



## Asymmetric expectation effects of regime shifts in monetary policy<sup>☆</sup>

Zheng Liu<sup>a,c</sup>, Daniel F. Waggoner<sup>b</sup>, Tao Zha<sup>b,c,\*</sup>

<sup>a</sup> Federal Reserve Bank of San Francisco, USA

<sup>b</sup> Federal Reserve Bank of Atlanta, USA

<sup>c</sup> Emory University, USA

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### ABSTRACT

This paper addresses two substantive issues: (1) Does the magnitude of the expectation effect of regime switching in monetary policy depend on a particular policy regime? (2) Under which regime is the expectation effect quantitatively important? Using two canonical DSGE models, we show that there exists asymmetry in the expectation effect across regimes. The expectation effect under the dovish policy regime is quantitatively more important than that under the hawkish regime. These results suggest that the possibility of regime shifts in monetary policy can have important effects on rational agents' expectation formation and on equilibrium dynamics. They offer a theoretical explanation for the empirical possibility that a policy shift from the dovish regime to the hawkish regime may not be the main source of substantial reductions in the volatilities of inflation and output.

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[Lucas (1976)] has expressed the view that it makes no sense to think of the government as conducting one of several possible policies while at the same time assuming that agents remain certain about the policy rule in effect.

Cooley et al. (1984, p. 468)

Explicit modelling of the connection of expectation-formation mechanisms to policy [regime] in an accurately identified model would allow better use of the data.

Sims (1982, p. 120)

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\* Corresponding author at: Federal Reserve Bank of Atlanta and Emory University, Atlanta, GA, USA.

E-mail address: tza@earthlink.net (T. Zha).

## 1. Introduction

Consider monetary policy that follows a Taylor rule, in which the nominal interest rate is adjusted to respond to its own lag and deviations of inflation from its target value and of output from its trend. Suppose there are two monetary policy regimes, where the interest rate responds to inflation more strongly in the second regime (a hawkish regime) than it does in the first regime (a less hawkish or dovish regime). In this policy environment, it is often assumed that when monetary policy enters a particular regime, rational agents naively believe that the regime will prevail indefinitely (see, for example, Clarida et al., 2000; Lubik and Schorfheide, 2004; Boivin and Giannoni, 2006). This assumption, however, does not square well with the rational expectations view in that agents form expectations based on all available information, including possible changes in future policy. This point has been elaborated by Sims (1982, 1987), Sargent (1984), Barro (1984), and Cooley et al. (1984) among others. These authors argue that in an economy where past changes in monetary policy rules are observable and future changes are likely, rational agents' information set should include a probability distribution over possible policy shifts in the future. The difference between equilibrium outcome from a model that ignores probabilistic shifts in future policy regime and that from a model that takes into account such expected changes in regime reflects the key expectation-formation aspect of the Lucas critique, as implied by the antecedent two epigraphs. We call this difference the "expectation effect of regime shifts" in monetary policy.

This paper answers two theoretical questions that are of substantive importance. Is the magnitude of the expectation effect of regime switching the same across policy regimes? If not, under which regime the expectation effect is quantitatively important or unimportant? To answer the first question, we obtain closed-form solutions for two dynamic stochastic general equilibrium (DSGE) models, one is a stylized flexible-price model and the other is a canonical sticky-price model. Our main finding is that the importance of the expectation effect depends on monetary policy regime. In particular, we show that no matter whether the price is sticky or not, the expectation effect of regime switching under the hawkish policy regime is smaller than that under the dovish regime. The farther apart the two policy regimes, the larger the difference between the expectation effects under the two regimes.

To quantify the importance of the expectation effect on dynamics of inflation and output, we simulate the sticky-price model with several sources of plausible frictions. Our simulated results show that the magnitude of the expectation effect depends more on how strong propagation mechanisms are and less on how persistent the prevailing regime is. The stronger the propagation mechanism is, the more impact on inflation and output the expectation of future regime change has. While in theory the expectation effect disappears if the prevailing regime lasts indefinitely, we find that in practice the expectation effect under the dovish policy regime is quantitatively important even if the regime is very persistent. This conclusion holds for different models and under different scenarios, as shown in Section 4.

The asymmetry in the expectation effect of regime switches in monetary policy provides a theoretical insight into the empirical difficulty of finding changes in monetary policy as a main source of substantial reductions in macroeconomic volatility (Stock and Watson, 2003; Sims and Zha, 2006; Cecchetti et al., 2007). This expectational asymmetry arises because either the hawkish stance of monetary policy in place or the expectation of switching to hawkish policy in the future influences agents' inflation expectations in a nonlinear way. As the expectation effect under the dovish regime can considerably alter the dynamics of key macroeconomic variables, caution needs to be taken in interpreting empirical models that are used to fit a subsample that covers only the dovish regime. In the hawkish policy regime, on the other hand, the expectation effect is small even if agents expect that the regime will shift to the dovish regime with a non-trivial probability, as hawkish policy itself anchors inflation expectations. Thus, even if a newly instituted hawkish regime is not perfectly credible, such as the Volcker disinflation studied by Erceg and Levin (2003) and Goodfriend and King (2005), inflation fluctuations can still be effectively stabilized.

## 2. Relation to the literature

There has been a growing strand of literature on Markov-switching rational expectations models. Examples include An-dolfatto and Gomme (2003), Leeper and Zha (2003), Schorfheide (2005), Svensson and Williams (2005), Farmer et al. (2006), and Davig and Leeper (2007). Following that strand of literature, we generalize the standard DSGE model by allowing the possibility of changes in policy regime to be part of the economic information set.<sup>1</sup> Those earlier papers, however, did not study the asymmetric aspect of expectation effects of regime switching and how important quantitatively such an asymmetry is in explaining some empirical findings on the effects of monetary policy changes. Nor did those papers study different implications of the expectation effect under different regimes and the role of different propagation mechanisms in the asymmetry of expectation effects.

Our paper is related to but different from the issues of indeterminacy (determinacy) of the equilibrium, which are the focus of the earlier work by Davig and Leeper (2007) and Farmer et al. (forthcoming). First, there exists no theoretical result in the literature regarding determinacy vs. indeterminacy for Markov-switching DSGE models, like ours in this paper,

<sup>1</sup> We view this kind of regime-switching structural model as a starting point to study the quantitative importance of expectation effects of regime switching in monetary policy, as emphasized by Sims and Zha (2006) and Cecchetti et al. (2007). An interesting issue that remains to be addressed is to what extent the probability of a regime shift is affected by the state of the economy or by the factors other than economic ones. This issue, deserving a separate investigation, is beyond the scope of this paper.

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