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Monetary policy and learning from the central bank's forecast ☆

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ABSTRACT

We examine the expectational stability (E-stability) of rational expectations equilibrium (REE) in a standard New Keynesian model in which private agents refer to the central bank's forecast in the process of adaptive learning. To satisfy the E-stability condition in this environment, the central bank must respond more strongly to the expected inflation rate than the extent to which the Taylor principle suggests. However, the central bank's strong reaction to the expected inflation rate raises the possibility of indeterminacy of the REE. In considering these problems, a robust policy requires responding to the current inflation rate to a certain degree.

1. Introduction

Since the development of adaptive learning in macroeconomics, a large number of studies have investigated the expectational stability (E-stability) conditions of rational expectations equilibrium (REE) in various macroeconomic models (Evans and Honkapohja, 2001). One of the important applications to monetary economics is provided by Bullard and Mitra (2002). They examine the E-stability condition in a simple class of the New Keynesian model, which consists of an IS equation, a New Keynesian Phillips curve (NKPC), and a Taylor-type monetary policy rule.[1] Their results indicate that the so-called Taylor principle, which requires the central bank to adjust the nominal interest rate by more than one-for-one with the inflation rate, corresponds to the E-stability condition under some versions of Taylor-type monetary policy rules, including a forward-looking rule incorporating the expectations for the future inflation rate and output gap, which are assumed to be homogeneous between the central bank and private agents.[2]

Honkapohja and Mitra (2005) extend the analysis of Bullard and Mitra (2002) to introduce heterogeneous expectations between the central bank and private agents. They show that, even if the central bank and private agents initially have different expectations, the correspondence between the E-stability condition and the Taylor principle holds so long as the

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[1] Evans and Honkapohja (2003a, 2009) review the studies of adaptive learning in New Keynesian models.

[2] The issue of stability under learning when the central bank introduces an interest-rate rule is originally raised by Howitt (1992) in an IS-LM model with a New Classical Phillips curve.

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learning algorithms used by these two agents are asymptotically identical. However, they further show that, if the difference in learning algorithms persists, even over the long run, the Taylor principle does not generally guarantee the E-stability of the REE. Therefore, their analysis points out that the heterogeneity between the central bank and private agents is a key issue for determining the E-stability condition in a standard New Keynesian model.

However, the environments of these previous studies are still quite rudimentary because the studies assume that the central bank and private agents homogeneously or simultaneously engage in adaptive learning. In other words, these studies assume that there is no interaction between the learning processes of the central bank and private agents. As Honkapohja and Mitra (2005) note, this assumption is introduced as a natural benchmark.[3] However, the validity of this assumption is empirically arguable when we take into account the possible interactions between the central bank and private agents.

In recent years, many central banks, including inflation-targeting central banks, regularly publish forecasts of future economic developments to enhance the transparency and accountability of monetary policy-making. In this environment, if private agents consider that the central bank has an informational advantage about aggregate economic variables, it is possible that private agents use the central bank's forecast as an information source in calculating their own forecasts. Fujiwara (2005) provides empirical evidence that, in Japan's survey data, the central bank's forecast significantly influences the forecast of private agents (not vice versa). Therefore, his results present a possibility that the central bank is the leader and private agents are the followers in forming expectations.[4]

In this study, we examine the E-stability of the REE in a standard New Keynesian model in which the central bank is the leader and private agents are the followers of expectation formations. This means that private agents refer to the central bank's forecast in their process of adaptive learning. This type of leader–follower relationship of adaptive learning has already been introduced by Granato et al. (2007) in the traditional "cobweb" model. However, their analysis investigates heterogeneous expectations among private agents. In contrast, a distinctive feature of our study is that it investigates heterogeneous expectations between the policymaker (namely, the central bank) and private agents.

Because we assume that private agents refer to the central bank's forecast, our study introduces heterogeneity concerning the perceived law of motion (PLM) used by the central bank and private agents. However, as for the learning algorithm, we assume that both the central bank and private agents use the recursive least squares (RLS) with decreasing gain, which is the most standard algorithm in the literature.[5] In these respects, the environment of our study contrasts sharply with that of Honkapohja and Mitra (2005), which assumes that the functional forms of PLM are homogeneous and that the learning algorithms are heterogeneous.

In this study, we restrict our attention to a Taylor-type simple monetary policy rule. In this sense, our study is distinct from studies that examine E-stability under optimal monetary policy, such as Evans and Honkapohja (2003b, 2006). In a recent study, Preston (2008) examines a situation in which the central bank and private agents have different expectations since they have different knowledge of the economic structure. Although the environment of his study is somewhat similar to that of our study, his study introduces a targeting rule, rather than Taylor-type policy rule.[6] In addition, his study does not examine the issue of interactions between the central bank's forecast and private agents' expectations.[7]

The rest of this paper is organized as follows. In Section 2, we introduce our framework and confirm that, if the central bank and private agents are homogeneously learning, the E-stability condition corresponds to the Taylor principle, as reported by Bullard and Mitra (2002). In Section 3, we examine the E-stability condition when private agents learn from the central bank's forecast. In Section 4, we investigate the relationship between E-stability and the determinacy (uniqueness) of REE. In Section 5, we provide further analysis. Section 6 concludes our study.

2. Framework

Our study is based on the standard New Keynesian model, which is used by Bullard and Mitra (2002) and Honkapohja and Mitra (2005). It consists of three equations, which are the IS equation, the NKPC, and a forward-looking version of Taylor-type monetary policy rule.

The IS equation and the NKPC are given as follows:

$$x_t = E_t^P x_{t+1} - \sigma(r_t - r_t^n - E_t^P \pi_{t+1}), \tag{1}$$

$$\pi_t = \beta E_t^P \pi_{t+1} + \kappa x_t, \tag{2}$$

[3] Honkapohja and Mitra (2005) stated that, "We will focus on the situation in which both the private sector and the central bank use their own forecasts in their decision-making and the forecasts are not available to the other agents. Consequently, the forecasts have no strategic role. This case can be seen as a natural benchmark."

[4] Fujiwara (2005) suggests, "In the learning context, it would be better to suppose that the central bank is a leader rather than a follower when analyzing monetary policy in Japan, since the results in this paper indicate that professional forecasters tend to learn from the central bank rather than to influence it (Fujiwara, 2005, p. 261)."

[5] An alternative algorithm is RLS with constant gain, which is typically used to describe a situation in which agents take account of the possibility of structural changes (as is explained by Evans and Honkapohja, 2001). Honkapohja and Mitra (2005) introduce heterogeneous constant gains between the central bank and private agents. They show that, if the difference of constant gains remains in the long run, then it matters for the E-stability condition.

[6] As a result, in his framework, the central bank responds to private agents' expectation, rather than to the central bank's internal forecast.

[7] Furthermore, his model introduces private agents' long-horizon forecast, rather than one-period-ahead forecast, following Preston (2005).