

Subjective Expectations and Uncertainty



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The notion of uncertainty is intimately related to people's expectations about the future. Therefore, in the recent paper we set out a novel theory of subjective expectations – which attempts to reflect well-known behavioral features of the process of expectation formation – and apply it to assess macroeconomic uncertainty. Using the proposed theoretical framework, we construct a novel uncertainty index based on forecast revisions of professional forecasters. In the empirical part of the study, we calculate this index for the US economy and compare it with the existing alternatives in terms of their performance and their impact on the economy.

Introduction

The interest of economists in the role of uncertainty and what follows, in measurement of this phenomenon, has increased substantially since the global financial crisis (GFC) in 2007/2009 and recently, because of the COVID-19 pandemic and Russian aggression against Ukraine. However, any empirical research on the importance of uncertainty requires a reliable measure of this variable, which by its nature is latent. The economic literature offers several ways to proxy uncertainty—including volatility of stock market returns, conditional volatility of forecast errors, frequency of appearances of newspaper's articles related to uncertainty, and some survey-based measures—but a consensus on how to measure uncertainty is still far from being achieved.

In the recent working paper ([Kocięcki et al., 2022](#)), we infer about uncertainty from the revisions of macroeconomic expectations of private sector experts. Our approach has strong theoretical foundations as it is derived from a novel subjective expectations theory. Its application allows us to decompose forecast revisions into two unobserved components: the “rational” part, driven by fundamentals, and the part associated with uncertainty. We define the uncertainty index as the volatility of the part of revisions unexplained by fundamental factors.

Theory of expectations in a nutshell

The subjective expectations theory proposed in our study is based on few realistic axioms and allows for omitting explicit reference to induced probability. We augment the axioms with the subjective assessment hypothesis (SAH) which describes the optimal decision rule for each individual facing a forecasting task. The forecaster's decision rule assumes that the process of forming expectations involves conscious and self-reflected thinking, as well as a persistence of beliefs. According to this rule, the forecaster attempts to make a forecast which is accurate, but at the same time does not deviate much from a certain fixed value (an anchor). Possible interpretations of the anchor include forecasters' previous predictions, lagged consensus forecast, or, in the case of inflation expectations, an inflation target or a central bank inflation projection. Inclusion of the distance from the anchor in the decision rule is supported by many theories of expectation formation that appeared in the broad literature, related, for example, to strategic behavior or cognitive limitations.

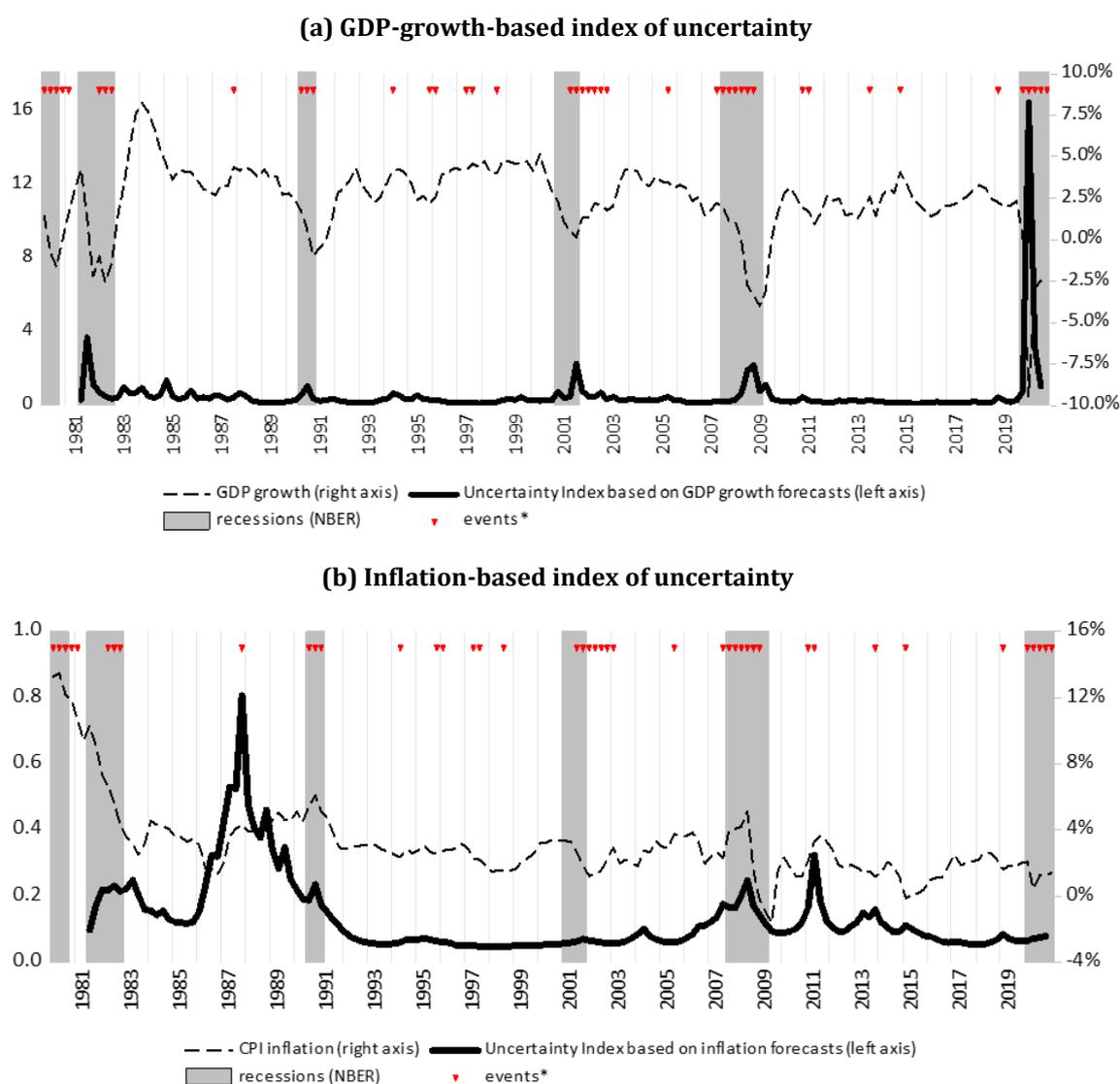
Employing the introduced framework, we show that revisions of forecasts might be decomposed into two unobserved components: the “rational” part, driven by fundamentals, and the part associated with uncertainty. The former one is related to the information available to individuals when forming expectations, while the latter one reflects unexplainable part in subjective assessment of future outcomes (hunch, intuition, etc.). To make the decomposition of forecast revision operational and to retrieve the uncertainty from subjective expectations, we propose the empirical model with time-varying coefficients and stochastic volatility. The uncertainty index is defined as the volatility of the part of revisions unexplained by fundamental factors.

Uncertainty index for the US

We calculate two versions of the uncertainty index for the US economy, based either on GDP growth or inflation forecast revisions in the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters (Figure 1). Revisions of one-quarter-ahead forecasts, referring to GDP growth or inflation, depend on the surprise part of recent realizations of macroeconomic variables (inflation, GDP growth, interest rate) and their deviations from the anchor, i.e., the consensus forecast.

The uncertainty indices based on GDP forecast revisions and inflation forecasts revisions are quite different from each other. The former one is negatively correlated with GDP growth and signals uncertainty mainly during recessions. We observe huge increase of this index at the beginning of the COVID-19 pandemic. Uncertainty index based on inflation forecast revisions tends to increase when inflation goes up. Its peaks correspond to some important events (Black Monday, Gulf War I, beginning of the global financial crisis, debt ceiling dispute, federal government shut-down) and, especially, to developments related to Fed monetary policy (so-called inflation scares in the 1980's, Volcker-Greenspan transition, QE programs, uncertainty regarding the exit from QE). However, some of the important economic and social events affect this measure of uncertainty only moderately (GFC) or do not affect it at all (beginning of the COVID-19 pandemic). The different evolution of both uncertainty indices during the pandemic is consistent with changes in survey-based measures of forecast disagreement which show a massive increase of disagreement regarding GDP growth forecasts at the beginning of the COVID-19 pandemic and only a mild increase of disagreement regarding future inflation.

Figure 1: Uncertainty indices and uncertainty events



Notes: The figures show two uncertainty indices proposed in our paper. Red triangles mark the following uncertainty events: 1987Q4 – Black Monday (19th October), 1990Q3-1991Q1 – Gulf War I, 1994Q2 – surge in commodity prices, 1995Q4-1996Q1 – federal government shutdown, 1997Q2-1997Q3 – Asian Crisis, 1998Q3 – Russian LTCM Default, 2001Q3 – 9/11 terrorist attack, 2001Q4-2002Q3 – Worldcom and Enron, 2002Q4-2003Q1 – Gulf War II, 2005Q3 – hurricane Katrina, 2007Q3-2009Q1 – credit crunch & sub-prime crisis, 2011Q1-2011Q2 – debt ceiling dispute, 2012Q3 – fiscal cliff, 2013Q4 – federal government shutdown, 2015Q1 – coalition against ISIL, 2019Q1 – federal government shutdown, since 2020Q1 – COVID-19 pandemic.

We compare the uncertainty indices with popular uncertainty measures, representing other approaches to capture this unobservable phenomenon: the volatility of stock market returns (Bloom, 2009), overall Economic Policy Uncertainty (EPU) and its monetary policy subindex (Baker et al., 2016), an index of macroeconomic uncertainty, which aggregates signals from a large number of economic indicators (Jurado et al., 2015), and disagreement of professional forecasters with regard to future inflation and GDP growth. The GDP-growth based index of uncertainty correlates with all alternative indices, showing the highest similarity to disagreement in GDP growth forecasts. On the contrary, the index based on inflation forecasts correlates only with selected alternative indices. In particular, it co-moves with the EPU sub-index related to monetary policy, but not with the baseline EPU aimed at measuring more general uncertainty. In contrast, the GDP-growth-based index shows stronger correlation with the general EPU than with its monetary policy version. This is in line with our interpretation that the two indices capture different types of uncertainty.

In addition, we validate the developed uncertainty indices by analyzing the responses of economy to uncertainty shocks using the VAR framework. The VAR model with recursive identification scheme, estimated on quarterly data, include seven variables in the following order: the uncertainty index, unemployment rate, real GDP, wages, prices, short-term interest rate and S&P 500 Index. Shocks to both uncertainty indices developed in our study lead to economic contraction, reflected in a fall in real GDP and an increase of unemployment, as well as to a reduction in CPI inflation. Such responses are in line with part of empirical literature on uncertainty which suggests that uncertainty shocks act similarly to typical demand shocks (Leduc and Liu, 2016). The impact of uncertainty shocks on GDP growth, unemployment rate and CPI inflation, is similar across various uncertainty measures used in the literature, including our new indices. The shocks to uncertainty indices proposed in our study, especially to uncertainty index based on GDP forecast revisions, produce relatively strong and persistent responses of the measures of economic activity.

Conclusions

Analysis of macroeconomic expectations of private sector agents reveals not only the path of expected macroeconomic developments and the mechanism of expectation formation, but also allows for assessing the degree of uncertainty faced by economic agents. Our recent study deals with these important and interrelated issues.

The new uncertainty indices proposed in our paper, based either on GDP or inflation forecast revisions, have a meaningful interpretation as their peaks correspond to major events in the US economic history. Empirical analysis suggests that both indices describe different kinds of macroeconomic uncertainty. The uncertainty index based on GDP forecast revisions seems to be closely related to developments in economic activity and increases during recessions. The uncertainty index based on inflation forecast revisions seems to refer to inflation risks, reflecting in particular monetary policy frameworks and conduct. We also find that the shocks to both indices act similarly as demand shocks, generating economic contractions and pushing inflation down. ■

References

- Baker S., Bloom N., Davis S., 2016, Measuring economic policy uncertainty, *The Quarterly Journal of Economics* 131(4), 1593-1636.
- Bloom N., 2009, The impact of uncertainty shocks, *Econometrica* 77(3), 623-685.
- Jurado K., Ludvigson S.C., Ng S., 2015, Measuring uncertainty, *American Economic Review* 105(3), 1177-1216.
- Kocięcki A., T. Łyziak, E. Stanisławska, 2022, Subjective Expectations and Uncertainty, *NBP Working Paper No. 345*, https://www.nbp.pl/publikacje/materialy_i_studia/345_en.pdf.
- Leduc S., Liu Z., 2016, Uncertainty shocks are aggregate demand shocks, *Journal of Monetary Economics* 82, 20-35.

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