainty on FOMC days for each month. The monthly uncertainty indicator captures the impact of monetary policy on FOMC announcement to isolate the effect of monetary policy uncertainty from 'FOMC uncertainty cycles' found in (Bauer et al., 2021). The main threat to the identifica-

tion is that monetary policy uncertainty might be high prior to a FOMC meetings because some monetary policy news has appeared the day before. On top of this, monetary policy uncertainty could be high because of bad bank fundamentals revealed in the the earnings calls or large interest surprises in the FOMC announcement. Monetary policy uncertainty on FOMC days is thus instrumented with daily movements in uncertainty that are orthogonalized with bank fundamentals, and high-frequency movements interest rate and forward guidance surprises. These movements in bank monetary policy are exogenous variations and identify monetary policy uncertainty surprises.

The impulse response functions document how monetary policy uncertainty in the banking sector causally impacts economic activity measured with industrial production. Results at the quarterly level also indicate that monetary policy uncertainty surprises lead to drops in investment. Moreover, monetary policy uncertainty shocks tend to increase the credit spread in the first year, consistent with Husted et al. (2020). The results are robust to using uncertainty on FOMC days directly, not orthogonalizing with bank fundamentals and only looking at FOMC days with at least five banks presenting earnings calls.

Finally, I dive deeper into the transmission channels of monetary policy uncertainty shocks. Using a similar specification as Husted et al. (2020), I find that monetary policy uncertainty shocks predict higher interest rate costs. The within firm effect is robust to controlling for the business cycle and macro-economic expectations impacting borrowing costs. The impact on borrowing costs is concentrated on the first three quarters and offers an explanation for the lagged response of investment and industrial production. On impact, borrowing costs increase and then firms react to higher interest expenses by reducing production and investment. On top of standard controls, I build a measure of monetary policy sentiment and uncertainty at the firm level for more than 200 000 earnings calls. The firm measure of monetary policy uncertainty does not impact borrowing costs but has a negative impact on investment rates. Beliefs at the firm level thus play a role on top of the financial frictions

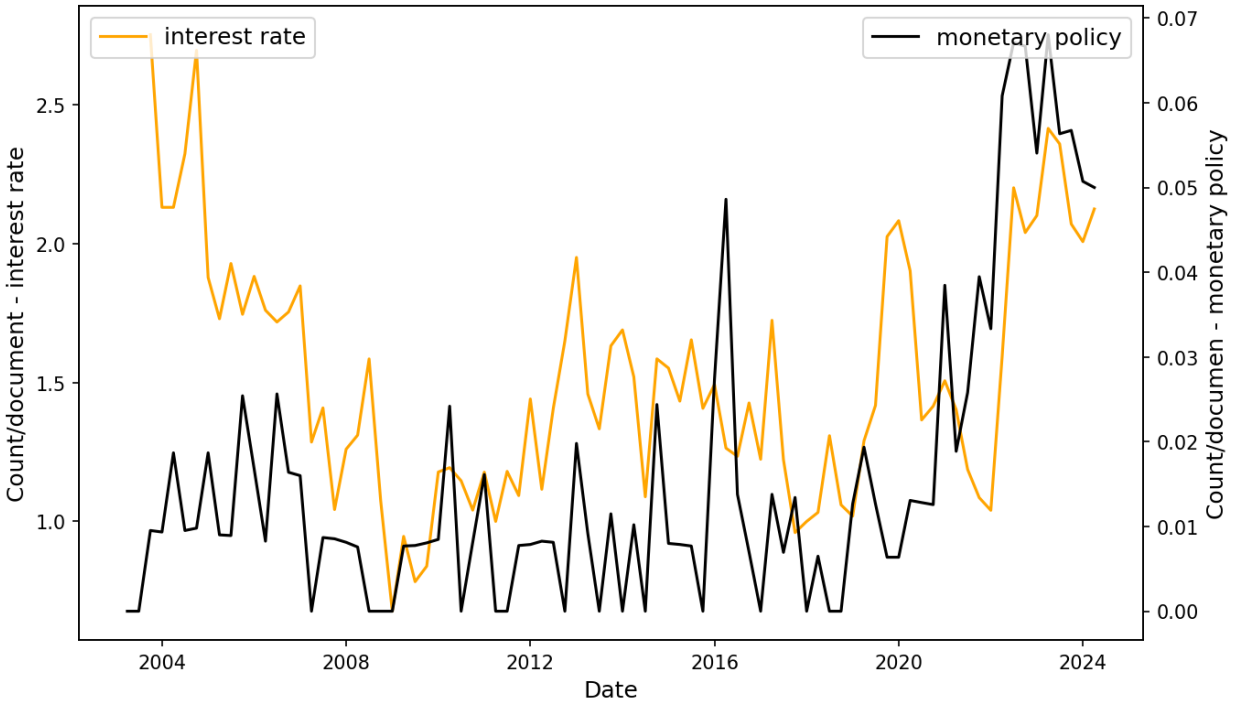
channel identified in this paper.

# 2 Renewed attention to Monetary Policy in the banking sector

With the return of high inflation, monetary policy has been at the center of public attention in the last three years. Banks have always mentioned macro-economic factors in their conversations with managers and analysts. This phenomenon is not novel; empirical evidence suggests that the mention of macroeconomic factors in firms' 10-K documents during times of crisis dates back to the 1990s (Flynn and Sastry, 2023). Figure 1 plots the count of mentions of the bi-grams "monetary policy" and "interest rate" per bank earnings calls. The graph corroborates these results: banks have indeed paid attention to monetary policy over the last 20 years. What is striking from the graph is that both mentions of the bi-grams "interest rate" and "monetary policy" have reached a new peak over the last 3 years. While rates were already increasing from the end of 2015, the rate surge of 2022 has sparked particularly high attention to monetary policy in the banking sector. Overall, the graph documents that attention to monetary policy in the banking sector is at an all time high relative to the past two decades. Studying beliefs about monetary policy in the banking sector is thus particularly relevant since monetary policy is mentioned when banks present their earnings.

Figure 1: Mentions of Monetary Policy and Interest rate

(a)




# 3 A Index of Uncertainty about Monetary Policy

## 3.1 A dictionary of monetary policy words

The main objective of this paper is to capture the level of optimism and uncertainty about monetary policy of US banks. The main difficulty lies in separating the text referring to monetary policy from parts of the text mentioning the situation of the firm. To address this concern, I construct a dictionary of terms related to monetary policy. To assemble this dictionary, I download Tealbooks A (formerly known as Greenbooks) from the Federal Reserve website from June 2010 until December 2017. These statements offer several advantages. First, they tend to be focusing on economic matters and employ a specialized vocabulary that reduces noise in the dictionary. Second, they resolve one of the significant challenges in building a monetary policy dictionary. Indeed, central banks often mention words related to the economy and monetary policy together. So building a dictionary from

FOMC statements or Beige books naturally leads to words refering to both the economy and monetary policy. The Tealbooks A are unique in that they employ headers, with sections covering monetary policy, risks and uncertainties as well as the economy. I take advantage of this natural separation between topics and isolate texts following a title referring to monetary policy from titles referring to economic growth and risks. [1].

Using regular expressions, I extract all the text after a monetary policy title and group it in a monetary policy text. The monetary policy text is then treated as a 'bag-of-words' for which the order of words does not matter. The text has a many tables and numeric characters since the Tealbooks A are used to communicate Central bank forecasts. I therefore start by removing numeric characters and quarters in rows of tables. I then remove double white spaced created by this algorithm. Finally, I run all the text through a cleaning algorithm that removes stop words and alpha-numeric characters smaller than two characters.

The text is broken into bi-grams. Using a count-vectorizer yields 25391 bi-grams. These bi-grams are then simply ranked by absolute frequency. I start by removing bi-grams based on their frequency. A bi-gram is retained in the list if it appears in at least half of the Tealbooks. Since I have 61 Tealbooks, a bi-gram has to appear at least 30 times in the text to be in the list. Next, I select monetary policy bi-grams. If the bi-gram has an ambiguous meaning and could be interpreted differently in another context such as "balance sheet" or "asset price", it is removed. Next, I remove bi-grams that appear less than 30 times in the economic words section (following the same algorithm). There is still some noise in the list. I finish by removing bi-grams containing the nouns "inflation" and "price". As such, I obtain a list of 101 words referring to monetary policy. I add monetary policy words from Baker et al. (2016) to make sure synonyms identified in the literature are included in the list. The whole list can be found in Appendix A.

[1] An example of the Teal book header structure is given in Appendix A.1 and the full list of titles is presented in Appendix A.2

## 3.2 Data and Pre-processing

The dataset comprises 10,957 bank earnings calls spanning from Q1 2001 to Q4 2023. These transcripts are extracted from Refinitiv Event Search. Earnings calls are a conference call in which analysts have the opportunity to ask questions to managers about earnings of the past quarter. During these conversations managers often talk about the macro-economic environment such as political risk or country risk (Hassan et al., 2019, 2021). I start by cleaning these earnings calls and remove special characters form the .txt format. Using an algorithm developed by Pastor Y Camarasa and Lamers (2023), I segment the text into sections where managers speak and analysts pose questions. This is done with speaker names and punctuation cues: I separate questions in the Q&A section from answers of CEOs by identifying the name of the speaker. If the speaker is a "Corporate Participants" (CP) representing the bank, the text is an answer. When the "Conference Call Participants" (CCP) speaks, the text is a question. If the name of the speaker is not provided in the transcript, a sentence is identified as a question if it finishes by '?'. The rest of the paper uses the concatenated text of Presentation and Answers to build the analysis. I merge the bank earnings calls with fundamentals from SNL Financials and obtain fundamentals for 323 US banks. Appendix B shows the descriptive statistics for banks in the sample. The bank fundamentals are in line with the literature. The equity-to-asset ratio is around 11% whereas loan-to-deposit ratio is around 92%. These banks are thus generally well capitalized and lend actively.

## 3.3 Monetary policy uncertainty at the bank level

The main contribution of the paper is to build an index of monetary policy uncertainty at the bank-level based on bank earnings. The algorithm used here closely follows Hassan et al. (2021) to limit measurement errors emanating from algorithmic choices. The index is

built as follows:

$$MPUn_{i,t} = \frac{1}{B_{it}} \sum_{b}^{B_{it}} \Big( [|b - r| < 10] \Big) \tag{1}$$

The construction of the index is in line with Hassan et al. (2019). The algorithm isolates bi grams b that refer to monetary policy from the dictionary described above. It then searches for synonyms of risk and uncertainty within 10 words of the monetary policy bi-grams. The risk words are synonyms obtained from the English Oxford Dictionary. The algorithm simply counts the appearance of these risks words associated with monetary policy and normalizes by $B_{it}$, the number of bi-grams in the earnings calls.

Measuring second moments beliefs about policy decisions is often a challenge because policy changes often affect both the first and second moment at the same time. To control for changes in the first moment of the distribution, I build another index that captures sentiment about monetary policy. Instead of conducting simple sentence identification, the algorithm looks at the sentiment of words within a 10 words window around monetary policy concepts. The monetary policy sentiment of bank i, at quarter t, is given by:

$$MPSent_{i,t} = \frac{1}{B_{it}} \sum_{b}^{B_{it}} \Big\{ \Big( \sum_{g=b-10}^{b+10} S(g) \Big) \Big\} \tag{2}$$

The construction of the index broadly follows Hassan et al. (2021). The algorithm first identifies a bi-gram b referring to monetary policy from the monetary policy dictionary and then finds the ten words $g$ on the right and the left of the bi-gram b and sums the sentiment of each word $S(g)$. The sentiment score are obtained from Shapiro et al. (2022). The sum of the sentiment scores is then divided by the number of bi-grams in the text. The final monetary policy sentiment is thus average of these sentiment scores.

## 3.4 Index validation - Why pay attention to monetary policy?

To validate the index, this section regresses the bank-level indices onto their fundamentals. The objective of the exercise is to understand the drivers of monetary policy attention

and sentiment between banks as well as to validate the construction of the index with fundamentals. The main regression follows:

$$y_{i,t} = \delta_t + \beta X_{i,t} + \epsilon_{i,t} \tag{3}$$

This simple regression measures the correlation between bank fundamentals with the sentiment or uncertainty of the bank. $y_{i,t}$ is the text-mining variable of interest. $MPAtt_{i,t}$ is an indicator of bank attention counting the number of bi-grams related to monetary policy. $y_{i,t}$ is replaced with the other text indices described in section 3.3. $X_{i,t}$ are bank controls. $\delta_t$ is a time fixed effects. Standard errors are clustered at the bank level. The regression is run at the quarterly level. The regression only includes time fixed effects. This means that the coefficient $\beta$ in the regression can be interpreted as a between-effect comparing two banks. This is deliberate because the objective of the regressions is to understand how the distribution of beliefs is correlated with characteristics of the bank.

Table 1 depicts a regression analysis of the number of monetary policy bi-grams against bank fundamentals. Column (1) highlights that attention and bank fundamentals are correlated. Bigger banks tend to pay more attention to monetary policy than smaller banks. One explanation is that large banks tend to have an economic analysis department which provides a deeper analysis of monetary policy. Banks with a lower equity-to-asset ratio and less provisioning also pay more attention to monetary policy. This indicates that having more portfolio risk or less capital buffer to sustain that risk makes a bank more wary of interest rate changes and the conduct of monetary policy. Moreover, what stands out from the table is that banks with high loans-to-deposits and low-equity-to-asset ratios, tend to worry more about monetary policy. These are banks with a large quantity of loans and a low amount of deposits to fund these assets. These banks would see a dramatic fall in asset value if interest rates were to rise. The results of Table 1 are consistent with the idea that monetary policy uncertainty is in consistent with the fundamentals of the bank.

Table 1: Relationship between managers' and analysts' sentiment

| | (1) $\text{MPAtt}_{b,t}$ | (2) $\text{MPUn}_{b,t}$ |
|---|---|---|
| $\log(\text{Size})_{b,t}$ | 0.153*** | -0.0173 |
| | (0.0192) | (0.0114) |
| $\text{Eq/TA}_{b,t}$ | -0.0224** | -0.0206*** |
| | (0.00980) | (0.00610) |
| $\text{Loans/dep}_{b,t}$ | 0.00318 | 0.00341** |
| | (0.00219) | (0.00142) |
| $\text{ROA}_{b,t}$ | -0.0256 | 0.0132 |
| | (0.0259) | (0.0177) |
| $\text{LLP}_{b,t}$ | -0.491*** | -0.154** |
| | (0.0996) | (0.0732) |
| Time FEs | Yes | Yes |
| Bank FEs | No | No |
| N | 9943 | 9943 |
| R2 | 0.198 | 0.0464 |

This table shows regression of bank managers' attention and uncertainty index computed on their earning calls. Bank monetary policy attention is the count of monetary policy bigrams in earnings calls. Bank monetary policy uncertainty is computed looking at 10 words before and after the monetary policy words, and counting synonyms of risk words. All controls are winsorized at the first and 99th percentile. Attention and Uncertainty are winsorized at the 99th percentile only. Standard errors (in parentheses) are clustered at the bank-level and ***, ** and * refer to significance at the 1%, 5% and 10%.

Table 2 presents the correlation between banks attention, uncertainty and macro-economic fundamentals. First, banks pay closer attention to monetary policy when Federal Fund rates are high and the economy is slowing down with inflationary pressures. Once again, economic agents tend to pay attention to the economic environment when it affects them. Second, bank monetary policy uncertainty aligns with measures of monetary policy uncertainty based on news. Monetary policy uncertainty is indeed correlated with the monetary policy index of Husted et al. (2020) at the 1% significance level. This indicates that bank managers are also influenced by news in the media about monetary policy uncertainty. Moreover, banks worry about monetary policy when they are in a macro-economic environment with high inflation and GDP growth that is auspicious to a monetary response. Managers attention and perception of monetary policy uncertainty therefore align with the macro-economic environment.

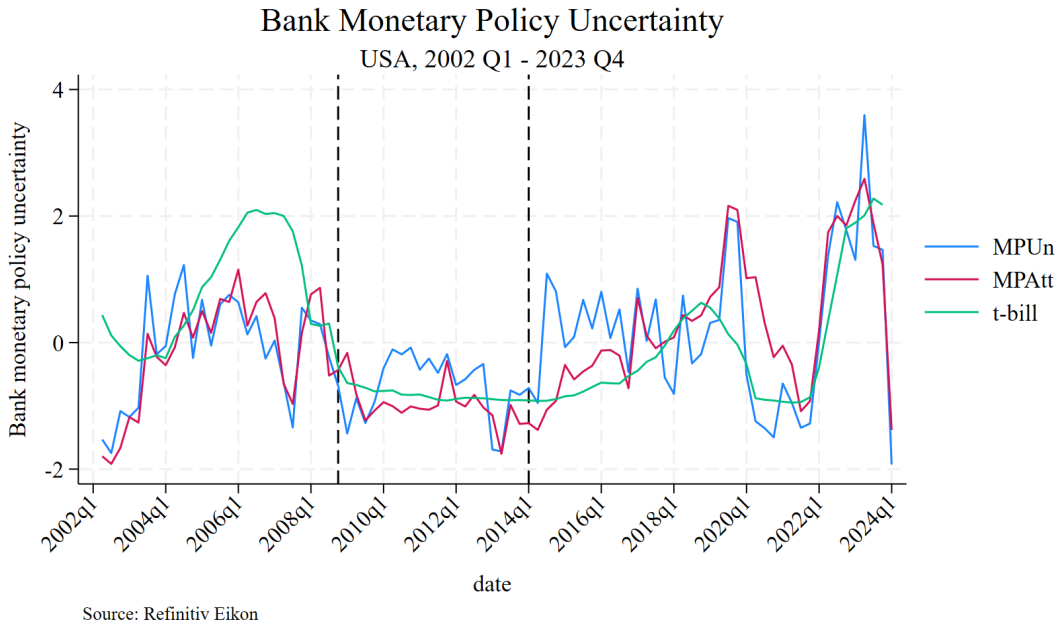
Table 2: Relationship between managers' and analysts' sentiment

| | (1) $\text{MPAtt}_{b,t}$ | (2) $\text{MPUn}_{b,t}$ |
|---|---|---|
| Federal Fund rate$_t$ | 0.0976*** | 0.0178** |
| | (0.0130) | (0.00885) |
| inflation$_t$ | 0.0458*** | 0.0184* |
| | (0.0109) | (0.00947) |
| GDP growth$_t$ | -0.0158*** | 0.0171*** |
| | (0.00451) | (0.00390) |
| log(SP500)$_t$ | -0.0143 | -0.185*** |
| | (0.0656) | (0.0490) |
| log(emp)$_t$ | -0.566 | -0.306 |
| | (0.592) | (0.471) |
| Husted et al.(2020)$_t$ | 0.00175*** | 0.00108*** |
| | (0.000141) | (0.000128) |
| Time FEs | No | No |
| Bank FEs | Yes | Yes |
| N | 10349 | 10349 |
| R2 | 0.349 | 0.199 |

This table shows regression of bank managers' attention and uncertainty index computed on their earning calls. Bank monetary policy attention is the count of monetary policy bigrams in earnings calls. Bank monetary policy uncertainty is computed looking at 10 words before and after the monetary policy words, and counting synonyms of risk words. All controls are winsorized at the first and 99th percentile. Attention and Uncertainty are winsorized at the 99th percentile only. Standard errors (in parentheses) are clustered at the bank-level and ***, ** and * refer to significance at the 1%, 5% and 10%.

## 3.5 Business Cycle Behavior

Figure 2




In this section, we sum $MPUn_{b,t}$ and $MPAtt_{b,t}$ for each quarter to understand how aggregate monetary policy uncertainty moves along the business cycle. Banks' beliefs about monetary policy are in line with the conduct of monetary policy as can be seen on Figure 2. The attention of banks to monetary policy peaks during the financial crisis and at the start of the forward-guidance policy. It then falls during the period of forward guidance (between the two dotted black vertical lines). This means that banks were particularly inattentive to monetary policy when it was communicating the most. At the end of the forward guidance, attention follows the interest rate and slowly increases to peak before the Covid-19 crisis. Monetary policy uncertainty offers a more interesting business cycle behavior. While interest rates were high before the financial crisis, monetary policy uncertainty started to decrease before seeing a sharp increase around 2007 and 2008. The forward guidance period in Q4 2008 marks the start of a period of historically low uncertainty around monetary policy. The intense communication of the Fed to the public therefore managed to calm banks' perception

of uncertainty. The end of Forward Guidance sees the end of a regime of low-for-long and uncertainty suddenly surges when the interest rates start increasing. Around 2019, when interest rates are starting to fall again, the change of dynamics in the fed fund rate goes hand in hand with a large increase in monetary policy uncertainty. Hence, over the last three years, monetary policy uncertainty has broadly followed the reference interest rate. The graph thus shows that uncertainty is high during periods of regime shift where the dynamics of monetary policy is not predictable at the end of Forward Guidance and before the Covid-19 crisis.

Figure 3

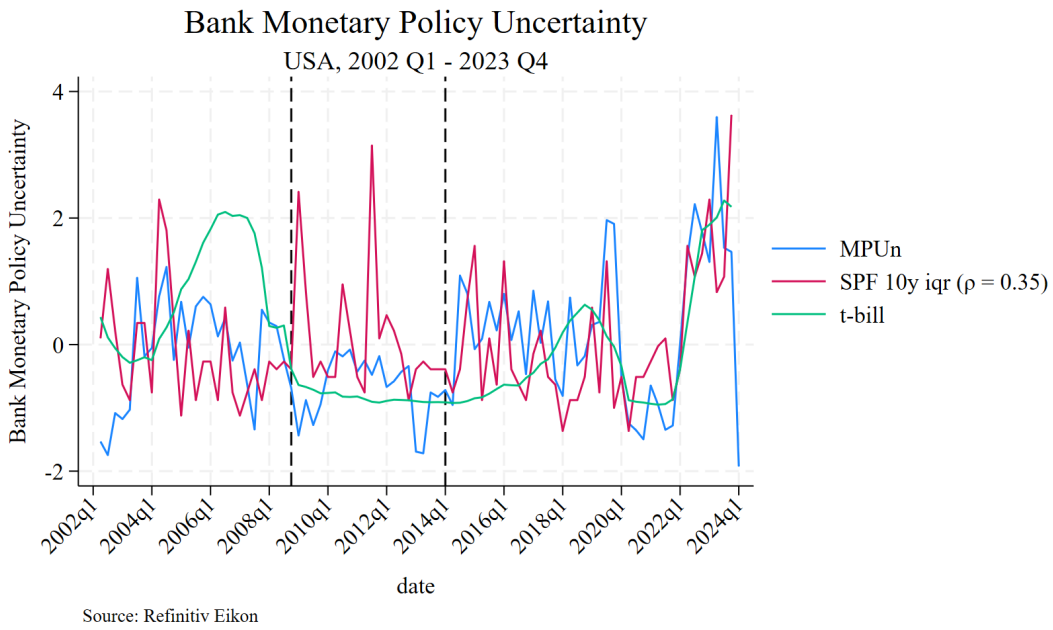



Figure 3 plots the evolution of bank uncertainty against the median forecast of the Survey of Professional Forecaster. Bank uncertainty about monetary policy is plotted against the inter-quartile range of forecast. Visually, there is no strong association between this common measure of uncertainty and monetary policy uncertainty before the period of Forward Guidance. During Forward Guidance, monetary policy uncertainty was low whereas there was some spikes in interest rate uncertainty. Over the last 10 years, bank monetary policy uncertainty and interest rate forecast disagreement are strongly aligned with a cor-

relation of 0.64. There is a new association between bank monetary policy uncertainty and the disagreement in forecast. When thinking about monetary policy uncertainty, the index thus captures uncertainty about the long-term rates. Furthermore, this association indicates that monetary policy uncertainty captured in earnings calls is conceptually similar to the concept of Knightian Uncertainty found in (Ilut and Saijo, 2021; Bianchi et al., 2018; Ilut and Schneider, 2014). According to this literature, Knightian uncertainty gives rise to ambiguity, which is the impossibility for agents to assign a single probability to future events. As such, agents' are ambiguity averse and behave as if they observed the worse probability distribution. In thus context, these macro-economic models would describe a situation in which the representative agent lending to the firm is ambiguity averse and lends to the firm with the worst-case probability distribution in its mind. Figure 3 thus suggests that peaks in uncertainty in the banking sector are periods when the range of monetary policy actions widens.

Figure 4

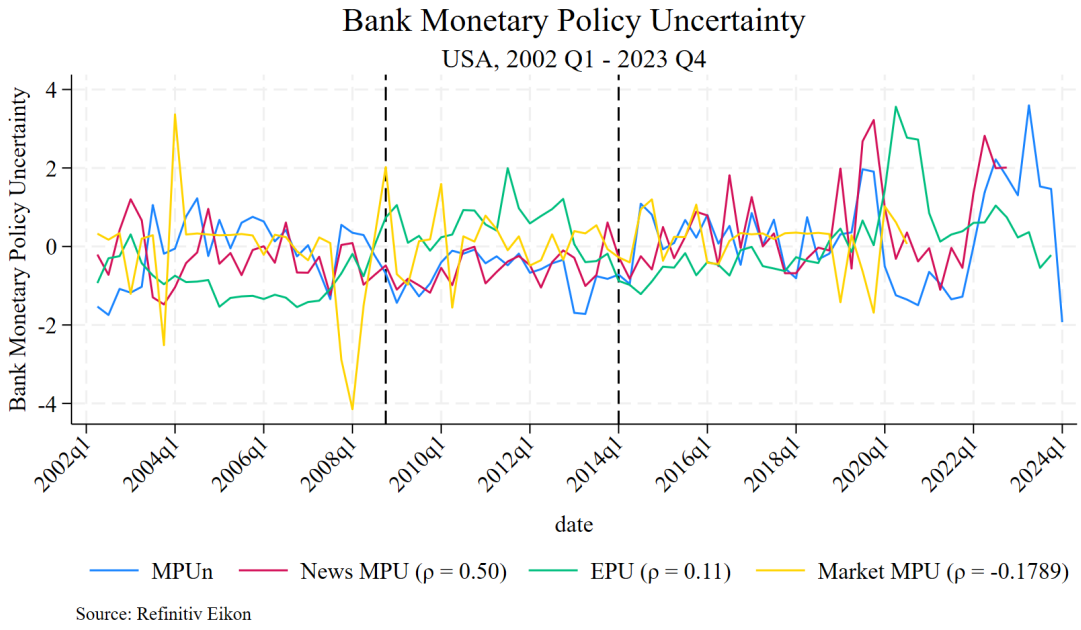



Figure 4 describes how the dynamics of aggregate bank policy uncertainty aligns with other measures of monetary policy uncertainty in the literature. Banks' monetary policy un-

certainty is correlated with the established measure of economic policy uncertainty in Baker et al. (2016). The correlation increases from 0.11 to 0.50 when looking at a news-based index only focusing on monetary policy uncertainty from Husted et al. (2020). Other measures of monetary policy uncertainty use market data and swaption implied volatility of interest changes captured in interest rate swap prices (Bauer et al., 2021). Here, monetary policy uncertainty in the banking system is negatively correlated with market-based uncertainty. While it is true that banks trade swaps, the index is capturing a different concept than uncertainty over different paths of monetary policy rates. Rather, Figure 2 and 3 show that monetary policy uncertainty is associated with uncertainty about the monetary policy paradigm beyond risk about interest rate movements.

This section argues that the dynamics of monetary policy uncertainty in the banking sector is consistent with the historical conduct of the policy: a first increase in the rate after an accommodative period leads to surges in uncertainty. Uncertainty is particularly high at the end of the forward guidance period and just before the COVID-19 crisis when rates were elevated. The measure is broadly in line with the news-based measure of monetary policy uncertainty, which suggests that news impact monetary policy uncertainty in the banking sector.

# 4 Monetary Policy uncertainty and Loan Pricing

This section researches how bank-level monetary policy uncertainty impacts the actions of banks in the syndicated loan data. I merge the bank uncertainty datasets with Dealscan at the bank-name quarter level. The datasets are first matched on the Lender Name and then on the Lender Parent Name. Standard cleaning is applied to the syndicated loan market. I remove transactions where the Lender Share is greater than 100% or smaller the 1%, where tranche amounts are smaller than 100 USD and where the maturity of the loans is smaller than 3 months. Following Schwert (2018), I remove banks with less than 50 unique deals

and with less than 10 billions USD in loan volume. To fully capture lending for productive activity, M&A and Acquisitions are removed from the sample. Finally, I drop non-Lead banks defined as in (Heider et al., 2019) and only retain transactions from US banks to US firms to prevent the effect of cultural distance found in Giannetti and Yafeh (2012).

The identification strategy is in the same vein as Khwaja and Mian (2008). In particular, I focus on tranches where at least two banks are lending to the *same* firm in the *same* quarter. While this limits the sample, this identification rules out any demand side channels that could affect the lending conditions given to firms. Firm-quarter fixed effect remove on firm-time variations in firm fundamentals. As such, I am capturing how monetary policy uncertainty at the bank level impacts the lending conditions of two different banks lending to the same firm. I therefore run the following regression for firm $f$ borrowing from bank $b$ at the quarter $t$ in the tranche $i$:

$$y_{b,f,t} = \alpha_f * \mu_t + \omega_b + \mu_t + \lambda * T_{i,t} + \nu * X_{b,t-1} + \beta * sent_{b,t} + \epsilon_{b,f,t} \tag{4}$$

The dependent variable $y_{b,f,t}$ is either the All-in-Drawn spread, a common measure of loan pricing, the maturity of loans in months or $\delta loan$, the inter-annual change in loan balances between firm $f$ and bank $b$. $\alpha_f * \mu_t$ is a firm quarter fixed effect controlling for all characteristics at the firm level. $\omega_b$ is a bank fixed effect and $\mu_t$ is a year fixed effect controlling for time varying macroeconomic factors. $T_{i,t}$ are tranche controls including $log(tranchamount)$, $LoanMaturity(month)$, $Secured-dummy$, $Covenant-Dummy$, $Performance-pricing-dummy$, Number of Lenders and a dummy whether the firm f has borrowed from the bank b in the last three years. Bank controls ($X_{B,t-1}$) are lagged one quarters and are $log(size)_{b,t}$,$equity-to-asset_{b,t}$, $loan-to-deposit_{b,t}$,$ROA_{b,t}$, $Loanlossprovisions_{b,t}$. Standard errors are clustered at the bank level which is the level of our treatment.

Table 3: Relationship between Lending Conditions and bank monetary policy uncertainty

| | (1) Spread | (2) Maturity (month) | (3) $\delta loan$ |
|---|---|---|---|
| Bank $MPU_{b,t}$ | 88.038** | 416.674 | 211.579 |
| | (40.921) | (341.243) | (129.265) |
| Bank $MPSent_{b,t}$ | -4.484 | 67.926 | 6.665 |
| | (3.536) | (43.099) | (5.402) |
| $MPAtt_{b,t}$ | -0.001 | -0.024** | -0.001 |
| | (0.001) | (0.011) | (0.001) |
| Analyst $MPU_{b,t-1}$ | 38.545 | -277.744 | -30.433 |
| | (24.416) | (250.962) | (36.615) |
| $\log(Size)_{b,t-1}$ | -0.039 | 0.511 | 0.068 |
| | (0.031) | (0.402) | (0.044) |
| Equity-to-$assets_{b,t-1}$ | -0.001 | -0.016 | 0.002 |
| | (0.005) | (0.067) | (0.006) |
| $Loans/dep_{b,t-1}$ | 0.002** | 0.001 | 0.001 |
| | (0.001) | (0.007) | (0.001) |
| $ROA_{b,t-1}$ | -0.009 | -0.125* | -0.016 |
| | (0.006) | (0.063) | (0.011) |
| $LLP_{b,t-1}$ | -0.005 | -1.015 | 0.034 |
| | (0.049) | (0.768) | (0.045) |
| Tranche controls | Yes | Yes | No |
| Firm-Quarter FE | Yes | Yes | Yes |
| Bank FE | Yes | Yes | Yes |
| Attentive | No | No | No |
| N | 19,401 | 20,534 | 5,630 |
| R2 | 0.017 | 0.134 | 0.001 |

The table shows the OLS estimates from regressions of the All-In-Spread-Drawn (AISD), the Maturity of loans (in month) and the inter-annual growth in lending on bank monetary policy uncertainty, tranche and bank controls. Bank monetary policy attention is the count of monetary policy bigrams in earnings calls. Bank monetary policy uncertainty is computed looking at 10 words before and after the monetary policy words, and counting synonyms of risk words. The sample runs from Q1 2002 until Q4 2023 for US banks lending to US firms. The data is obtained merging our sentiment dataset and the syndicate loan market, collapsed at the bank-firm-quarter level. We only retain yearly observations where the bank is always the lead bank. The bank controls are log(Size), Equity-to-assets ratio, Return-on-assets (ROA), Loans-to-deposit and loan-loss-provisions. Tranche controls are log(Tranche Amount in USD), a secured and covenants dummy, a dummy for the presence of performance pricing, the number of lenders and a dummy equal to 1 if the bank has lent to the firm in the last three years. All columns include firm-quarter fixed effecs and bank fixed effects. Standard errors (in parentheses) allow for clustering at the bank level. ***, ** and * refer to significance at the 1%, 5% and 10%.

Table 3 shows the results of the specification controlling for credit demand. We add three more controls on top of standard controls in syndicated loan regressions: $MPSent_{b,t}$, $MPAtt_{b,t}$ , and $AnalystMPU_{b,t-1}$. The first variable controls for beliefs about the first moment of the distribution of monetary policy shocks. Rates increase could be a positive news for some banks. This can also impact their beliefs about the range of possible monetary policy and the spread charged on the syndicated loan market. Next, $MPAtt_{b,t}$ is another possible confounding factor in the regression. Banks that generally pay more attention to monetary policy in a specific quarter are also more likely to identify monetary policy uncertainty. $AnalystMPU_{b,t-1}$ is another important control to remove the possibility of bank managers catering to analyst who perceived a high monetary policy uncertainty in the last quarter by increasing their perceived monetary policy uncertainty (Simpson, 2013). After controlling for confounding beliefs of bank managers and analysts, table 3 documents that banks' perceived monetary policy uncertainty does not impact the maturity and the quantity of loans in the syndicated loan market. Nevertheless, monetary policy uncertainty at the bank level is associated with loan prices. Banks who perceived high monetary policy uncertainty compared to their counterpart also charge a higher spread on their loans. The magnitude of the effect is relatively small, as $BankMPU_{b,t}$ rises by one standard deviation, the All-in-drawn spread only increases by 0.02%. The association between bank level monetary policy uncertainty and loan pricing is thus present at the bank level but the magnitude is small. On top of this, the identification strategy says nothing about the net effect of monetary policy uncertainty on the economy since the regression only compares two banks lending to the same firm in the same quarter. The next section answers this question by measuring the impact of monetary policy uncertainty on FOMC days on the economic activity.

# 5 Aggregate impact of beliefs about Monetary Policy

## 5.1 BANK MPU on FOMC days

This section sheds light on the impact of monetary policy uncertainty shocks in the banking sector in the economy. In table 2, monetary policy uncertainty is endogenous to the business cycles and news about monetary policy. High GDP growth and a high interest rate are associated with monetary policy uncertainty. Uncertainty about monetary policy revealed in the news is also indicative of high uncertainty in the banking sector since aggregate monetary policy uncertainty and Husted et al. (2020) are correlated at the 0.5 level. To address this endogeneity concern, I make use of the date of the earnings calls to retain only earnings calls that happen the day of a FOMC announcement. This daily measure at the FOMC frequency is a cleaner proxy for monetary policy uncertainty than aggregate monetary policy uncertainty at the monthly or quarterly level.

To conduct the analysis at the monthly level, I compute monetary policy uncertainty at the daily level and then only retain earnings calls released on a FOMC day. The resulting index $BankMPUn_{FOMC,t}$ is a monthly index measuring the monetary policy uncertainty for each month measured on the FOMC announcement day. On of the limitations of this approach is that FOMC days vary from month to month so that $BankMPUn_{FOMC,t}$ is measured using different banks. $BankMPUn_{FOMC,t}$ might be high on a day because banks with high loans-to-deposits ratios are publishing earnings calls that day. I therefore run a first stage regression at the quarterly level for banks publishing earnings calls on FOMC days:

$$BankMPUn_{FOMC,b,t} = \delta_b + \beta X_{b,t} + \epsilon_{b,t} \tag{5}$$

In this regression, $\delta_b$ is a bank fixed effect and $X_{b,t}$ are bank controls used in Table 1: $log(size)_{b,t}$,$equity - to - asset_{b,t}$, $loan - to - deposit_{b,t}$,$ROA_{b,t}$, $Loanlossprovisions_{b,t}$. The residuals of this regression are then averaged for each FOMC days to have $\hat{\epsilon_t}$, an index of

bank monetary policy uncertainty that is orthogonal to bank fundamentals.

| | N | Mean | SD | p25 | p50 | p75 |
|---|---|---|---|---|---|---|
| $\Delta\hat{\epsilon}_t$ | 56 | 0.000012 | 0.00008 | -0.00004 | 0.00001 | 0.00005 |
| $\Delta BankMPU_t$ | 61 | -0.000008 | 0.00013 | -0.00003 | 0.00001 | 0.00005 |
| $\hat{\epsilon}_t$ | 64 | -0.000003 | 0.00006 | -0.00003 | -0.00001 | 0.00002 |
| Bank MPU$_t$ | 73 | 0.000057 | 0.00006 | 0.00000 | 0.00005 | 0.00009 |
| US MPU Bauer et al. (2021) | 196 | 130.339887 | 68.46885 | 85.19391 | 113.61217 | 156.52724 |
| Num Banks$_t$ | 73 | 8.054795 | 6.91996 | 2.00000 | 8.00000 | 13.00000 |
| Num Banks$_{t-1}$ | 71 | 7.830986 | 5.84071 | 2.00000 | 7.00000 | 12.00000 |

Table 4: Descriptive statistics.

Table 4 describes the descriptive statistics of the new index orthogonal to bank fundamentals. Out of 196 FOMC announcement since Q2 2002, I am only able to measure monetary policy uncertainty for 73 FOMC meetings. Once controlling for bank fundamentals, this number goes down to 64 FOMC announcements. There are on average 8 banks revealing their earnings calls on that day. While the coverage in terms of FOMC meetings is limited, the number of banks for each meeting lends support to the idea that the index is representative of the banking sector.

## 5.2 Identification

The main identification is a Vector-Autoregressive-Model a la Husted et al. (2020). The sample runs from Q2 2002 until Q4 2023 at the monthly frequency. The first specification is a SVAR-IV specification a la Mertens and Ravn (2013) to understand how the monetary policy uncertainty impacts economic activity and the credit spread. The following VAR is estimated:

$$e_t = (e_{\hat{\epsilon}t,t}, e_{FFR,t}, e_{crisis,t}, e_{ebp,t}, e_{EPU,t}, e_{Sents,FOMC,t}, e_{cpi,t}, e_{ip,t}) \tag{6}$$

$e_{ip,t}$ is the log of industrial production in percentage point, $e_{cpi,t}$ is the log of the consumer price index in percentage, $e_{Sents,FOMC,t}$ is the equivalent of $\hat{\epsilon}_t$ using the $BankMPSent_{b,t}$, $e_{EPU,t}$ is the Economic Policy Uncertainty index of Baker et al. (2016) which capture shocks to economic policy, $e_{ebp,t}$ is the excess bond premium, a financial indicator introduced by Gilchrist and Zakrajšek (2012). $e_{crisis,t}$ is a dummy equal to 1 between 2008/06 and 2015/12 that controls for the period of the ZLB and $e_{FFR,t}$ is the one-year bond, a common proxy for the monetary policy reference rate that is less sensitive to the period of the zero-lower bound. The GZ excess bond premium is the difference between the spread of an index of corporate securities' returns and the safe government bond after controlling for default risk. The VAR has 12 lags and is at the monthly level, which gives 264 monthly observations.

## 5.3 External Instrument

Uncertainty on FOMC days has been used as an instrument in Husted et al. (2020) and Fasani et al. (2023). They argue that the level of uncertainty on FOMC days is not polluted by the release of macro-economic data because only one FOMC meeting coincided with the release of unemployment report. Using simply the level of uncertainty as a source of variation is nonetheless problematic. In their paper about market-based uncertainty, Bauer et al. (2021) use the daily changes of MPU around FOMC announcements instead of the level of the implied volatility. Their argument is that using variations in MPU around FOMC announcements identifies changes to monetary policy uncertainty that are due to FOMC announcements. Indeed, the daily implied volatility might be high on a specific day but lower than to the day before so that uncertainty is decreasing on the FOMC day. To address this potential identification concern, I identify monetary policy uncertainty surprises using the variation in $e_{\hat{\epsilon}_t}$: $\Delta\hat{\epsilon}_t$. Another issue is that uncertainty could be increasing on FOMC days because of changes in the short-term interest rate or in the future interest rates. I therefore follow Husted et al. (2020) and orthogonalized monetary policy uncertainty shocks

with respect to interest rate surprises from Bauer and Swanson (2022), forward guidance surprises (Euro-dollar future at 4 quarters horizons orthogonalized with the surprises) and asset purchase indicator (residual of the change in ten-year yield over the surprises and the forward guidance surprises). The instrument is the residual $\hat{\eta}_t$ of the following regression:

$$\Delta\hat{\epsilon}_t = \beta_1 BSsurp_t + \beta_2 ED4surprise + \beta_3 10yearYieldsurp_t + \eta_t \tag{7}$$

The monetary policy uncertainty surprises are thus orthogonal to both changes in the present and future path of the interest rates. The first stage regression shows that the instrument is strong with an F-statistic of 36.48 and a robust F-statistic of 10.86 when allowing for heteroskedasticity. The instrument explains roughly 12.73% of the variation of monetary policy uncertainty shocks. The evidence thus suggests that the instrument is valid. Indeed, the F-stat is above the threshold of 10, which alleviates concerns of weak instrument problems, and the instrument is orthogonal to monetary policy decisions and changes in bank fundamentals, which supports the exogeneity condition.

## 5.4 Macroeconomic impact of monetary policy uncertainty

Figure 5: Uncertainty and economic activity: Impulse Response Function

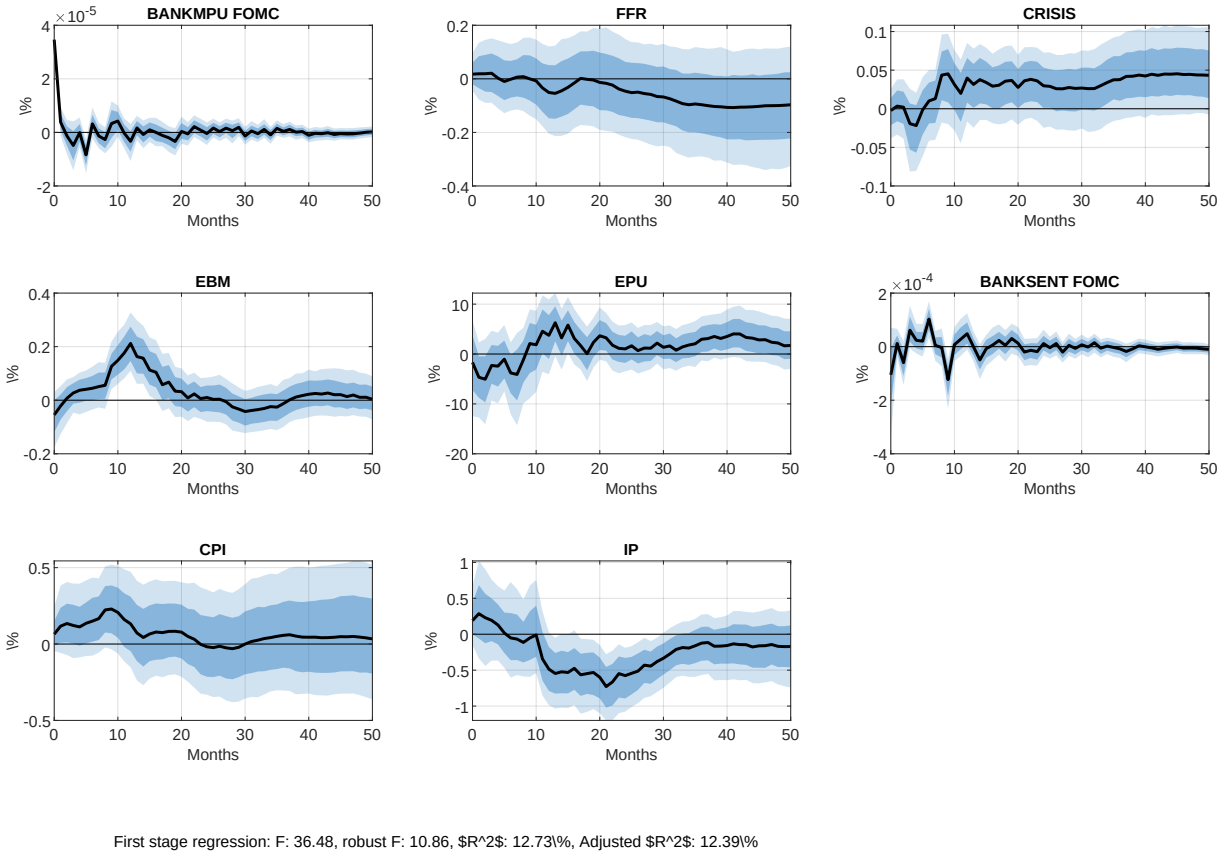
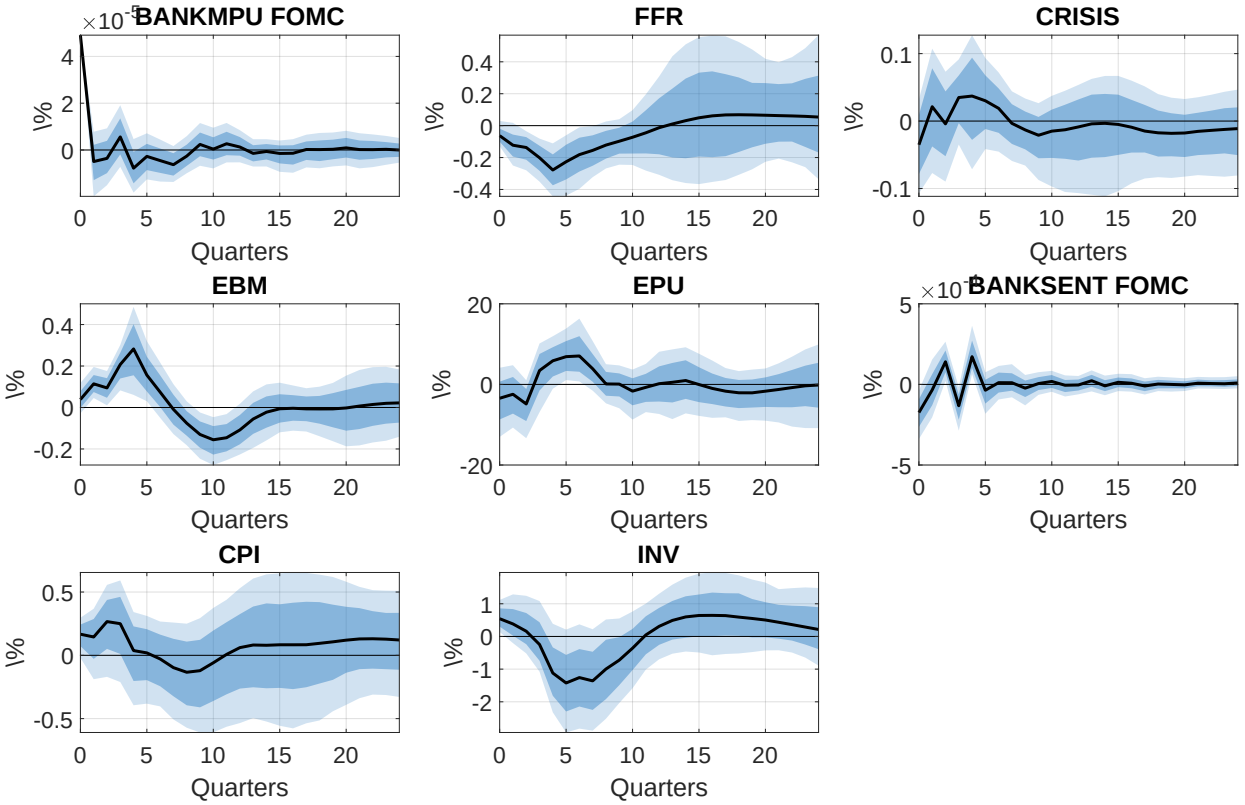



Figure 5 presents the impulse response function to a one standard deviation shock in bank policy uncertainty. Monetary policy uncertainty shocks in the banking sector precedes drops in economic activity measured in industrial production. The impulse response functions in Figure 5 document an delayed effect of monetary policy uncertainty. While the external bond premium falls on impact, it increases steadily to reach its peak after 12 months. Inflation surges over the next 10 months, as there is more uncertainty in the conduct of monetary policy. During this period, industrial production is not significantly affected by uncertainty surprises. However, in the medium run, the impact of monetary policy uncertainty on economic activity is negative. In line with Husted et al. (2020), the through of industrial production's response is at around 20 months. The magnitude of the effect is non-negligible,

a one standard deviation shock in monetary policy uncertainty on FOMC announcement days leads to a fall in industrial production by 0.5%. The effect is thus roughly half of the impact of MPU in Husted et al. (2020). Overall, the IRF indicates that surprises in monetary policy uncertainty in the banking sector leads to a fall in economic in activity due to higher borrowing costs.

Figure 6: Uncertainty and economic activity: Impulse Response Function




First stage regression: F: 23.03, robust F: 24.98, $R^2$: 21.93\%, Adjusted $R^2$: 20.98\

Next, the analysis goes one step further to explore the impact of the index at the quarterly frequency. To do that, we remove observations where only one bank is presenting earnings calls the day before or the day of the FOMC announcement. The resulting index is at the quarterly frequency. The monetary policy uncertainty is thus measured for one FOMC

announcement per quarter. The following VAR at the quarterly frequency is thus estimated:

$$e_t = (e_{\hat{\epsilon}_t,t}, e_{FFR,t}, e_{crisis,t}, e_{ebp,t}, e_{EPU,t}, e_{Sents,FOMC,t}, e_{cpi,t}, e_{inv,t}) \tag{8}$$

The evidence in Figure 6 highlights that the dynamics of the IRFs are similar at the quarterly frequency. The economy responds to a monetary policy uncertainty shock with higher borrowing costs in the first 4 quarters and a delayed response of economic activity. Investment does not react on impact but only with a lag of 4 quarters. The impact on investment is nonetheless important: a one standard deviation increase in monetary policy uncertainty decreases investment by 1.42% five quarters after the shock. The negative impact of monetary policy uncertainty on economic activity is therefore both delayed at the monthly and quarterly frequency.

This section highlights the implications of monetary policy uncertainty for economic activity. The effect of monetary policy uncertainty comes with a lag and only appears between two semesters and two years after the occurrence of the shock. This naturally poses the question of the transmission of monetary policy uncertainty shocks which is what section 6 explores.

## 5.5 Additional SVAR results and robustness

This subsection explores additional results to confirm the stability of the findings. A first robustness test replaces industrial production by industrial production in the manufacturing sector. The results in Appendix C Figure 7 show that the response is very similar with a delayed response of economic activity and a surge in the External Bond Premium.

A second robustness test studies the role of not differencing the daily bank Monetary Policy

Uncertainty and estimates the following first stage regression:

$$\hat{\epsilon_t} = \beta_1 BSsurp_t + \beta_2 ED4surprise + \beta_3 10yearYieldsurp_t + \eta 2_t \tag{9}$$

In this regression, $\hat{\eta 2_t}$ is then the instrument for the $e_{\hat{\epsilon t}}$. The results in Appendix C Figure 8 illustrate that the reaction to shocks are broadly the same, with a somewhat strong response of inflation and a similar drop in industrial production.

In the third robustness test, the specification completely ignores the impact of bank fundamentals. Since the choice of bank controls is somewhat arbitrary, Figure 9 runs the same specification as the baseline without orthogonalizing with respect to bank fundamentals as in eq. (5). This makes sure that the results are not sensitive to the choice of bank fundamentals. The IRFs are in line with the baseline. The External Bond Premium surges after a monetary policy uncertainty shock and this increase goes hand in hand with a drop in industrial production.

The last robustness exercise tests the stability of the results to the number of banks presenting earnings calls on a FOMC day. The specification is the same as the baseline but removes observations for which less than 5 banks hold an earnings call. The results draw the same picture as in the baseline. Figure 10 thus highlights that the number of banks presenting earnings is not factor impacting the results.

# 6 Transmission of monetary policy uncertainty surprises

This section explores the transmission channel of monetary policy uncertainty shocks to the economy. In particular, I am interested in whether aggregate surprises in monetary policy uncertainty translate to high costs of borrowing for firms. The financial friction theory argues that high uncertainty broadens the dispersion in future cash-flows and pushes the price of debt financing upwards (Gilchrist et al., 2014; Gilchrist and Zakrajšek, 2012). In contrast, wait-and-see explanations argue that uncertainty shocks force firms to suspend their investment decisions until uncertainty resolves (Bloom, 2009; Fernández-Villaverde and Guerrón-Quintana, 2020). To compare these predictions, the same exercise as in the section 3.3 is run with firm earnings calls. The firm dataset comprises 208,582 earnings calls from US firms[2] over the last 20 years. These transcripts are sourced from Refinitiv Event Search. Balance sheet information for these firms is Compustat. By merging these two datasets at the gvkey-quarter level, we are able to ascertain the fundamental characteristics for 195,693 firm-quarter observations. To identify the sectors that refer to the real economy, I exclude the "Finance and Insurance" and "Utilities" firms from the sample. Finally, observations with negative assets, sales and book equity are excluded from the sample. The descriptive statistics of firms can be found in appendix D.

Using firm-level data from 2002 Q2 until 2024 Q1, I run the following regression:

$$log(Intexp)_{i,t} = \gamma_i + \beta_1 \hat{\eta}_{t t-l} + \beta_3 Q_{i,t-1} + \beta_4 \frac{\text{CF}_{i,t}}{\text{TA}_{i,t-1}} + \beta_5 \text{SG}_{i,t} + \beta_6 \text{Firm MPU}_{i,t} + \beta_7 M_{t-1} + \varepsilon_{i,t} \tag{10}$$

where the dependent variable $log(Intexp)_{i,t}$ measures the amount of interest expenses paid by a firm $i$ in quarter t, $\hat{\eta}_{t-l}$ is the monetary uncertainty surprises lagged from 1 to 8 quarters, $Q_{i,t-1}$ is the Tobin's Q while $\frac{\text{CF}_{i,t}}{\text{TA}_{i,t-1}}$ and $\text{SG}_{i,t}$ are the cash flows and sales growth following Husted et al. (2020). $M_{i,t-1}$ are the same as in Husted et al. (2020) and include GDP growth,

[2]Excluding only the pharmaceutical sector and financial firms not classified as banks

the Economic Policy Uncertainty Index of Baker et al. (2016), the expected GDP growth over the next 6 months, Consumer Confidence and the expected Business condition index from the University of Michigan. The macroeconomic variables control for macroeconomic conditions and expectations about future investment profitability which might conflate the firm controls. Finally, this paper builds the uncertainty and sentiment index at the firm level to control for firm-level beliefs about monetary policy which impact borrowing policy impacting interest rate costs. Following Husted et al. (2020), all variables are divided by their standard errors. The regression includes a firm (industry) $\gamma_i$ fixed effect and standard errors are clustered at the firm (industry) and quarter level.

Table 5 shows that monetary policy uncertainty impacts interest rate costs from one to three quarters ahead (9 months). The first two columns are the firm-level and have different macro-economic controls. Both column (1) and (2) document that monetary policy uncertainty shock impact interest rate costs. To give an idea of the economic magnitude of the effect, the coefficient represents one third of the impact of monetary policy uncertainty shocks found in Husted et al. (2020) and is greater than the difference of impact of news-MPU on high vs low leverage firms. Column (3) and (4) run the same specification as in column (1) but with different fixed effects. In column (3), fixed effects at the 3 digit SIC codes do not impact the magnitude of the effect while the findings are robust to 2 digit SIC codes fixed effects. Column (5) and (6) introduce the firm-level beliefs measures. Both attention (raw number of monetary policy words) and sentiment are significantly related to interest rate costs. High attention and low sentiment about monetary policy are associated with more interest rate costs. The economic significance of the effect is nonetheless smaller than the impact of monetary policy uncertainty shocks in the banking sector. All in all, the results shed light about the time between the shock and the investment and industrial production response found in the VAR. Following a monetary policy uncertainty shock, interest rate costs increase for firms over the next 9 months, the resulting interest rate burden then

Table 5: Log Interest Expenditure and monetary policy uncertainty

| | (1) Log Int Exp$_{i,t}$ | (2) Log Int Exp$_{i,t}$ | (3) Log Int Exp$_{i,t}$ | (4) Log Int Exp$_{i,t}$ | (5) Log Int Exp$_{i,t}$ | (6) Log Int Exp$_{i,t}$ |
|---|---|---|---|---|---|---|
| $\hat{\eta_{t-1}}$ | 0.019** | 0.027*** | 0.019** | 0.019** | 0.018** | 0.018** |
| | (0.009) | (0.008) | (0.009) | (0.009) | (0.009) | (0.009) |
| $\hat{\eta_{t-2}}$ | 0.017* | 0.025*** | 0.017* | 0.017* | 0.018* | 0.017* |
| | (0.010) | (0.007) | (0.010) | (0.009) | (0.010) | (0.010) |
| $\hat{\eta_{t-3}}$ | 0.022** | 0.027*** | 0.022** | 0.022** | 0.022** | 0.023** |
| | (0.010) | (0.006) | (0.010) | (0.010) | (0.010) | (0.010) |
| $\hat{\eta_{t-4}}$ | 0.015 | 0.010 | 0.015 | 0.015 | 0.014 | 0.015 |
| | (0.011) | (0.009) | (0.012) | (0.011) | (0.012) | (0.012) |
| $\hat{\eta_{t-5}}$ | 0.011 | 0.005 | 0.010 | 0.010 | 0.010 | 0.009 |
| | (0.013) | (0.010) | (0.013) | (0.012) | (0.013) | (0.013) |
| $\hat{\eta_{t-6}}$ | 0.008 | 0.012 | 0.008 | 0.008 | 0.008 | 0.008 |
| | (0.013) | (0.009) | (0.012) | (0.012) | (0.012) | (0.012) |
| $\hat{\eta_{t-7}}$ | 0.003 | -0.000 | 0.004 | 0.004 | 0.004 | 0.004 |
| | (0.012) | (0.010) | (0.012) | (0.012) | (0.012) | (0.012) |
| $\hat{\eta_{t-8}}$ | 0.003 | 0.004 | 0.003 | 0.003 | 0.003 | 0.003 |
| | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) |
| GDPg$_{t-1}$ | 0.012* | 0.005 | 0.011 | 0.011* | 0.011 | 0.011 |
| | (0.007) | (0.006) | (0.007) | (0.006) | (0.007) | (0.007) |
| EPU$_{t-1}$ | 0.001*** | 0.002*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Expected GDP Growth$_{t-1}$ | | -0.025* | | | | |
| | | (0.014) | | | | |
| Consumer Sentiment$_{t-1}$ | | -0.005 | | | | |
| | | (0.004) | | | | |
| Expected Bus Cond$_{t-1}$ | | 0.006*** | | | | |
| | | (0.002) | | | | |
| Firm MPUn$_{i,t}$ | | | | | 0.002 | 0.002 |
| | | | | | (0.002) | (0.002) |
| Count$_m onpol_5$ | | | | | 0.012*** | 0.012*** |
| | | | | | (0.003) | (0.003) |
| Firm MPSent$_{i,t}$ | | | | | -0.004** | -0.004** |
| | | | | | (0.002) | (0.002) |
| Firm Analyst MPSent$_{i,t}$ | | | | | | -0.002 |
| | | | | | | (0.001) |
| Firm Analyst MPUn$_{i,t}$ | | | | | | 0.002 |
| | | | | | | (0.001) |
| Ind FE | No | No | Sic 3 dig | Sic 2 dig | No | No |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 81,514 | 81,514 | 81,514 | 81,514 | 81,514 | 80,237 |
| R2 | 0.037 | 0.055 | 0.036 | 0.036 | 0.038 | 0.038 |

This table shows regression of log(interest rate expenditure) on Firm Monetary Policy Uncertainty and Firm controls. Firm controls are Tobin's Q$_{i,t-1}$, $\frac{CashFlow_{i,t}}{TA_{i,t-1}} and real sales growth$ :

lowers industrial production and investment.

Table 6 runs the same specification as equation (10) but with $\frac{\text{CAPX}_{i,t}}{\text{PPENT}_{i,t-1}}$ as dependent variable (measured as in (Ottonello and Winberry, 2020) and Cloyne et al. (2023). The regressions within firm across the different specification confirm the results found in the quarterly VAR: uncertainty has a delayed impact on investment decisions. Column (5) and (6) introduce the firm-level belief variables. $FirmMPU_{i,t}$ is negatively correlated with investment rate. Firms perceiving more monetary policy uncertainty decide to investment less. There is thus some evidence of wait-and-see impact of monetary policy uncertainty in the last two columns of Table 6 on top of the delayed impact of the financial constraint channel.

The section confirms the idea that monetary policy uncertainty has a delayed impact on economic activity. The immediate response of interest rate costs is positive. Banks charge firm a higher interest rate when they perceive more monetary policy uncertainty. This heightened debt-burden then translates into a larger interest rate burden that impacts investment.

Table 6: Capital Investment rate and monetary policy uncertainty

| | (1) Inv rate | (2) Inv rate | (3) Inv rate | (4) Inv rate | (5) Inv rate | (6) Inv rate |
|---|---|---|---|---|---|---|
| $\hat{\eta_{t-1}}$ | -0.038 | -0.129** | -0.038 | -0.038 | -0.038 | -0.042 |
| | (0.054) | (0.058) | (0.054) | (0.054) | (0.054) | (0.055) |
| $\hat{\eta_{t-2}}$ | 0.033 | -0.062 | 0.033 | 0.033 | 0.033 | 0.034 |
| | (0.089) | (0.079) | (0.089) | (0.089) | (0.088) | (0.088) |
| $\hat{\eta_{t-3}}$ | -0.118 | -0.164** | -0.118 | -0.118 | -0.119 | -0.120 |
| | (0.104) | (0.078) | (0.105) | (0.105) | (0.104) | (0.104) |
| $\hat{\eta_{t-4}}$ | -0.050 | -0.078 | -0.050 | -0.050 | -0.051 | -0.046 |
| | (0.102) | (0.083) | (0.102) | (0.102) | (0.101) | (0.101) |
| $\hat{\eta_{t-5}}$ | -0.199** | -0.229*** | -0.199** | -0.199** | -0.200** | -0.197** |
| | (0.086) | (0.075) | (0.086) | (0.086) | (0.086) | (0.085) |
| $\hat{\eta_{t-6}}$ | -0.206** | -0.266*** | -0.206** | -0.206** | -0.206** | -0.210** |
| | (0.083) | (0.070) | (0.083) | (0.083) | (0.083) | (0.082) |
| $\hat{\eta_{t-7}}$ | -0.241** | -0.219** | -0.241** | -0.241** | -0.241** | -0.243** |
| | (0.110) | (0.088) | (0.110) | (0.110) | (0.109) | (0.109) |
| $\hat{\eta_{t-8}}$ | -0.190* | -0.175** | -0.190* | -0.190* | -0.190* | -0.191* |
| | (0.097) | (0.076) | (0.097) | (0.097) | (0.096) | (0.096) |
| $\text{GDPg}_{t-1}$ | -0.116 | -0.068 | -0.116 | -0.116 | -0.116 | -0.116 |
| | (0.075) | (0.045) | (0.075) | (0.075) | (0.075) | (0.074) |
| $\text{EPU}_{t-1}$ | -0.015*** | -0.020*** | -0.015*** | -0.015*** | -0.015*** | -0.015*** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| $\text{Expected GDP Growth}_{t-1}$ | | -0.057 | | | | |
| | | (0.112) | | | | |
| $\text{Consumer Sentiment}_{t-1}$ | | 0.089*** | | | | |
| | | (0.030) | | | | |
| $\text{Expected Bus Cond}_{t-1}$ | | -0.062*** | | | | |
| | | (0.015) | | | | |
| $\text{Firm MPUn}_{i,t}$ | | | | | -0.036** | -0.036** |
| | | | | | (0.014) | (0.014) |
| $\text{Count}_m onpol_5$ | | | | | 0.039* | 0.037 |
| | | | | | (0.022) | (0.022) |
| $\text{Firm MPSent}_{i,t}$ | | | | | 0.008 | 0.010 |
| | | | | | (0.020) | (0.021) |
| $\text{Firm Analyst MPUn}_{i,t}$ | | | | | | -0.003 |
| | | | | | | (0.019) |
| Ind FE | No | No | Sic 3 dig | Sic 2 dig | No | No |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 95,968 | 95,968 | 95,968 | 95,968 | 95,968 | 94,281 |
| R2 | 0.050 | 0.056 | 0.050 | 0.050 | 0.050 | 0.050 |

This table shows regression of log(interest rate expenditure) on Bank Monetary Policy Uncertainty surprises and Firm controls. Firm controls are $\frac{CashFlow_{i,t}}{}$

# 7 Conclusion

In conclusion, the analysis sheds light on the impact of monetary policy uncertainty on economic activity, with a sample of banks' earnings calls. The analysis first reveals that monetary policy attention is at an all-time high: banks mention interest rates now more than ever. Banks' attention to monetary policy is closely related to the macro-economic environment, with attention increasing during periods of inflation and high interest rates. At the bank level, attention is linked positively to size and negatively to loan-loss provisions.

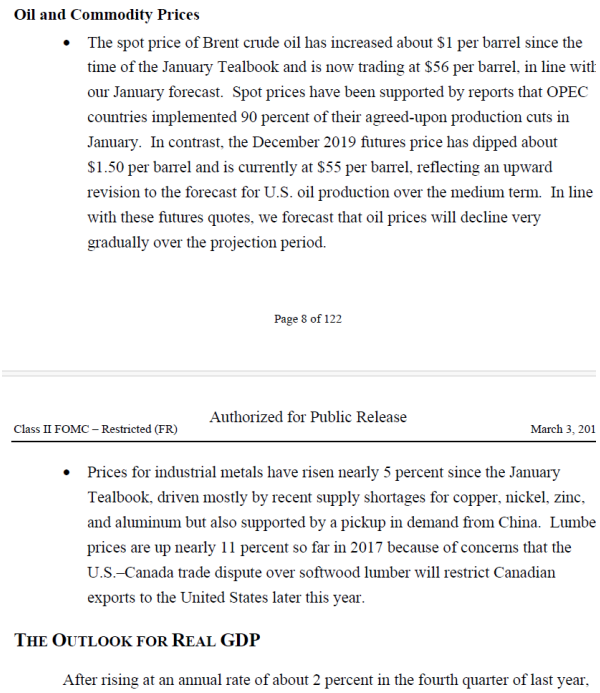
The paper builds an indicator of monetary policy in the banking sector. Managers' monetary policy uncertainty is related to the quantity of loans and a low equity position. Banks sensitive to interest rates changes thus perceive more uncertainty. The index is then aggregated at the quarterly frequency and correlates with disagreement in the Survey of Professional Forecaster and monetary policy uncertainty in the news. To understand how monetary policy impacts bank lending practices, the dataset is merged with the syndicated loan market. Results at the bank level using the syndicated loan data suggest that monetary policy uncertainty is linked to loan pricing. Comparing two banks lending to the same firm, banks perceiving more monetary policy uncertainty tend to charge a higher All-in-Drawn-Spread. This indicates that uncertainty about monetary policy leads to greater financial frictions at the firm level and rules out the possibility that monetary policy uncertainty is contaminated with global uncertainty in the economy.

The findings underscore the delayed yet pronounced impact of monetary policy uncertainty on economic activity. The paper finds that monetary policy uncertainty in the banking sector leads to a surge in the credit spread for firms. This has important implications for macro-economic activity. Industrial production falls in the first two years following the monetary policy uncertainty shock. The uncertainty also precedes a period of increased inflation over the next year. Although the effect is small in magnitude, it alludes to the fact that mon-

etary policy uncertainty impacts economic activity the financial friction channel. Looking at quarterly data, the impact of a one standard deviation shock in monetary policy uncertainty leads to a fall of investment of more than 1.4%. Within-firm regressions show that this effect is mediated by higher borrowing costs after a monetary policy uncertainty shock. The paper thus argues that monetary policy uncertainty has a causal impact on economic activity. Beliefs about monetary policy in the banking sector can therefore be a source of business cycle variation.

# 8 Appendix

## 8.1 Appendix A.1: Example of Tealbooks



**Oil and Commodity Prices**

- The spot price of Brent crude oil has increased about $1 per barrel since the time of the January Tealbook and is now trading at $56 per barrel, in line with our January forecast. Spot prices have been supported by reports that OPEC countries implemented 90 percent of their agreed-upon production cuts in January. In contrast, the December 2019 futures price has dipped about $1.50 per barrel and is currently at $55 per barrel, reflecting an upward revision to the forecast for U.S. oil production over the medium term. In line with these futures quotes, we forecast that oil prices will decline very gradually over the projection period.

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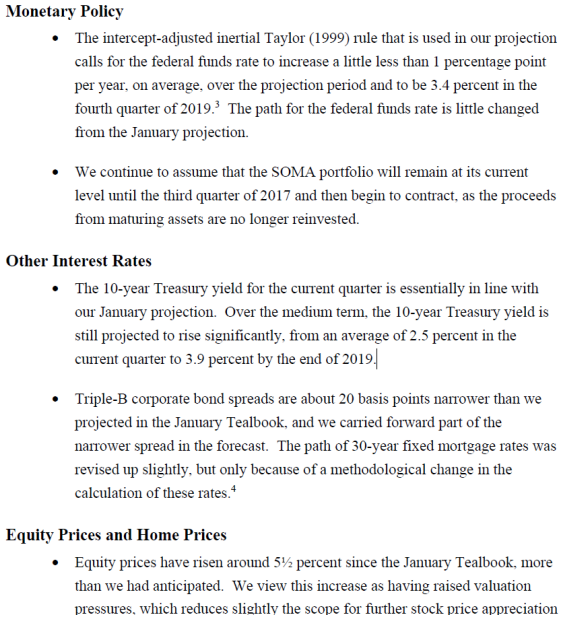
- Prices for industrial metals have risen nearly 5 percent since the January Tealbook, driven mostly by recent supply shortages for copper, nickel, zinc, and aluminum but also supported by a pickup in demand from China. Lumbe prices are up nearly 11 percent so far in 2017 because of concerns that the U.S.–Canada trade dispute over softwood lumber will restrict Canadian exports to the United States later this year.

**THE OUTLOOK FOR REAL GDP**

After rising at an annual rate of about 2 percent in the fourth quarter of last year,

Figure 7: Economic growth Sections



**Monetary Policy**

- The intercept-adjusted inertial Taylor (1999) rule that is used in our projection calls for the federal funds rate to increase a little less than 1 percentage point per year, on average, over the projection period and to be 3.4 percent in the fourth quarter of 2019.[3] The path for the federal funds rate is little changed from the January projection.

- We continue to assume that the SOMA portfolio will remain at its current level until the third quarter of 2017 and then begin to contract, as the proceeds from maturing assets are no longer reinvested.

**Other Interest Rates**

- The 10-year Treasury yield for the current quarter is essentially in line with our January projection. Over the medium term, the 10-year Treasury yield is still projected to rise significantly, from an average of 2.5 percent in the current quarter to 3.9 percent by the end of 2019.

- Triple-B corporate bond spreads are about 20 basis points narrower than we projected in the January Tealbook, and we carried forward part of the narrower spread in the forecast. The path of 30-year fixed mortgage rates was revised up slightly, but only because of a methodological change in the calculation of these rates.[4]

**Equity Prices and Home Prices**

- Equity prices have risen around 5½ percent since the January Tealbook, more than we had anticipated. We view this increase as having raised valuation pressures, which reduces slightly the scope for further stock price appreciation

Figure 8: Monetary Policy Sections

## 8.2 Appendix A.2: Monetary policy dictionary

Table 7: List of monetary policy titles in Tealbooks A

| **Title** |
|---|
| monetary policy |
| key background factors monetary policy |
| policy expectations and treasury yields |
| securities financing |
| special questions on the financing of cmbs and clos |
| special questions on long term changes in standards |
| treasury yields and policy expectations |
| special questions on the funding of high yield corporate bonds |
| special questions on the total return swaps referencing |
| financial institutions and short term funding markets |
| short term funding markets |
| special questions on market funding and liquidity |
| short term dollar funding markets and financial institutions |
| treasury and agency mbs market functioning |
| short term funding markets and financial institutions |
| treasury yields |
| treasury and agency finance and market functioning |
| treasury and other benchmark yields and policy expectations |
| policy expectations and treasury and agency mbs yields |
| policy expectations and asset prices |
| treasury and agency finance and short term funding markets |
| short term funding markets and year end dynamics |
| federal reserve operations and market functioning |
| short term funding markets and federal reserve operations |
| federal reserve operations and short term funding markets |
| federal reserve operations and short term funding marketsf |
| policy expectations and asset market developments |
| and federal reserve operations |

Table 8: List of monetary policy words

| | | | |
|---|---|---|---|
| money market | employment report | overnight index | issuance purchase |
| term premium | yield right | spread year | corporate bond |
| fund future | survey respondent | primary dealer | tips measure |
| security semiannual | premium basis | respondent percent | par security |
| bond spread | swap rate | maturity security | smoothed yield |
| financing rate | debt ceiling | policy expectation | swap quote |
| investment grade | target federal | market measure | yield notional |
| security yield | reverse repurchase | demand funding | term funding |
| valuation window | dollar funding | movement year | bond yield |
| repo rate | federal fund | source staff | straight read |
| source percent | path year | market participant | market stable |
| effective federal | distribution federal | repurchase agreement | curve smoothed |
| minute interval | curve indexation | financial market | fund rate |
| comparable maturity | agreement source | yield curve | market rate |
| future contract | curve run | nominal yield | policy rule |
| dollar percent | coupon security | run coupon | survey primary |
| future rate | dealer survey | policy path | interest rate |
| policy rate | yield source | market quote | intraday standard |
| commercial paper | data release | market expectation | notional par |
| window period | dealer market | yield basis | term rate |
| staff estimate | financial institution | market fund | funding market |
| yield period | note overnight | term yield | term security |
| path federal | yield investment | coupon source | downward revision |
| semiannual coupon | index percent | index swap | target range |
| monetary policy | forward rate | speculative grade | grade corporate |
| smoothed nominal | nominal security | deviation basis | liquidity functioning |
| debt limit | purchase program | risk premium | security basis |
| intermeeting period | term interest | dollar roll | central bank |
| general collateral | | | |
| Federal Reserve | Open Market | Alan Greenspan | Central Bank |
| The Fed | Quantitative Easing | Janet Yellen | Interest Rates |
| Money Supply | Monetary Policy | Jerome Powell | Fed Chairman |
| Fed Funds | Overnight Lending | Jay Powell | Fed Chair |
| Ben Bernanke | Central Bank | Last Resort | Discount Window |
| European Central | The ECB | Bank England | Bank Japan |
| The BOJ | Bank China | The Bundesbank | Bank France |
| Bank Italy | | | |

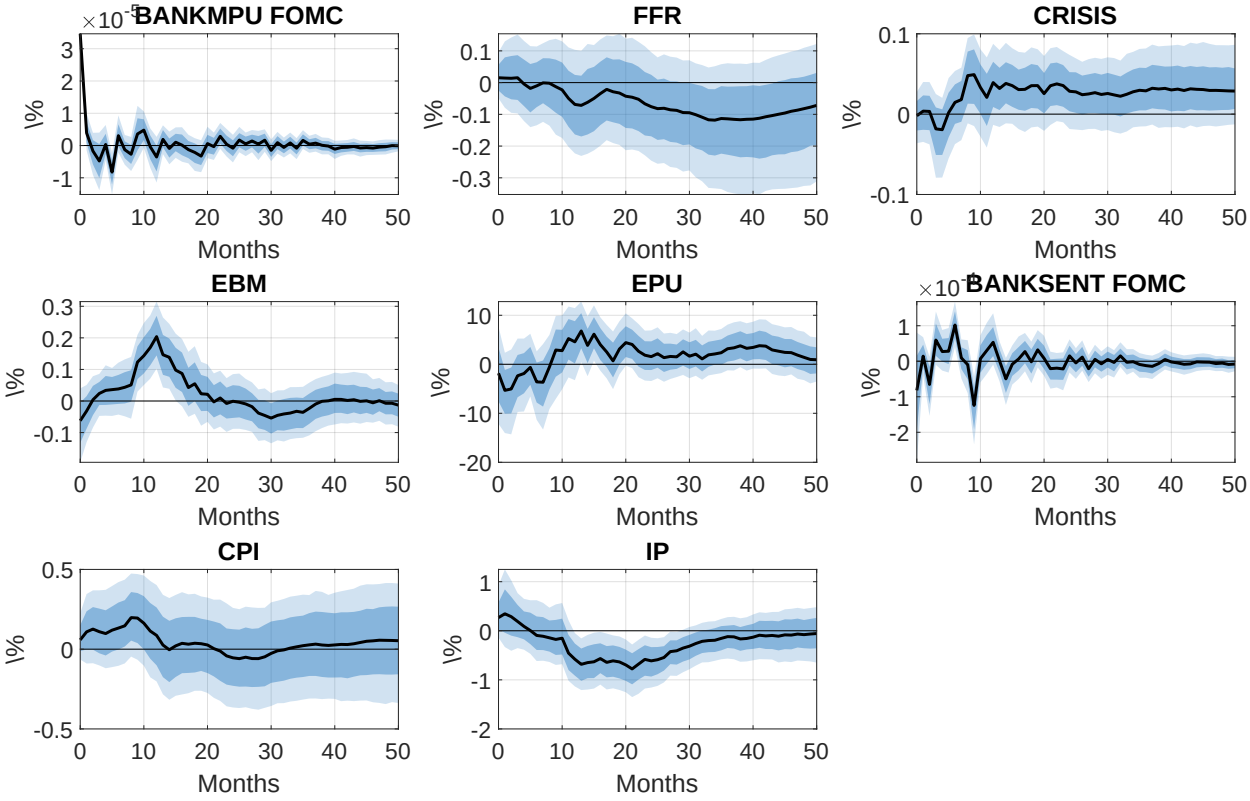
## 8.3 Appendix B: Bank Fundamentals

| | N | Mean | SD | p25 | p50 | p75 |
|---|---|---|---|---|---|---|
| $\text{MPAtt}_{b,t}$ | 10945 | 5.737 | 4.993 | 2.000 | 5.000 | 8.000 |
| $\text{MPSent}_{b,t}$ | 10945 | 0.001 | 0.001 | 0.000 | 0.000 | 0.001 |
| $\text{MPUn}_{b,t}$ | 10945 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| $\log(\text{Size})_{b,t}$ | 10320 | 15.899 | 1.648 | 14.769 | 15.649 | 16.688 |
| $\text{Eq/TA}_{b,t}$ | 10319 | 10.923 | 3.592 | 8.976 | 10.542 | 12.344 |
| $\text{Cost/inc}_{b,t}$ | 10089 | 62.978 | 21.326 | 54.507 | 61.141 | 67.868 |
| $\text{Loans/dep}_{b,t}$ | 10085 | 92.071 | 22.410 | 82.117 | 92.318 | 100.672 |
| $\text{ROA}_{b,t}$ | 10218 | 0.876 | 1.743 | 0.715 | 1.030 | 1.318 |
| $\text{LLP}_{b,t}$ | 10218 | 0.145 | 0.332 | 0.019 | 0.056 | 0.134 |
| Federal Fund $\text{rate}_t$ | 10907 | 1.609 | 1.709 | 0.250 | 1.000 | 2.250 |
| $\text{inflation}_t(QoQ)$ | 10907 | 0.578 | 0.435 | 0.349 | 0.512 | 0.708 |
| GDP $\text{growth}_t(QoQ)$ | 10907 | 0.531 | 1.482 | 0.321 | 0.612 | 0.886 |
| $\log(\text{SP500})_t$ | 10907 | 7.551 | 0.487 | 7.137 | 7.562 | 7.961 |
| $\text{employment}_t$ | 10907 | 147909.452 | 7159.519 | 141526.000 | 146241.000 | 153786.000 |

Table 9: Descriptive statistics.

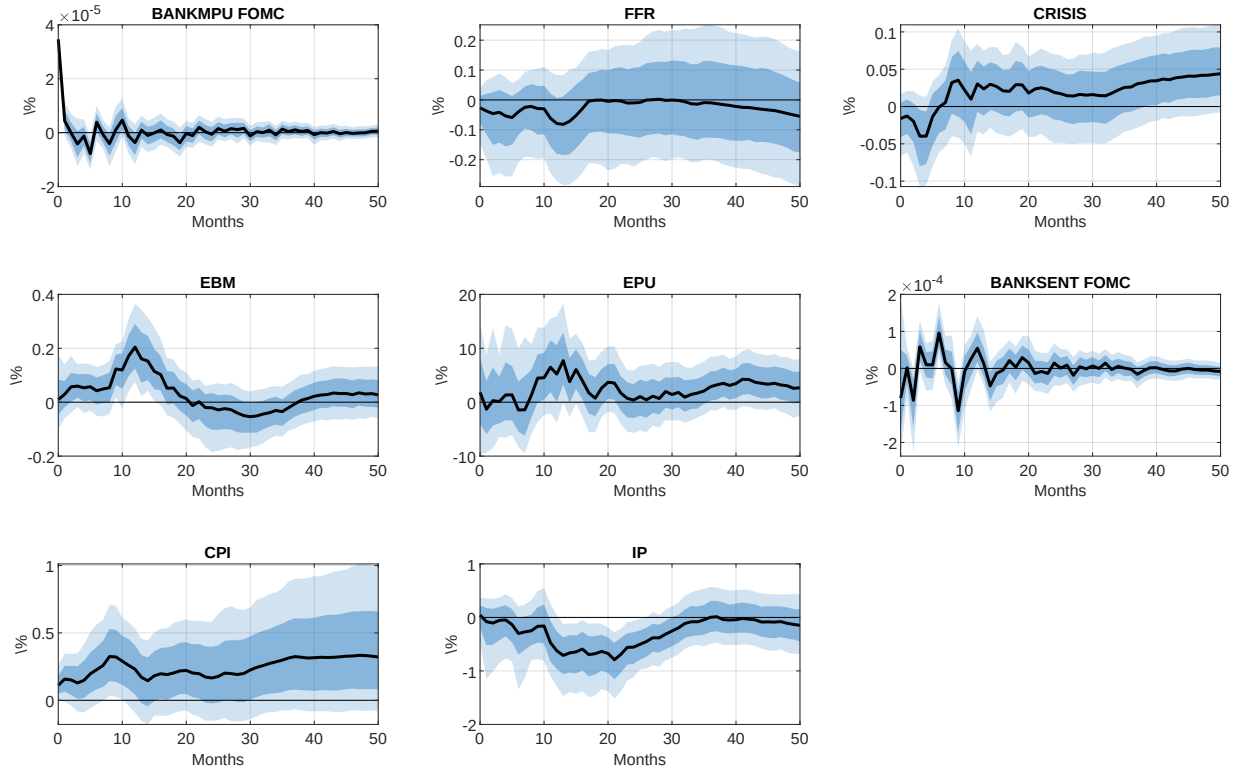
## 8.4 Appendix C: Robustness VAR

Figure 9: Uncertainty and economic activity: Impulse Response Function - Industrial Production Manufacturing



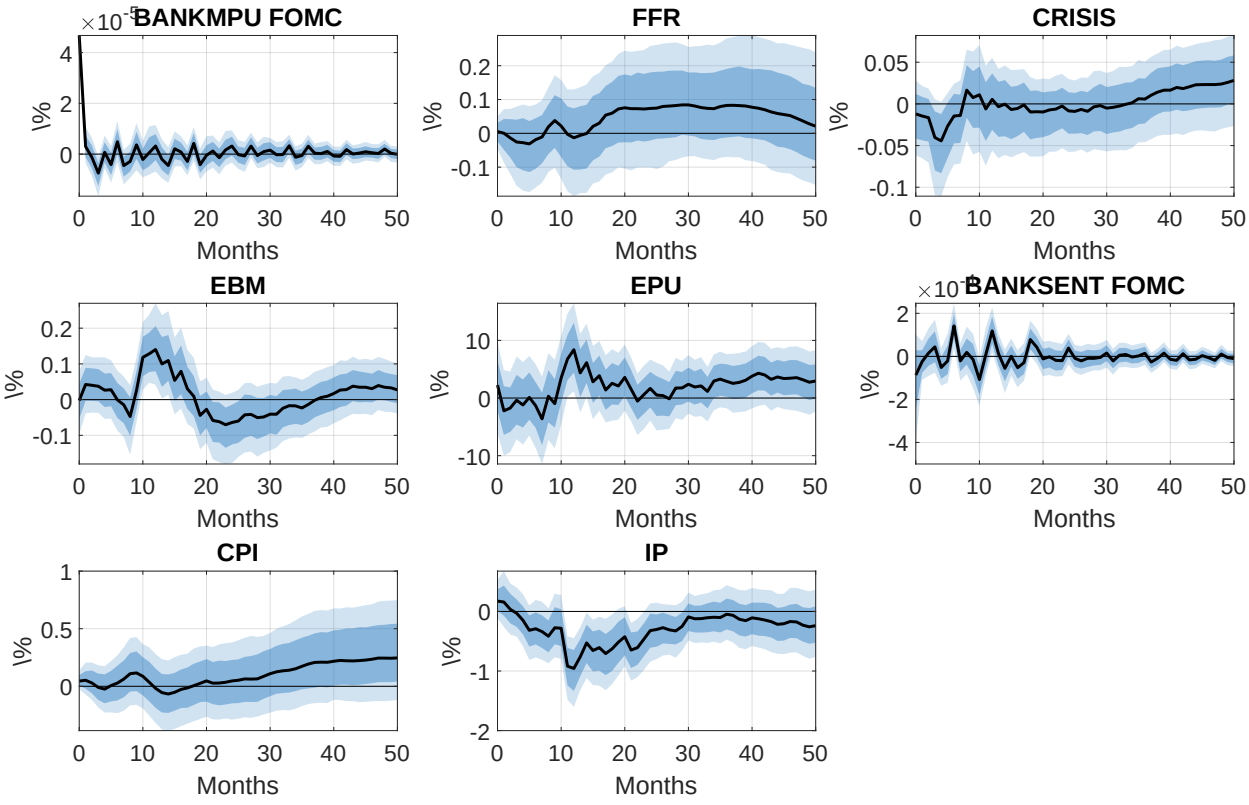

First stage regression: F: 37.71, robust F: 11.54, $R^2$: 13.11\%, Adjusted $R^2$: 12.76\

Figure 10: Uncertainty and economic activity: Impulse Response Function - Instrument: $\hat{\eta 2}_t$



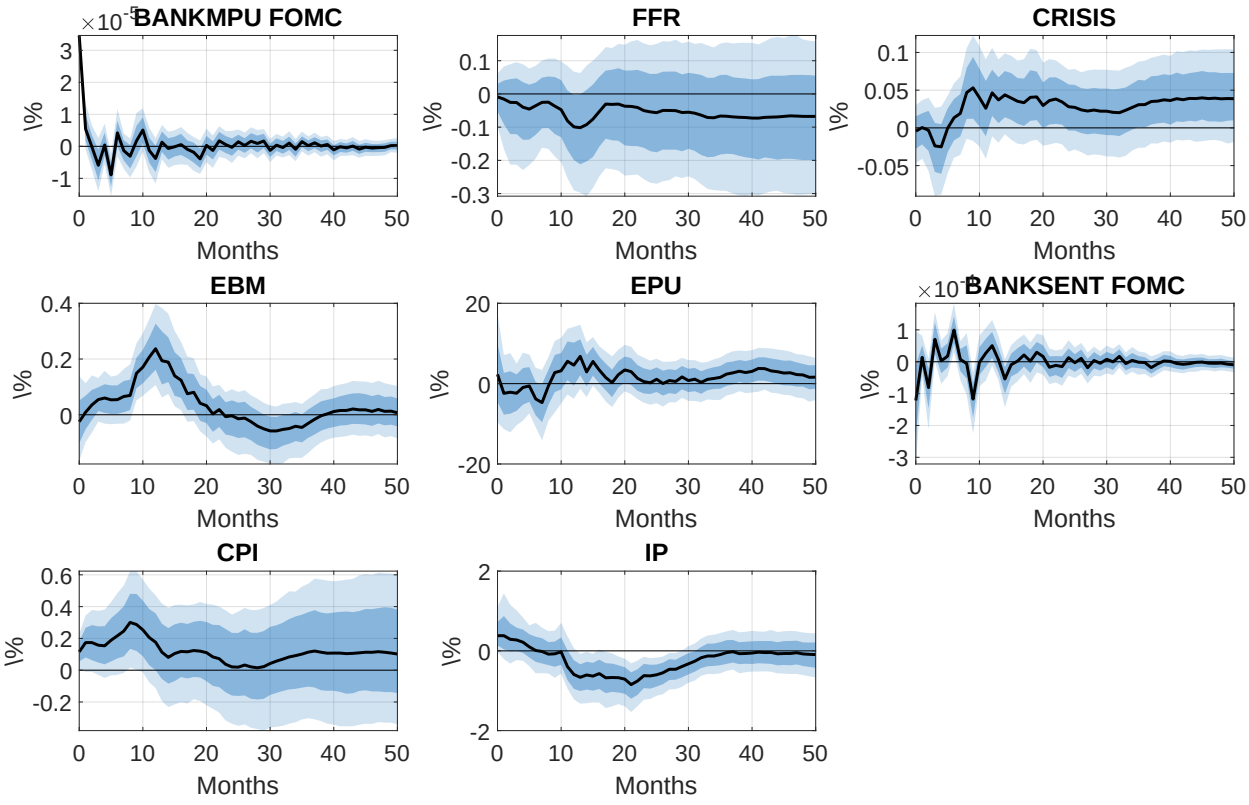

First stage regression: F: 30.02, robust F: 13.23, $R^2$: 10.72\%, Adjusted $R^2$: 10.36\%

Figure 11: Uncertainty and economic activity: Impulse Response Function - No Bank Fundamentals




First stage regression: F: 67.14, robust F: 40.60, $R^2$: 21.17\%, Adjusted $R^2$: 20.86\(

Figure 12: Uncertainty and economic activity: Impulse Response Function - (Num Banks $> 5$)




First stage regression: F: 20.41, robust F: 10.40, $R^2$: 7.55\%, Adjusted $R^2$: 7.18\%

## 8.5 Appendix D: Index for firms

| | N | Mean | SD | p25 | p50 | p75 |
|---|---|---|---|---|---|---|
| $\text{MPSent}_{f,t}$ | 141114 | 0.235 | 1.001 | 0.000 | 0.000 | 0.000 |
| $\text{MPAtt}_{f,t}$ | 141114 | 0.685 | 1.559 | 0.000 | 0.000 | 1.000 |
| $\text{MPUn}_{f,t}$ | 141114 | 0.142 | 1.002 | 0.000 | 0.000 | 0.000 |
| $\log(\text{TA}_{f,t})$ | 349373 | 5.304 | 2.893 | 3.468 | 5.535 | 7.407 |
| $\Delta Sales_{f,t}$ | 317790 | 4.310 | 37.633 | -8.111 | 1.075 | 10.612 |
| $\text{EBITDA ratio}_{f,t}$ | 298466 | -9.516 | 58.487 | -2.610 | 1.879 | 3.849 |
| $\text{Lev}_{f,t}$ | 348299 | 40.114 | 103.427 | 2.486 | 21.710 | 41.464 |
| $\text{IC ratio}_{f,t}$ | 241881 | -5.419 | 220.519 | -4.045 | 2.036 | 10.297 |
| $\text{Federal Fund rate}_t$ | 141114 | 1.533 | 1.663 | 0.250 | 0.500 | 2.250 |
| $\text{inflation}_t(QoQ)$ | 141114 | 0.575 | 0.427 | 0.349 | 0.514 | 0.708 |
| $\text{GDP growth}_t(QoQ)$ | 141114 | 0.519 | 1.392 | 0.301 | 0.612 | 0.886 |
| $\log(\text{SP500})_t$ | 141114 | 7.477 | 0.477 | 7.085 | 7.326 | 7.836 |
| $\log(\text{emp}_t)$ | 141114 | 11.896 | 0.047 | 11.852 | 11.890 | 11.935 |
| $\text{CEO conf}_t$ | 141114 | 52.699 | 12.667 | 44.000 | 55.000 | 62.000 |
| $\text{EPU}_t$ | 141114 | 128.123 | 42.550 | 97.604 | 122.445 | 154.011 |
| $\text{Jiang et al.(2020)}_t$ | 99983 | 0.037 | 0.833 | -0.440 | 0.198 | 0.728 |

Table 10: Descriptive statistics Firms.

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