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Learning and monetary policy shifts

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Abstract

This paper estimates a dynamic stochastic equilibrium model in which monetary policy follows a nominal interest rate rule that is subject to regime switches in the target inflation rate. Two specifications are considered: agents know the current state of monetary policy (full information) and agents use Bayesian updating to infer the policy regime (learning). First, our policy regime estimates are consistent with the view that policy was marked by a shift to a high-inflation regime in the early 1970s which ended with Volcker's stabilization policy. Second, while Bayesian posterior odds favor the full-information version of the model, the fall of interest rates, actual and expected inflation in the early 1980s is better captured by the delayed response of the learning specification. Third, monetary policy shocks of up to two standard deviations essentially do not trigger the Bayesian learning mechanism. Yet due to nonlinearities, interventions that lead to small initial interest rate changes may be associated with much larger effects on output and inflation than under full information.

JEL classification: C11; C32; E52

Keywords: Bayesian econometrics; Learning; Monetary DSGE models

1. Introduction

The effects of monetary policy are closely linked to the expectation formation of agents in the economy. Vector autoregressions (VAR) in the tradition of Sims (1980) have emerged as a tool to assess the consequences of policy interventions. The intervention is modeled as

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an unanticipated deviation—a policy shock—from the perceived policy rule, and its consequences are evaluated through impulse response functions. However, extended systematic deviations from the perceived policy rule may lead agents to change their beliefs about the conduct of monetary policy and invalidate the VAR impulse response predictions.

One method to overcome this problem is to estimate a fully-specified dynamic stochastic general equilibrium (DSGE) model that can be re-solved for alternative policy rules to predict effects of fundamental changes in the policy regime. However, this approach faces some conceptual difficulties as well (e.g. Sims, 1982 and Cooley et al., 1984). First, for several periods after the regime change the agents are potentially uncertain whether the policy shift was temporary or permanent and the transition dynamics are possibly affected by the learning process. Second, the extent to which past data can be used to validate the predictions is very limited, since the policy change typically has no precedent.

In this paper we estimate a basic New Keynesian monetary DSGE model, along the lines of Woodford (2003), in which monetary policy follows a nominal interest rate rule that is subject to regime switches in the target inflation rate. In the first version of the model agents take the possibility of regime shifts into account when they translate observed monetary policy into expectations about future output, prices, and interest rates. They use a Bayesian learning rule to infer the current state of monetary policy. Under the second specification agents have full information about the state of monetary policy. Unlike in the models considered by Sargent (1999), Cogley and Sargent (2004) and Primiceri (2004), our regime switching framework offers no explanation why monetary policy shifts occur over time. We simply assume that there are high-inflation and low-inflation regimes and that the transition probabilities stay constant. While firms and households make inference about the conduct of monetary policy, the central bank itself does not attempt to learn about the effectiveness of their policy and choose policy in an optimal manner.

For the empirical analysis we combine a prior distribution with the likelihood functions derived from the structural model specifications and conduct Bayesian inference. First, we estimate the model parameters and the monetary policy regimes for the post-war US. Our estimates are consistent with the view that policy was marked by a shift to a high-inflation regime in the early 1970s which ended with Volcker's stabilization policy at the beginning of the 1980s. The regime-switching model fits the data better than the standard specification in which the target inflation rate is assumed to be constant. Markov-switching models have been used, for instance, by Sims (2000) and Sims and Zha (2004) to study time-variation in monetary policy. Sims (2000) considers a univariate policy reaction function that is subject to regime shifts, whereas Sims and Zha (2004) extend the analysis to an identified VAR. While these papers find frequent oscillation between regimes and emphasize heteroskedasticity of the structural shocks, our estimation uncovers essentially two distinct shifts of monetary policy.

Second, we study the empirical evidence in favor of the learning mechanism. While Bayesian posterior odds favor the full-information version of the model, the fall of interest rates, actual and expected inflation during and after the disinflation episode in the early 1980s is better captured by the delayed response of the learning specification. DSGE models with shifting policy regimes have recently been analyzed by Andolfatto et al. (2002), Andolfatto and Gomme (2003), and Erceg and Levin (2003). The first two papers consider cash-in-advance models. Andolfatto et al. (2002) show that the agents' learning can explain