



# Robust monetary policy in a small open economy

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## Abstract

We study how a central bank in a small open economy should conduct monetary policy if it fears that its model is misspecified. Using a new-Keynesian model of a small open economy, we solve analytically for the optimal robust policy rule and the equilibrium dynamics, and we separately analyze the consequences of central bank robustness against misspecification concerning the determination of inflation, output, and the exchange rate. We show that an increase in the preference for robustness makes the central bank respond more aggressively or more cautiously to shocks, depending on the type of shock and the source of misspecification.

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## 1. Introduction

Good policy design requires a good understanding of private sector behavior. Such an understanding is important not only in order to identify market deficiencies and hence policy objectives, but also when trying to reach objectives in the best possible way. The new-Keynesian model as laid out by Rotemberg and Woodford (1997), Goodfriend and King (1997), and others have been established as the mainstream model for monetary policy analysis. This model captures the sluggish adjustment of prices and the intertemporal consumption decision in a model framework with optimizing households and

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firms. With only a limited number of equations and clear intuition, the model has been very influential and has provided policymakers with several guiding policy principles in responding to the different disturbances in the economy (see, for example, Clarida et al., 1999; King, 2000). More recently, the new-Keynesian framework has been extended to open economies, for example by Galí and Monacelli (2005) and Clarida et al. (2001).

Although the new-Keynesian model has many attractive theoretical properties, it has been criticized by many researchers, most notably for not fitting the data well (see, for example, Ball, 1994; Mankiw, 2001; Estrella and Fuhrer, 2002). One response to such criticism is to design more complex models that are better able to capture the behavior of macroeconomic variables, following Christiano et al. (2005) and others. Such models gain in realism but lose in tractability. An alternative route, explored in this paper, is to acknowledge that the simple model is a misspecified description of reality, and to design policy to be robust against model misspecification. We will assume that the true model of private sector behavior lies in some neighborhood around a reference model, and we analyze how monetary policy should be designed in order to work reasonably well for all models inside this neighborhood. This problem has recently been addressed by Hansen and Sargent (2007) using ‘robust control’ techniques. Assuming that the policymaker is unable to formulate a probability distribution over plausible models, the robust policymaker designs policy for the worst possible outcome within a pre-specified set of models.

We apply robust control techniques developed by Hansen and Sargent (2007) and Giordani and Söderlind (2004) to a simple new-Keynesian open-economy model developed by Galí and Monacelli (2005) and Clarida et al. (2001). The simple model structure allows us to find closed-form solutions for the optimal robust policy and the equilibrium behavior of the economy. We also generalize the standard robust control framework by allowing the policymaker’s preference for robustness to differ across equations, reflecting the confidence the policymaker has in each relationship. For instance, the policymaker may be quite confident about one of the equations (such as the Phillips curve) and believe that robustness against misspecification in this equation is not very important, but at the same time be uncertain about some other equation (for example, the exchange rate relationship). Our approach allows us to consider each equation in turn and ask what is the effect on the robust policy of misspecification in that particular equation. Thus we will consider several different types of misspecification within the model: misspecification in firms’ price-setting, misspecification in consumer behavior, and misspecification in the model determining the exchange rate.<sup>1</sup>

The ability to focus on specification errors in particular equations seems important. Policymakers are more confident in some relationships than in others, and so regard some types of specification errors to be more important than others. In open economies, monetary policymakers are particularly uncertain about interactions between monetary policy, the exchange rate, and the economy. Using our approach, we are able to analyze the design of monetary policy under such specific model uncertainty while keeping other potential sources of misspecification fixed.

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<sup>1</sup>In an earlier paper (Leitemo and Söderström, 2005), we study the effects of exchange rate model misspecification on the performance of optimized monetary policy rules. In that framework, the central bank is uncertain about the exchange rate model, but private agents have perfect information about the exact specification of the model. In the robust control approach used in the present paper the central bank fears misspecification and private sector expectations reflect this fear.

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