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Monetary policy when wages are downwardly rigid: Friedman meets Tobin

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ABSTRACT

Monetary policy in an economy with both downwardly rigid wages and a transaction motive for money demand is studied using a dynamic stochastic general equilibrium model. The two key features of the model imply that both Tobin's "inflation grease" argument and Friedman's rule are operative, and so optimal inflation may be positive or negative. The Simulated Method of Moments is used to estimate the nonlinear model based on its second-order approximation. Results indicate that the Ramsey policy that maximizes social welfare involves an average inflation rate of about 0.4% per year. In the more realistic case where a central banker follows a simple targeting policy, the optimal inflation target is about 1% per year. We view this result as providing support for the low, but strictly positive, inflation targets used in many countries.

1. Introduction

The idea that nominal wages are more downwardly rigid, than upwardly rigid, has a long history in economics. Earlier references include Keynes (1936), who discusses the role of downward nominal wage rigidity in business cycle fluctuations; Olivera (1964) and Tobin (1972), who suggest that a positive rate of inflation may be socially beneficial in an economy where cutting nominal wages is privately costly; and Harris and Holmstrom (1982), who show that when firms are risk-neutral and workers are risk-averse, the optimal long-term contract has an insurance component whereby the (real) wage never falls.

Furthermore, downward nominal wage rigidity has received ample empirical support from a large body of research based on micro data at the individual, firm and industry levels. Research on wage changes at the individual level finds that its distribution has a peak at zero, features few wage cuts, and is positively skewed. This is so even in countries, like Japan and Switzerland, where inflation is very low or even negative.[1] Surveys on attitudes towards nominal wage cuts show that both workers and firms dislike them, but for different reasons. Workers perceive nominal wage cuts as unfair (Kahneman et al., 1986), while firms are generally concerned about the effect of wage cuts on morale and, in practice, only cut wages when facing bankruptcy (Bewley, 1995; Campbell and Kamlani, 1997).

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[1] See McLaughlin (1994), Akerlof et al. (1996), Card and Hyslop (1997), Barattieri et al. (2009) for the United States; Farès and Lemieux (2001) for Canada; Kuroda and Yamamoto (2003) for Japan; Castellanos et al. (2004) for Mexico; Fehr and Goette (2005) for Switzerland; and Dickens et al. (2007) for a sample of 16 developed economies. The same characteristics are found by Holden and Wulfsberg (2008) in the distribution of wage changes at the industry level in various OECD countries. An important finding by Dickens et al. is large heterogeneity in wage distributions across countries.

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This paper is concerned with the macroeconomic implications of downward nominal wage rigidity, in particular for monetary policy. To that end we build a small-scale, dynamic stochastic general-equilibrium (DSGE) model where the cost of adjusting prices and wages may be asymmetric. We follow the Neo Keynesian literature in postulating a simple mechanism to model nominal frictions in the goods and labor markets, but relax the assumption that frictions are symmetric around the current price or wage.[2] In particular, we adopt an adjustment cost specification based on the linex function due to Varian (1974), which includes the quadratic function in Rotemberg (1982) as a special case. Hence in our model, adjustment costs depend not only on the size but also on the sign of the adjustment. For example, a nominal wage cut may involve a larger frictional cost that an increase of exactly the same magnitude. The nonlinear model based on a second-order approximation is estimated by the Simulated Method of Moments (SMM) and a simple t test is used to evaluate whether the macro data supports the view that nominal wages are downwardly rigid.

This project builds on—but makes a distinct contribution from—our previous work; Kim and Ruge-Murcia (2009) carry out the analysis using a cashless economy and are primarily concerned with the optimal amount of "grease" inflation. In contrast, this paper studies the positive implications of downward wage rigidity—which are not examined in our earlier contribution—and does so in the context of a fully fledged monetary economy. From the modeling perspective, this paper extends Kim and Ruge-Murcia (2009) by characterizing the role of money as a medium of exchange. Modeling money is important for the normative analysis of monetary policy. In the cashless environment of Kim and Ruge-Murcia (2009), downward wage rigidly trivially induces a positive optimal rate of inflation, as was anticipated by Tobin (1972). Thus, the object of interest in our previous paper is not the level of inflation *per se*, but rather the extra optimal inflation induced by asymmetric costs compared with symmetric costs (that is, "grease" inflation).

In a monetary economy, inflation—or even modest deflation as far as the nominal interest rate is positive—leads to the inefficient economizing in money balances. Thus, in the absence of nominal frictions, the optimal inflation rate is negative and equal to Friedman's (1969) rule. In many previous models with nominal frictions, optimal inflation rate is larger than Friedman's rule but still negative (see, for example, Rotemberg and Woodford, 1997). However, if nominal wages are downwardly rigid, the monetary authority faces a non-trivial trade-off. Explicit modeling of this trade-off is important because there is currently a discrepancy between economic theory and monetary policy in practice. The former prescribes a zero-to-negative optimal inflation rate while the latter targets low, but strictly positive, inflation rates. In a sense, our quantitative analysis has the flavor of a (friendly) match between two old long-standing views of optimal monetary policy, namely those of James Tobin and Milton Friedman.

While characterizing this paper as a quantitative analysis for the optimal inflation rate, we would like to note that this paper abstracts from some channels that may be potentially important for such an analysis. The most prominent one—especially in the context of recent financial turmoil—is the presence of the zero lower bound for the nominal interest rate and its effect on the optimal inflation rate. Inclusion of the zero lower bound would increase the optimal inflation rate, though not much according to Schmitt-Grohé and Uribe (2011). Their paper also discusses how the optimal inflation rate is related to the unmeasured quality improvement. Another reason touted for the desirability of positive inflation is the fear of deflation. See Mishkin (2008) for more on these issues from a policymaker's perspective.

The paper is organized as follows: Section 2 presents the model; Section 3 describes the data and method used to estimate the model, reports parameter estimates, and studies aggregate implications of downward nominal wage rigidly; Section 4 computes the optimal inflation rate and derives the optimal responses to shocks under the Ramsey policy that maximizes social welfare; Section 5 computes the optimal inflation target under a strict targeting policy; and Section 6 concludes.

2. The model

The economy consists of (i) a continuum of infinitely lived households with differentiated job skills, (ii) a continuum of firms that produce differentiated goods using labor as sole input, and (iii) a government that implements monetary policy using a Taylor-type rule. Households and firms interact in markets with frictions where adjusting nominal wages and prices involves convex and (possibly) asymmetric costs. The model is a monetary version of the one developed by Kim and Ruge-Murcia (2009) and we refer the reader to that article for a more detailed discussion about functional forms and modeling assumptions.

2.1. Households

Household $h \in [0,1]$ maximizes

$$E_s \sum_{t=s}^{\infty} \beta^{t-s} U(c_t^h, n_t^h), \tag{1}$$

[2] Two widely used mechanisms for nominal frictions are due to Rotemberg (1982) and Calvo (1983). In the former, agents face a quadratic (and, hence, symmetric) cost for changing prices or wages. In the latter, only agents that receive an exogenous signal are allowed to re-optimize their price or wage. Solving a first-order approximation to a model with Calvo-type rigidity imposes symmetry by construction.