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Learning about monetary policy rules when the cost-channel matters

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ABSTRACT

We study how monetary policy may affect determinacy and expectational stability (E-stability) of rational expectations equilibrium when the cost channel of monetary policy matters. Focusing on instrumental Taylor-type rules and optimal target rules, we show that standard policies can induce indeterminacy and expectational instability when the cost channel is present. A naïve application of the traditional Taylor principle could be misleading, and expectations-based reaction function under discretion does not always induce determinate and E-stable equilibrium. This result contrasts with the findings of Bullard and Mitra [2002. Learning about monetary policy rules. Journal of Monetary Economics 49, 1105–1129] and Evans and Honkapohja [2003. Expectations and stability problem for optimal monetary policies. Review of Economic Studies 70, 807–824] for the standard new Keynesian model. The ability of the central bank to commit to an optimal policy is an antidote to these problems.

1. Introduction

There is recent and growing empirical evidence showing that the cost channel of monetary policy, when the interest rate directly affects a firm's price setting behavior, has important implications in both inflation dynamics and the design of optimal monetary policy. Ravenna and Walsh (2006) and Chowdhury et al. (2006) have provided empirical evidence for the cost channel in the United States and the euro area, respectively. Barth and Ramey (2001) found a significant cost-channel effect on U.S. data at industry level. Christiano et al. (2005) estimated a dynamic stochastic general equilibrium model of the U.S. economy and found that monetary policy operates also through the supply side. From the normative point of view, Ravenna and Walsh (2006) showed that a trade-off between stabilizing inflation and output arises endogenously as a consequence of the cost channel.

At the same time, in recent literature, economists have begun an ongoing evaluation of the stability under adaptive learning of rational expectations equilibrium (REE) in new Keynesian models.[1] Using the standard new Keynesian framework, Bullard and Mitra (2002) found that determinacy and learnability of a variety of instrument rules is guaranteed if the traditional Taylor principle is satisfied, that is, the interest rate reacts more than one-for-one to inflation (also referred

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[1] As Bullard (2006) pointed out, since adaptive learning is a "minimal deviation from rational expectations", its stability should be viewed as an additional minimal criterion, besides determinacy (i.e. unique and non explosive solution), that a REE should meet.

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as active rules). In the same framework, Evans and Honkapohja (2003, 2006) showed that optimal target rules (under discretion or commitment) render the REE always unstable under learning if policymakers attempt to implement it using an interest-rate reaction function derived under the rational expectations (RE) assumption as a function of exogenous and lagged endogenous variables (referred to as fundamentals-based reaction function, FB-RF). Evans and Honkapohja (2003, 2006) proposed an alternative implementation of the optimal rule by relaxing the assumption of rational expectations on private agents (referred to as expectations-based reaction function, EB-RF), and they found that this type of function (which reacts optimally to private sector expectations) can always induce determinacy and learnability. Partial economic intuition given by Evans and Honkapohja (2003, 2006) is that their proposed expectations-based reaction function always satisfies the Taylor principle.

This paper examines the effects of the cost channel coupled with a variety of instrument and optimal target rules on the determinacy (i.e. a unique nonexplosive solution) and learnability conditions of the REE. In particular, we study local determinacy and expectational stability (E-stability) properties of the REE in the cost-channel model proposed by Ravenna and Walsh (2006).[2] In this sense, our work extends Bullard and Mitra (2002) and Evans and Honkapohja (2003, 2006) standard-economy results to a cost-channel framework. We perform the analysis of instrumental Taylor-type rules under two specifications: *contemporaneous data* specification, which reacts to current variables, and *forward expectations* specification (also referred as forward-looking or forecast-based rules), which reacts to one-period-ahead expectations. In the case of target rules, in the fashion of Evans and Honkapohja (2003, 2006), we analyze fundamentals-based and expectations-based reaction functions, under both discretion and commitment. We also analyze the corresponding "specific target rules" under discretion and commitment.

In general, our results highlight an important link between the cost channel and both determinacy and learnability of REE. The nature of the policy adopted by the monetary authorities might change this link in important ways. The main findings of our analysis can be summarized as follows:

(i) Under instrumental rules, standard policies recommended to guarantee determinacy and E-stability in the standard economy (see Bullard and Mitra, 2002) may not be effective or could even be counterproductive if the cost channel is present. For instance, even if the nominal interest rate is adjusted according to the traditional Taylor principle a determinate and E-stable REE is not necessarily attainable.

(ii) A discretionary optimal policy does not solve completely the indeterminacy and expectational instability problems as is the case in the standard model, see Evans and Honkapohja (2003). On one hand, the FB-RF implies that the optimal equilibrium is indeterminate and unstable in the learning dynamics, a result that coincides with those of Evans and Honkapohja (2003). On the other hand, the EB-RF that performs well on both grounds in the standard economy does not always lead to determinacy and stability under learning in the cost-channel model.

(iii) A commitment optimal policy can fix the indeterminacy and expectational instability problems found under optimal discretion or instrumental rules. Moreover, it is possible to reach a determinate and E-stable optimal REE not only through the EB-RF, as in the standard model, but also through the FB-RF,[3] which is never E-stable in the standard model (see Evans and Honkapohja, 2006). Nevertheless, the FB-RF is not robust to alternative calibrations and could be less appealing given the difficulties that its implementation involves. Thus, problems of instability under learning and indeterminacy when the cost channel is active can be safely mitigated by committing to the EB-RF.

(iv) As in the standard model (Evans and Honkapohja, 2003, 2006), the "specific target rules" under commitment and discretion share the same determinacy and E-stability properties of their corresponding expectations-based reaction functions.

Our paper contributes to an important strand of the literature that deals with stability issues when the cost-channel matters. Brückner and Schabert (2003) focused on determinacy and pointed out that the cost channel introduces an additional upper bound to the inflation reaction in the Taylor rule. Surico (2008) found that if a central bank assigns positive weight to output fluctuations a model with a cost channel is more prone to multiple equilibria (indeterminacy) relative to the standard one.[4] Hence, our paper's contribution to the existing literature is twofold. First, we evaluate whether or not a minimal state variable (MSV) solution is E-stable in the case of indeterminacy. We have shown that E-stability depends on type of instrument rule (contemporaneous or forward-looking). Second, we evaluate determinacy and E-stability for a set of interest-rate rules that aim to implement optimal discretionary policy and optimal policy with

[2] Evans and Honkapohja (1999, 2001) developed the criterion of *expectational stability*: the conditions under which agents are able to learn (through least squares) the reduced form dynamics under the assumption of rational expectations. E-stability, therefore, provides a robustness criterion: if agents make small mistakes in expectations relative to those consistent with the associated REE, then a policy rule that is E-stable ensures such mistakes are corrected over time. Even though learnability is a more general concept than E-stability, throughout the paper we will use both terms interchangeably.

[3] This finding concurs with those of Duffy and Xiao (2007). They found that if one includes the interest-rate deviations in the objective, E-stability can be achieved without requiring the central bank to react to private sector expectations, by having the interest rate react suitably to contemporaneously observed aggregate output and inflation.

[4] Other papers shed lights on the effects of other supply-side mechanisms on the determinacy and E-stability. Kurozomi (2006) proved that even a small degree of non-separability between consumption and money balances in the utility function causes the traditional Taylor principle to be much more likely to induce indeterminacy or E-instability.