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Monetary policy uncertainty and investor expectations

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ABSTRACT

How does monetary policy uncertainty affect the behavior of market participants? In a New-Keynesian DSGE model with Epstein–Zin preferences, an increase in interest rate uncertainty is found to increase precautionary savings for households, and depress output, inflation and the short- and long-term asset yields. These effects are similar to a negative demand shock. The monetary policy uncertainty shock is calibrated using ex-ante uncertainty of investors about the future changes in Treasury yields, extracted from Options and Futures data. Incorporating the monetary policy uncertainty shock is also found to lower the term premium generated by the model, relative to the case without stochastic volatility in the interest rate rule.

1. Introduction

> "The pace of business investment has also been only modest during this recovery [...]. Businesses seem not to have had sufficient confidence in the strength and durability of the recovery [...]. Moreover, some analysts have suggested that uncertainty, not only about the strength of the recovery but also about economic policy, could be a significant factor."

Chair Janet Yellen's speech at the Providence Chamber of Commerce, Providence, Rhode Island, May 22, 2015.

During the financial crisis, and in its aftermath, policymakers have used several unconventional tools of monetary policy in attempts to influence expectations of market investors. As the level of the Federal Funds Rate fell to the zero-lower bound, the communications and issuances of forward guidance have attempted to influence (and lower) investors' uncertainty about interest rate policy. Uncertainty about interest rates has important implications for decision making by economic agents; the above quote by the Chair of the Federal Reserve recognizes how uncertainty about economic policy could negatively impact investment activity during the recovery period. Changes in uncertainty about interest rates has also been a prevalent feature of the conduct of monetary policy during the mid-2000s. The step-wise increase in the federal funds rate, announced in different statements of the FOMC between June 30, 2004 and June 29, 2006, attempted to guide investor expectations away from the near zero-lower bound in a systematic way. These announcements are hypothesized to have reduced the uncertainty about the path of interest rates. However, even as the Federal Reserve has attempted to influence investor

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uncertainty about the path of interest rates, the channels through which this uncertainty about monetary policy affects the economy have remained relatively unexplored.

This paper investigates the effects of uncertainty about monetary policy on the optimizing behavior of households. The analysis develops a New-Keynesian model with Epstein–Zin preferences in which monetary policy uncertainty is introduced through a stochastic volatility component in the interest rate rule. Since there are no direct measures of the evolution of uncertainty about monetary policy, the paper uses a novel dataset to do so. Options and Futures data on U.S. Treasuries is used to extract the ex-ante uncertainty about the future change in Treasury yields using the procedure of Beber and Brandt (2006) and Sinha (2015). Observed prices of Call Options on 30–90 day contracts for 2-year Treasuries, traded on the Chicago Board of Trade, are used to extract the moments of the underlying risk-neutral probability distributions of investors. Empirical studies show that these moments respond to announcements of the Federal Reserve. The standard deviation of the Call Options on these securities are considered as the empirical measure of interest rate uncertainty. In this model, an increase in the interest rate uncertainty is found to encourage precautionary savings for households, and causing a decline in their consumption. Thus, the increased uncertainty about the interest rate acts as a negative demand shock, and depresses inflation as well as short- and long-term interest rates. Finally, the model performance in matching moments on U.S. macroeconomic data is also examined. The analysis thus suggests that if monetary policy can lower the uncertainty about interest rate among investors and households, it may be able to have a positive effect on the output and inflation levels.

The mechanism of the model is similar to the effects of an uncertainty shock to technology or government spending, and has been previously discussed in the literature. However, unlike previous studies, the model here also considers the effects of stochastic volatility in a production economy, and the implications of the uncertainty shock, on the term premia. The simulations indicate that the slope between the 10-year and three-month interest rate falls in response to an increase in the monetary policy uncertainty shock. The analysis also finds that the degree of risk aversion required to generate a positive nominal yield curve is larger than in the model with no stochastic volatility. Intuitively, while holding nominal bonds, the investors face additional consumption uncertainty arising from the stochastic volatility component of the interest rate rule.

The rest of the paper is organized as follows: a brief review of the literature in Section 2 is followed by a description of the theoretical model in Section 3. The calibration and simulation of the monetary policy uncertainty shock and subsequent effects on the economy are discussed in Section 4. Section 5 concludes.

2. Context in the literature

This paper is related to the theoretical effects and empirical measurements of policy uncertainty. Mumtaz and Zanetti (2013) use a monetary structural vector autoregression (SVAR), and allow for time-varying variance of monetary policy shocks. This is estimated for U.S. data, and in response to an increase in monetary policy uncertainty, output, inflation and the nominal interest rate fall. The authors proceed to explain the empirical responses by using a New-Keynesian model based on Ireland (2004) and Sargent and Surico (2011) with stochastic volatility in the interest rate rule. In contrast to this, I use Epstein–Zin preferences to estimate the effects of the monetary policy uncertainty shock on the term premia (among other macroeconomic variables). The calibration of the uncertainty shock is different from the (Mumtaz and Zanetti, 2013) analysis, and the solution method uses a third-order approximation approach. Hatcher (2011) uses a DSGE model with external habit formation in preferences, and a combination of demand and supply disturbances with time-varying volatilities. The present paper focusses on the effect of time-varying volatilities in the interest rate rule only. Finally, other analyses that examine the effects of uncertainty on the economy are Basu and Bundick (2012) and Leduc and Liu (2012). These consider the effects of a technology and productivity shock respectively. Akkaya (2015) analyzes the effects of changes in the uncertainty about the future path of monetary policy in closed and open economy frameworks. The impact of a change in the volatility of the interest rate is found to be similar to a change in the level of the interest rate. An increase in the uncertainty about the future policy path also leads to an appreciation of the exchange rate. Fernández-Villaverde et al. (2013) examine the effects of changes in uncertainty about future fiscal policy. The authors find that fiscal volatility shocks can generate large adverse effects on the economy, especially at the zero-lower bound. The present analysis considers the effects of a change in uncertainty in the interest rate rule, and the consequent effects on the yield curve and the term premium.

Among the empirical approaches to measuring monetary policy uncertainty shocks, Nakamura and Steinsson (2013) use intra-day data on Fed funds and Eurodollar futures to extract the market expectations about the federal funds rate. They consider the changes in thirty-minute (and one-day windows) around the FOMC announcements, and use these changes as a new measure of monetary shocks. Jurado et al. (2015) extract policy uncertainty as the common volatility in the unforecastable component of relevant macroeconomic variables. Baker et al. (2013) develop a measure of general policy uncertainty.

The approach used in this paper attempts to measure monetary policy uncertainty directly from investors in the Futures markets for U.S. Treasuries. This provides a new approach to measuring monetary policy uncertainty for Treasury yields. Since 2-, 5- and 10-year Treasury Futures and Options are traded, the procedure also develops a new method to estimate investor uncertainty across the term structure of yields.

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