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Learning about monetary policy rules when the housing market matters

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ABSTRACT

In this paper we study a general equilibrium model with a housing market, and use stability under adaptive learning as a criterion to evaluate monetary policy rules. An important feature of the model is that there exist credit-constrained borrowers who use their housing assets as collateral to finance purchases. We evaluate both conventional Taylor rules and rules that incorporate other targets such as housing prices. We find that the effect of responding to housing prices, in addition to output and inflation, depends critically on the assumed information structure of the economy.

1. Introduction

In the literature of monetary policy design, "learnability" has become an important criterion to evaluate interest rate policies. A rational expectations equilibrium (REE) is learnable (expectationally stable or E-stable in the sense of Evans and Honkapohja, 2001) if it can be eventually reached when agents who do not initially possess the knowledge of the true law of motion of the economy use adaptive learning techniques such as least squares to acquire such knowledge. If a policy rule is properly designed, it should facilitate the convergence of the economy to a learnable REE. Bullard and Mitra (2002) and Evans and Honkapohja (2003, 2006) provide some landmark results on the learnability of REEs under instrumental and optimal rules. Since the publication of their works, there has been a burgeoning literature that contributes to this topic.

The workhorse for this research is the new Keynesian model, i.e., dynamic stochastic general equilibrium models with imperfect competition and staggered price setting. The model provides a compact and tractable framework for E-stability analysis. However, what is notably missing from the model are asset markets. Typically, neither the financial equity market nor a real asset market such as the housing market is specifically considered in this model. While this omission is harmless when analyzing most targeted issues, it does render the model useless in addressing certain important policy

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questions. One such question that we are particularly interested in is: how should the central bank respond to housing market volatility? The question has long been a challenging one for academics and policymakers. Recent development in the economy has inevitably sparked a new round of intensive debate. Newer evidence suggests that housing wealth redistribution has a significant effect on consumer expenditure and the business cycle (Leamer, 2007). This effect is enhanced when housing assets can be used as collateral in a well-functioning credit market (Muellbauer (2007). To our knowledge, no work has yet been done in the adaptive learning literature to incorporate these new findings and analyze proper policy responses to housing market volatility. This is the goal of this paper. We construct an extended version of the new Keynesian model in which the housing market is specifically characterized, and study the E-stability of REEs under different Taylor-type interest rate rules. As in similar studies, an interest rate policy is deemed plausible if it is conducive to a learnable REE. We also examine the related concept of "determinacy"—a determinate REE is locally unique and free from self-fulfilling fluctuations. We consider not only conventional policy rules that target inflation and output, but also more innovative rules that target the housing prices and the amount of total outstanding credit. We hope to shed light on the question of whether central banks should directly target the housing market, in addition to output gaps and inflation.

We need a model that not only has a housing market, but also has the proper channel via which asset market fluctuations can have real effects on the economy. To this end we take advantage of recent development in dynamic general equilibrium models and modify and extend a housing model studied by Iacoviello (2005). Our model has two consumers, a patient lender and an impatient borrower, who trade housing assets. The credit-constrained borrower must use her housing assets as collateral to borrow from the lender. A housing boom raises the borrower's net worth, and enables her to expand purchases, which leads to an increase in aggregate demand. Consequently, a change in the interest rate policy can stabilize the economy via a "credit channel"—higher interest rate lowers the borrower's net worth, reduces her ability to borrow, and decreases aggregate demand. This channel does not exist in a standard new Keynesian model. The critical component of the model that triggers this channel is the collateral constraint.

Equipped with a working model, we put different interest rate rules to a test. We begin with a conventional Taylor rule that targets inflation and output. Our task is to investigate whether or not the established results in the literature are overturned when the economic environment undergoes major changes that we describe above.[1] After obtaining some results with this standard rule, we add housing price to the policy rule and examine what changes it can bring to the model's E-stability properties. This analysis helps us understand the merits or demerits of housing price targeting, from a learning perspective. Finally, we consider a third policy rule that includes total outstanding credit in its target set. What motivates us to consider this rule is the model's transmission mechanism. The rationale is that if the credit channel is critical for the relationship between asset prices and the real economy, then targeting total credits could become a viable approach to stabilize the economy.

Our results help us draw three interesting conclusions. First, with conventional Taylor rules, the benchmark result of Bullard and Mitra (2002) still holds, i.e., Taylor's principle of a more-than-proportional rise in the central bank's target interest rate in response to higher inflation is still a necessary condition for the existence of a learnable and determinate REE. We believe that this result is instructive, in that it highlights the fact that some established conclusions are indeed robust to model environment changes. Second, the effect of responding to housing prices, in addition to output and inflation, depends critically on the assumed information structure of the economy. If agents and the central bank do not possess current data of inflation and output and must forecast them, but do observe current housing prices, then responding to housing prices is *stabilizing*, as it makes it more likely for REEs to be E-stable and determinate given empirically plausible policy parameters. If current housing price data is not available, then the conclusion is reversed—responding to (forecasted) housing prices makes it less likely that an REE is learnable and determinate. Finally, if current data on all three variables are available, responding to housing prices is redundant. The result suggests that in the debate of whether monetary policy should target housing prices, one important factor is the availability and quality of housing market data itself. Reliable housing market data improves equilibrium stability by offering an information gain to policymakers, while unreliable data does not. Our third conclusion is that the effect of responding to total outstanding credit is similar to that of responding to housing prices. The information structure is also critical for the stability results.

2. Related literature

Our paper can be considered as an extension to the adaptive learning literature that studies the relationship between monetary policies and the E-stability of REEs. We provide a short review of the closely related papers below. See Bullard (2006) and Evans and Honkapohja (2009) for a comprehensive review of recent research in this area.

Bullard and Mitra (2002) analyze determinacy and E-stability of REEs under Taylor-type instrumental rules in a standard new Keynesian model. They find that when the central banks possess current data of output gaps and inflation, a determinate REE is always E-stable and an E-stable REE is also determinate, as long as the Taylor principle is satisfied. If forward-looking or lagged data rules are used, the situation is more complicated. The Taylor principle is no longer sufficient for determinacy and E-stability. Instead, careful choices of policy reaction parameters are needed.

[1] Precedents suggest that this is not unlikely. Carlstrom and Fuerst (2005), for example, show that the determinacy property of REEs can be very sensitive to the introduction of a new state variable—in their case, physical capital.