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Optimal monetary policy in a regime-switching economy: The response to abrupt shifts in exchange rate dynamics

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Abstract

This paper examines the trade-offs that a central bank faces when the exchange rate can experience sustained deviations from fundamentals and occasionally collapse. The economy is modelled as switching randomly between different regimes according to time-invariant transition probabilities. We compute both the optimal regime-switching control rule for this economy and optimised linear Taylor rules, in the two cases where the transition probabilities are known with certainty and where they are uncertain. The simple algorithms used in the computation are also of independent interest as tools for the study of monetary policy under general forms of (asymmetric) additive and multiplicative uncertainty. An interesting finding is that policies based on robust (minmax) values of the transition probabilities are usually more conservative.

JEL classification: C6; E5

Keywords: Optimal monetary policy; Regime switching; Uncertain probabilities

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1. Introduction

A common concern amongst central bankers is that the true or perceived existence of financial imbalances or asset price misalignments could at some point in time lead to sudden and large adjustments in asset prices, with potentially adverse consequences for inflation and output stability. For instance, one of the major risks that has worried some members of the Bank of England's Monetary Policy Committee (MPC) in recent years has been the possibility that sterling could suddenly fall by a material amount.[1] Other risks routinely debated by actual policymakers, including oil price hikes or abrupt changes in key econometric relationships, may also be asymmetric.[2] Nevertheless, modelling of asymmetric risks is not very common in the monetary policy literature, possibly because of the lack of readily applicable technical tools.[3]

In this paper we examine the trade-offs that the policymaker faces when the exchange rate can experience sustained deviations from fundamentals and occasionally collapse. To do so we use a simple algorithm which has rarely been applied in the economics literature. Our analysis is based on the small open economy model of Ball (1999), which comprises a demand equation, a Phillips curve and an equation linking the real exchange to the real interest rate. We modify this model to incorporate regime switching in the exchange rate. In one regime, which we call the bubble regime, any shock can lead the exchange rate to deviate increasingly from fundamentals. In the other regime, which we call the no-bubble regime, the exchange rate displays transitory fluctuations around its fundamental value. The evolution over time of these two regimes is described by a Markov chain so that the times at

[1] See e.g. the minutes of the February 2002 MPC meeting (Bank of England, 2002):
(...) *Some members placed weight on upside risks to the inflation outlook. Two main risks to inflation were emphasised: from the possibility of a depreciation of sterling's exchange rate and from the possibility that consumption would not slow as much as projected*
(p.10). At the same meeting some members were also worried about potential financial imbalances:
Persistently rising debt levels potentially increased the probability that any adjustment to household balance sheets would be abrupt rather than smooth, with an attendant risk of a fall in asset prices and, thus, in the value of collateral. (...) *In the view of some members, therefore, rising debt levels risked increasing the volatility of output and so of inflation in the medium term, potentially making future inflation outturns more uncertain. Other members placed little or no weight on this.*
(p. 5). On the risks posed by financial imbalances see also Borio and Lowe (2002).

[2] See e.g. the discussion of skews and asset prices in Goodhart (2001, pp. 178–180). A proper account of asymmetric risks could also help explain part of the (large) deviations often observed between the actual policy rate and that implied by various versions of estimated simple rules. As pointed out by Svensson (2003a), estimated Taylor rules for a closed economy like the US leave approximately one third of the variance unexplained.

[3] The literature on monetary policy has produced a number of papers on whether simple rules should include asset prices or asset price misalignments but has unfortunately been relatively silent on the more general question of how policy should optimally react to asymmetric or one-sided risk. Skewed risks and policymakers' cognitive biases are discussed by Al Nowaihi and Stracca (2003). Svensson (2003b) investigates, in a simple model, the optimal response to low-probability extreme events under various types of loss functions.