Estimation of a forward-looking monetary policy rule: A time-varying parameter model using ex post data [☆]

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Abstract

In this paper, we consider estimation of a time-varying parameter model for a forward-looking monetary policy rule, by employing ex post data. A Heckman-type (1976. The common structure of statistical models of truncation, sample selection, and limited dependent variables and a simple estimator for such models. Annals of Economic and Social Measurement 5, 475–492) two-step procedure is employed in order to deal with endogeneity in the regressors. This allows us to econometrically take into account changing degrees of uncertainty associated with the Fed's forecasts of future inflation and GDP gap when estimating the model. Even though such uncertainty does not enter the model directly, we achieve efficiency in estimation by employing the standardized prediction errors for inflation and GDP gap as bias correction terms in the second-step regression. We note that no other empirical literature on monetary policy deals with this important issue. Our empirical results also reveal new aspects not found in the literature previously. That is, the history of the Fed's conduct of monetary policy since the early 1970s can in general be divided into three subperiods: the

1970s, the 1980s, and the 1990s. The conventional division of the sample into pre-Volcker and Volcker–Greenspan periods could mislead the empirical assessment of monetary policy.

1. Introduction

Since the seminal work by Taylor (1993), various versions of backward-looking and forward-looking Taylor rule for the U.S. monetary policy have been estimated by many empirical macroeconomists. Based on subsample analyses, Judd and Rudebusch (1998), Clarida et al. (2000), and Orphanides (2004) show that the Fed's interest rate policy has changed since 1979. Cogley and Sargent (2001, 2003) and Boivin (2001) report significant time variation in the policy response to the state of the economy, within the framework of the time-varying parameter models. By applying Hamilton's (1989) Markov-switching models, Sims (2001) and Sims and Zha (2006) argue that time-varying variance of the shocks is more important than time-varying coefficients in modeling the monetary policy rule.

Focusing on estimation of a Taylor-rule type forward-looking monetary policy rule, the literature introduces two alternative approaches depending on the data set employed. One approach, undertaken by Orphanides (2001, 2004), is to use historical real-time forecasts data by the Fed, called "Greenbook data." If these real-time forecasts are made under the assumption that the nominal federal funds rate will remain constant within the forecasting horizon, there would be no endogeneity problem in the policy rule equation. Thus, the use of real-time forecasts data allows one to straightforwardly extend the basic model to incorporate time-varying coefficients and to employ the conventional Kalman (2006) filter. Such an attempt has recently been made by Boivin (2006). Another approach, undertaken by Clarida et al. (2000), is to use ex post data and explicitly estimate the Fed's expectation process. An instrumental variables (IV) estimation procedure or a generalized method of moment (GMM) is applied, since the future economic variables used as regressors in the policy rule equation are correlated with the disturbance terms. However, extending the basic model to incorporate time-varying coefficients would not be as straightforward as in Boivin (2006), and no such attempts have been made so far. With the endogeneity problem that results from using the ex post data, a conventional IV estimation procedure or a conventional GMM estimation procedure cannot be readily applied to a time-varying parameter model.

In this paper, we consider estimation of a Taylor-rule type forward-looking monetary policy rule, that allows for time-varying parameters (TVPs) by employing ex post data.[1] In doing so, we apply Kim's (2006) TVP-with-endogenous-regressors model in at least two

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[1] Sims and Zha (2006) argue that "the Taylor rule formalism, valuable as it may be as a way to characterize policy in the last 20 years, can be seriously misleading if we try to use it to interpret other historical periods, where monetary aggregate growth was an important factor in the thinking of policy-makers." An extension of the model in this paper to include monetary aggregate growth would be worth pursuing.