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Ragnar E. Juelsrud
Vegard H. Larsen



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Macroeconomic uncertainty and bank lending*

Ragnar E. Juelsrud[†] Vegard H. Larsen[‡]

Abstract

We investigate the impact of macro-related uncertainty on bank lending in Norway. We show that an increase in general macroeconomic uncertainty reduces bank lending. Importantly, however, we show that this effect is largely driven by monetary policy uncertainty, suggesting that uncertainty about the monetary policy stance is key for understanding why macro-related uncertainty impacts bank lending.

JEL-codes: D80, E52, G21,

Keywords: Macroeconomic uncertainty, Textual analysis, Bank lending

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[†]Norges Bank. ragnar.juelsrud@norges-bank.no

[‡]Corresponding author: Centre for Applied Macroeconomics and commodity Prices (CAMP), BI Norwegian Business School. vegard.larsen@bi.no

1 Introduction

A large and growing literature has documented the importance of uncertainty for macroeconomic aggregates such as output and employment (Baker et al., 2016; Benati, 2013; Bloom, 2009, 2014). Raunig et al. (2017) show that banks respond to uncertainty by contracting credit and therefore are potentially important for explaining uncertainty-induced recessions. Recently, several papers have explored the impact of more specific sources of uncertainty. While one strand of the literature has focused on the role of monetary policy uncertainty (Fu and Luo, 2021; Husted et al., 2020) or policy uncertainty more broadly (Baker et al., 2016), a different strand of the literature focuses on the impact of macro-related uncertainty itself (Jurado et al., 2015). A key challenge in the literature, however, is to disentangle the effects of different sources of uncertainty, as these different measures often capture similar, underlying factors. For instance, disentangling the effect of uncertainty about the macroeconomic outlook from the effect of uncertainty about the stance of policy makers is challenging, as both types of uncertainty tends to be correlated.

This paper contributes to the existing literature by investigating how different sources of macroeconomic uncertainty affect bank lending. Specifically, we disentangle the effect of uncertainty about the macroeconomy in general on bank lending from uncertainty about monetary policy. Our paper consists of two main steps. In the first step, we use newspaper articles from the financial press in Norway and a Latent Dirichlet Allocation model (Blei et al., 2003) to create measures of uncertainty about different topics, for instance monetary policy uncertainty. This step is crucial in allowing us to focus on the role of individual sources of uncertainty that often is aggregated into market prices. In the second step, we link the text-based measures of uncertainty with bank data to investigate the effect of uncertainty on bank lending using local projections.

We show that general macroeconomic uncertainty has a negative and significant impact on bank lending, both to households and corporations. A one standard deviation increase in a general macroeconomic uncertainty measure reduces bank lending growth at peak impact by approximately .40 percentage points. This compares, for instance, to an average lending growth to corporations of roughly 1.9 percentage points. Importantly, we show that the key macro-related uncertainty measure is monetary policy uncertainty. Specifically, when we run an augmented local projection where we include both the monetary policy uncertainty and the more general macroeconomic uncertainty measure, we find that only monetary policy uncertainty affects bank lending. The peak impact of a one standard deviation increase in monetary policy uncertainty is approximately 50 basis points on both lending to households and corporations, while the more general macroeconomic uncertainty measure no longer has a significant impact on bank lending.

2 Data and Methodology

We use a text-based approach to measure uncertainty based on the content of news articles. The newspaper data we use is printed articles from Dagens Næringsliv (DN) for the period May 1988 to October 2022. The news data have been generously provided by the company Retriever through their “Atekst” database, and collected manually for the latter part of the sample. DN is published six times a week and is the biggest business newspaper in Norway covering a wide range of Norwegian and international business news.

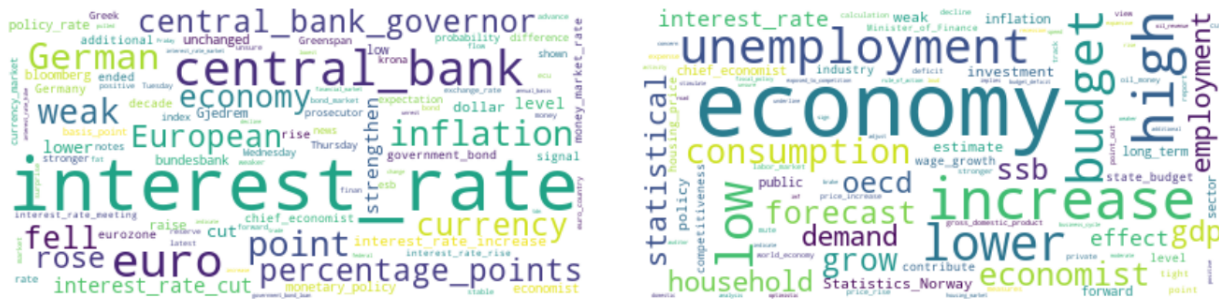


Figure 1: News topics as word clouds for monetary policy (left) and macroeconomics (right)

Notes: The 200 words with the highest probabilities are shown. The size of the words corresponds to the probability of that word occurring in the topic distribution. Words that are connected by an underscore represent single words that become phrases when translated from Norwegian to English.

2.1 Uncertainty measurement

We investigate two types of uncertainty: monetary policy uncertainty and macroeconomic uncertainty. These measures are created as in [Larsen \(2021\)](#).

First, the various news topics are identified by classifying all news articles according to a set of latent underlying themes. The articles are classified as a set of topics using a Latent Dirichlet allocation (LDA) model, introduced by [Blei et al. \(2003\)](#). This is an unsupervised learning algorithm that classifies text in a similar way as humans would do, see [Chang et al. \(2009\)](#). Before the topics are estimated we have to specify the total number of topics, and we use 80 topics in total.¹ A news topic is defined as a probability distribution over words (one distribution for each of the 80 topics). We focus on two types of news, and visualise the probability distribution for the monetary policy topic and the macroeconomics topic as word clouds in [Figure 1](#). Note that the LDA does not assign any label to a topic - a topic is defined by the word distribution. We label the topic subjectively after inspecting the word clouds associated with each topic. In addition to the word distributions, the LDA provides a set of distributions over the identified topics, one for each article. These topic distributions give the thematic content of each article.

In the second step we count the number of uncertainty terms in all the articles. The words that are counted (in Norwegian) are *usikker*, *usikre*, *usikkert*, *usikkerhet*, *usikkerheter*, *usikkerheten*, *usikkerhetene*. The count of uncertainty terms is combined with the topic classification from the LDA (the probability distribution over the topics) to create category specific measures of uncertainty. The topic-specific measures are created by multiplying the topic weight for a given article by the uncertainty count in the same article.² This methodology gives us a daily measure of uncertainty for all the news topics.

We plot the monetary policy and the macroeconomics uncertainty measures in [Figure 2](#). We annotate some historical events that coincided with significant movements in uncertainty. See [Table 1](#) in the appendix

¹This number is chosen as a compromise between getting topics that describe the underlying text well (many topics) and getting a set of topics that makes sense for our economic application.

²See [Larsen \(2021\)](#) for a detailed description of how the topic specific uncertainty measures are created.

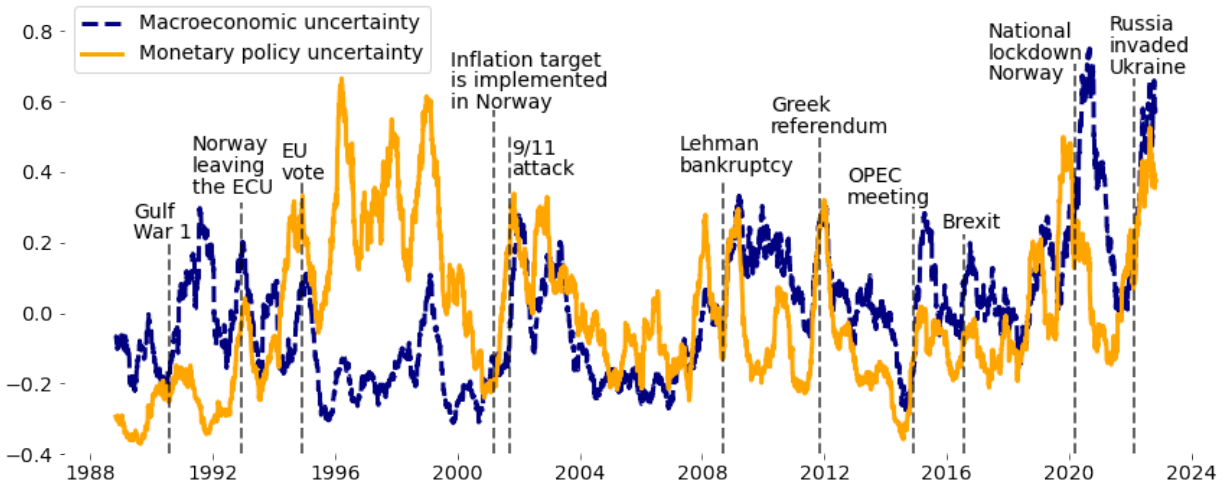


Figure 2: Measures of uncertainty

Notes: The uncertainty measures are plotted as the 150-day backward-looking mean. Both measures are normalized.

for the exact dates and a description of these events.

The two measures co-varies for parts of our sample and the daily (quarterly) correlation between the two is 0.32 (0.23). This correlation is not surprising given that uncertainty about the execution of monetary policy is related to macroeconomic uncertainty where the central banks policy is a function of the economic situation and its outlook.

We observe some episodes where there are significant differences between the two measures. First, we see large deviations in the late 1990s where monetary policy uncertainty is persistently elevated. The 1990s was a period where the monetary policy regime in Norway was changing and this elevated uncertainty is likely related to what type of monetary policy regime that should be implemented in Norway. In 1990 Norway implemented a fixed exchange rate, pegged to the European Currency Unit (ECU). The European Monetary System broke down in 1992 and a free floating exchange rate regime was implemented. Norway transitioned into inflation targeting in 2001 which was de facto implemented already in 1999, see [Eitrheim et al. \(2020\)](#).

Second, in the aftermath of the Global Financial Crisis, macroeconomic uncertainty remained high for several years, while monetary policy uncertainty fell down relatively quickly.

Third, Brexit lead to a large increase in macroeconomics uncertainty, but did not seem to affect monetary policy uncertainty that much. Lastly, we see that monetary policy uncertainty increased when Norges Bank started to gradually increase the policy rate from the autumn of 2018. However, this uncertainty was resolved when Norges Bank set interest rates to zero in the spring of 2020 in response to the Covid-19 lockdown. At the same time, macroeconomic uncertainty rose to an all time high during the Covid-19 pandemic.

2.2 Bank data

We combine the uncertainty measures in Section 2.1 with bank-level data on lending to households and corporations. The bank-data comes from a supervisory database on all major balance sheet and income statement variables of all Norwegian banks. We restrict attention to the period 2002q2 to 2020q4. In total, our

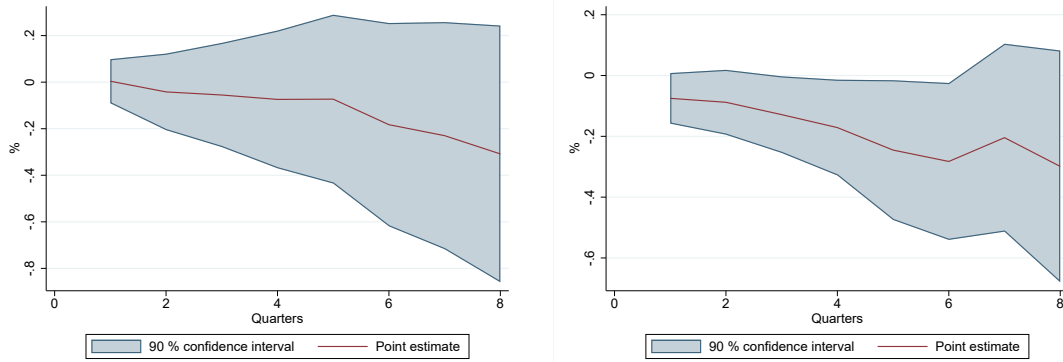


Figure 3: IRF of the effect of macroeconomic uncertainty on household lending (left panel) and corporate lending (right panel).

Notes: This figure shows the cumulative effect (in percent) on lending to households (left panel) and corporates (right panel) of a one standard deviation change in the macroeconomic uncertainty measure. Blue shaded area correspond to a 90 percent confidence interval.

data is based on 242 unique banks.

2.3 Local projections

To identify the effects of uncertainty on bank lending, we start by estimating local projections (Jordá, 2005) of the following form

$$\log l_{i,t+h} - \log l_{i,t-1} = \alpha_i + \beta^h z_{t-1} + \sum_{k=2}^K \beta_k^h z_{t-k} + \sum_{k=1}^K \gamma_k^h X_{t-k} + \sum_{k=1}^K \delta_k^h \Delta \log l_{i,t-k} + \epsilon_{i,t}, \quad (1)$$

where i denotes a bank and $h \in \{1, 8\}$ denotes different horizons. The key dependent variable is (the log of) bank-level loans to either households or corporations. The key independent variable z_{t-1} is first the macroeconomic uncertainty measure. We include a vector of controls X_{t-k} , which contains changes in GDP, CPI, industrial production, unemployment rate, the GDP deflator and the price of Brent Crude oil. We set $K = 2$, that is we include up to two lags of the main independent and dependent variables.

We then run this specification again while including both the macroeconomic uncertainty measure *and* a monetary policy uncertainty measure in z . In this case, we are able to map out the dynamic effects of monetary policy uncertainty on bank lending conditional on general macroeconomic uncertainty and vice versa.

3 Results

We start by investigating the impact of macroeconomic uncertainty on bank lending. In Figure 3, we plot the response of household lending (left panel) and corporate lending (right panel) to a one standard deviation increase in macroeconomic uncertainty.

As is clear from the figure, an increase in macroeconomic uncertainty decreases bank lending. This is true for both household and corporate lending. In both cases, the peak impact of a one standard deviation increase in macroeconomic uncertainty is a reduction in bank lending of about 35-40 basis points. This compares to an average lending growth of about 1.95 percentage points.

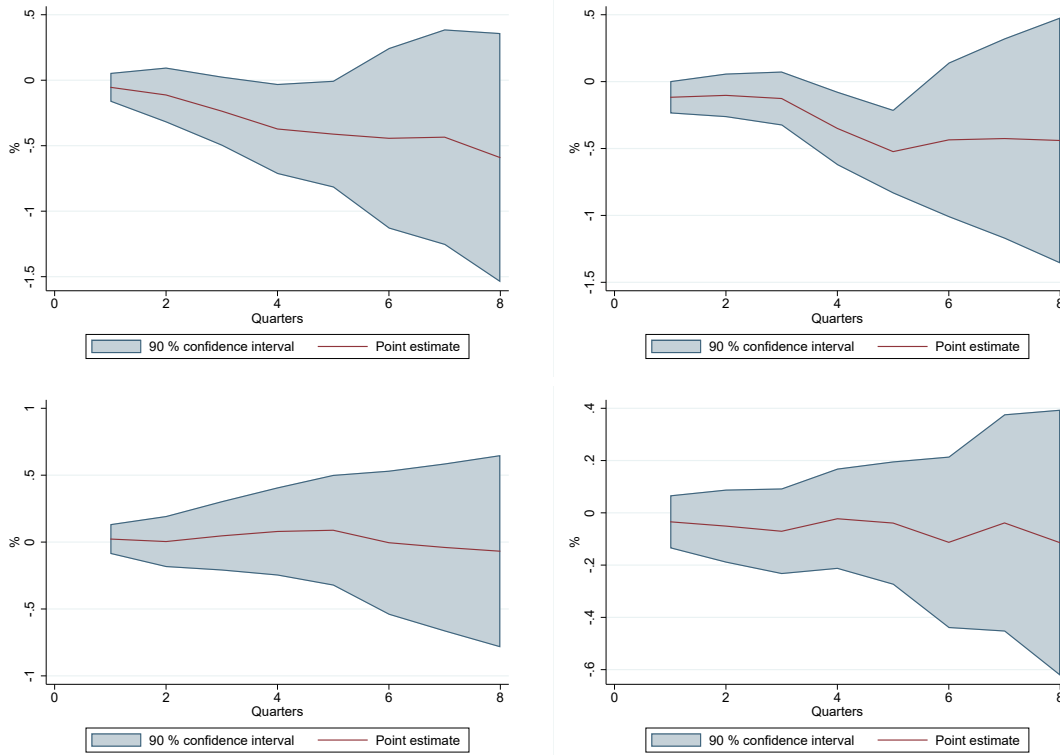


Figure 4: IRF of the effect of monetary policy uncertainty on household lending (top left panel) and corporate lending (top right panel) compared to the effect of (residual) macroeconomic uncertainty on household lending (bottom left panel) and corporate lending (bottom right panel).

Notes: The top panel in this figure shows the cumulative effect (in percent) on lending to households (top left panel) and corporates (top right panel) of a one standard deviation change in macroeconomic uncertainty. The bottom panel shows the conditional IRF of a one standard deviation change in macroeconomic uncertainty, holding monetary policy uncertainty fixed. Blue shaded area correspond to a 90 percent confidence interval.

Next, we explore the impact of general macroeconomic uncertainty vs one specific source of macro-related uncertainty, namely monetary policy uncertainty. By controlling for both measures at the same time, we are able to look at the effect of each measure in isolation.

The results are shown in Figure 4. In the top panel, we show the impact of monetary policy uncertainty on bank lending conditional on the macroeconomic uncertainty measure. There is a significant, negative impact of monetary policy uncertainty on bank lending to both households and corporations. The peak impact in both cases is roughly 50 basis points.

In the bottom panel, we show the impact of macroeconomic uncertainty when holding monetary policy uncertainty fixed. In contrast to Figure 3, macroeconomic uncertainty no longer has a significant impact on bank lending. Overall, these results suggest that monetary policy uncertainty is key for understanding how macro-related uncertainty affect bank lending.

4 Conclusion

In this paper, we investigate the effects of text-based uncertainty measures on bank lending. We show that macroeconomic uncertainty significantly affect bank lending. Both household and corporate lending is affected by uncertainty. We then investigate whether general macroeconomic uncertainty generally or monetary policy uncertainty specifically is most important for bank lending. Conditional on the level of monetary policy uncertainty, the broader macroeconomic uncertainty measure has no significant impact on bank lending. In contrast, monetary policy uncertainty (conditional on macroeconomic uncertainty) significantly reduces bank lending both qualitatively and quantitatively. A potential alley for future research is to investigate further how banks adjust their balance sheets in response to uncertainty to better the exact mechanisms through which uncertainty reduces bank lending. It would also be important to understand how important reduced bank lending due to higher uncertainty are in explaining the depths of uncertainty-induced recessions.

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A Online appendix

Table 1: Historical events

Event	Date	Description
<u>1990s</u>		
Gulf War 1	1990-08-02	Gulf War 1 (2 Aug. 1990 – 28 Feb 1991)
Norway leaving the ECU	1992-12-01	Norway leaving the European Currency Unit (ECU). Free floating exchange rate
EU vote	1994-11-28	Norwegian referendum for EU membership
Asian crisis	1997-11-01	The Asian financial crisis
<u>2000s</u>		
Inflation target Norway	2001-03-01	Official implementation of a inflation targeting central bank in Norway
9/11 attack	2001-09-11	The Al-Qaeda attack on the US
Lehman bankruptcy	2008-09-15	The collapse of Lehman Brothers
<u>2010s</u>		
Greek referendum	2011-10-31	Greek proposed economy referendum
OPEC meeting	2014-11-28	OPEC chose not to reduce production
Brexit	2016-06-26	UK voted to leave the EU
<u>2020s</u>		
National lockdown Norway	2020-02-12	National lockdown Norway due to the Covid-19 pandemic
Russia invaded Ukraine	2022-02-24	Russia invaded Ukraine

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BI Norwegian Business School
Centre for Applied Macro - Petroleum economics (CAMP)
N-0442 Oslo

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