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Monetary policy under uncertainty in an estimated model with labor market frictions ☆

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ABSTRACT

We study the design of monetary policy in an estimated model with sticky prices, search and matching frictions, and staggered nominal wage bargaining. We find that the estimated natural rate of unemployment is consistent with the NBER description of the U.S. business cycle, and that the inflation/unemployment trade-off facing monetary policymakers is quantitatively important. We also show that parameter uncertainty has a limited effect on the performance or design of monetary policy, while natural rate uncertainty has more sizeable effects. Nevertheless, policy rules that respond to the output or unemployment gaps are more efficient than rules responding to output or unemployment growth rates, also in the presence of uncertainty about the natural rates.

1. Introduction

In recent years, monetary business cycle models with monopolistic competition and staggered price setting have been widely used to study the implications of alternative specifications of monetary policy. One shortcoming of these models, however, is that they typically do not include a very detailed description of the labor market, and are therefore not suited to discuss the relationship between monetary policy and unemployment. In the labor market literature, on the other hand, search and matching models with equilibrium unemployment have been fairly successful in explaining aggregate labor market fluctuations. Such labor market specifications have recently been extended to monetary business cycle models, originally by Trigari (2004, 2006) and Walsh (2005b), and thus present a natural alternative to the standard monetary framework.

Christiano et al. (2005) and Smets and Wouters (2003) have demonstrated that nominal wage rigidities are a crucial ingredient when explaining U.S. business cycles, using monetary business cycle models without search and matching

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frictions. Within a similar model, Levin et al. (2005) have shown that wage rigidities account for the main welfare cost of business cycle fluctuations, and that a monetary policy rule that responds only to nominal wage inflation performs almost as well as the welfare-optimizing policy. However, these results are very sensitive to the precise form of wage rigidities, suggesting that the specification of the labor market has important consequences for monetary policy.

The aim of this paper is to better understand the importance of labor market frictions and the evolution of labor market variables for the design of monetary policy. We study a micro-founded macroeconometric model with sticky prices, search and matching frictions on the labor market, and staggered nominal wage bargaining, following Gertler and Trigari (2006) and Gertler et al. (2007). Compared with the models of Christiano et al. (2005), Smets and Wouters (2003), and Levin et al. (2005), our model includes a more realistic description of the labor market, featuring equilibrium unemployment, and wage rigidities are not subject to the Barro (1977) critique. It is therefore a natural laboratory for studying issues related to monetary policy and the labor market. In addition, Gertler et al. (2007) show that this new framework fits U.S. data well.

Using this model we study the behavior of the natural rate of unemployment and the implied unemployment (and output) gap(s), and we quantify the trade-offs facing the monetary authorities. We also analyze the design of monetary policy in the estimated model and the effects of parameter and natural rate uncertainty on optimized monetary policy rules.

In contrast to the existing literature on monetary policy in models with search and matching frictions, for instance, Blanchard and Galí (2006) and Thomas (2007), we use a quantitative framework and we study the implications for monetary policy of uncertainty concerning parameters and the natural rates of unemployment and output. While many authors have studied robust monetary policy with parameter and model uncertainty, for example, Levin et al. (1999, 2003, 2005), Leitemo and Söderström (2005), Batini et al. (2006), and Edge et al. (2007b), to our knowledge no one has considered uncertainty in a model with equilibrium unemployment.

Our analysis proceeds in the following steps. We first develop our model (in Section 2) and estimate it on U.S. data using Bayesian techniques (in Section 3). This part of the paper follows closely Gertler et al. (2007). We show that the estimated model fits U.S. data very well, also for the rate of unemployment and the degree of labor market tightness, variables that were not used when estimating the model.

We then discuss some properties of the model that are important for the design of monetary policy (see Section 4). In particular, we study the behavior of the estimated natural rates of output and unemployment and the implied output and unemployment gaps. We find that the implied path for the natural rate of unemployment is similar to estimates obtained with very different methodologies, for instance, by Staiger et al. (1997, 2002) or Orphanides and Williams (2002), and that the estimated unemployment and output gaps coincide closely with the standard view of the U.S. business cycle (for example, contractions dated by the National Bureau of Economic Research). This feature of the model is in stark contrast with other estimated macroeconometric models, e.g., Levin et al. (2005) or Edge et al. (2007a). We also discuss the trade-offs facing monetary policymakers in terms of inflation and unemployment stability, showing that complete inflation stabilization is very costly in terms of unemployment volatility, mainly due to shocks to price markups, but also to the bargaining power of workers and (in the presence of wage rigidities) technology.

Finally, we study the design of monetary policy in our framework, assuming that the central bank aims at minimizing a loss function that is consistent with the mandate of the U.S. Federal Reserve (see Section 5). In particular, we compare the performance of standard monetary policy rules that respond to the rate of inflation and the output gap with rules that in addition to inflation respond to the unemployment gap, the output growth rate, or the change in the unemployment rate. We also study the effects of uncertainty concerning model parameters and the natural rates of output and unemployment on the appropriate conduct of monetary policy. We show that the optimized monetary policy rules are superinertial, that is, the interest rate should respond to the lagged interest rate with a coefficient larger than one. Parameter uncertainty has little effect on the performance of monetary policy rules, while uncertainty concerning the natural rates has a more sizeable effect, especially for the rule responding to the unemployment gap. Finally, we show that monetary policy rules that respond to the output or unemployment gaps dominate rules responding to the growth rates of output and unemployment, also when the central bank faces uncertainty about the natural rates.

2. The model

The model is based on Gertler et al. (2007) and is a monetary dynamic stochastic general equilibrium (DSGE) framework with habit formation, investment adjustment costs, variable capital utilization, and nominal price and wage rigidities. The model also includes growth in the form of a non-stationary productivity shock, as in Altig et al. (2005). In contrast to conventional DSGE models, the labor market involves search and matching in the spirit of Mortensen and Pissarides (1994) and others, and nominal wage rigidity in the form of staggered Nash bargaining as in Gertler and Trigari (2006).

We here provide a sketch of the model; for more details, see Gertler et al. (2007). There are three types of agents in the model: households, wholesale firms, and retail firms. Following Merz (1995) we assume a representative family in order to introduce complete consumption insurance. Production takes place at competitive wholesale firms that hire workers and negotiate wage contracts. Monopolistically competitive retail firms buy goods from wholesalers, repackage them as final goods, and set prices on a staggered basis.