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An inventory of simple monetary policy rules in a New Keynesian macroeconomic model

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Abstract

We derive necessary and sufficient conditions for simple monetary policy rules that guarantee equilibrium determinacy in the New Keynesian monetary model. Our modeling framework is derived from a fully specified optimization model that is amenable to analytical characterisation. The monetary rules analyzed are variants of the basic Taylor rules ranging from simple inflation targeting (current, forward, backward) to canonical Taylor rules with and without inertial nominal interest rates. We establish that determinacy obtains for a wide range of policy parameters, especially when the monetary authority targets output and smoothes interest rates. Contrary to other results in the literature, we do not find a case for super-inertial interest rate policy.

JEL classification: C62; E40; E52
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1. Introduction

This paper derives parameter restrictions for simple monetary policy rules which deliver a fully determinate equilibrium in an otherwise standard monetary general equilibrium model. Following the

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seminal contribution of Rotemberg and Woodford (1997), this model has become the workhorse in the literature on monetary policy. The main result from our analysis is that the monetary authority should implement an aggressive anti-inflationary stance irrespective of whether the interest rate rule is current-, forward- or backward-looking, or whether output gap targeting is desired or not. However, a rule with a large response coefficient on inflation does not necessarily lead to determinacy when there is no interest rate inertia or output targeting. When these are introduced, determinacy obtains for a wide range of parameter constellations, thereby 'supporting' the monetary authority's inflation response. Notably, and contrary to policy recommendations for super-inertial interest rate setting, an inertial coefficient lower than one is found to be necessary for determinacy.

Recent research explores the characteristics of monetary dynamic general equilibrium models under both empirical and theoretical aspects. Researchers such as King and Watson (1996) or Kim (2000) analyze the properties of the New Keyenesian modeling framework with respect to its ability to replicate basic business cycle regularities. The contribution of Rotemberg and Woodford (1997) was to shift emphasis towards the performance of such models when a Taylor (1993) type policy rule is applied. The conference volume edited by Taylor (1999) presents a wide collection of papers in this vein. The issue of equilibrium determinacy, however, has come to the forefront of this literature only recently.

It has been recognized in the literature that monetary policy rules can actually be destabilizing. An interest rate policy that is not aggressive enough in the face of rising inflation can lead to adverse outcomes where non-fundamental or 'sunspot' shocks can affect aggregate dynamics which would not be present otherwise. In such a case, agents would rationally respond to extraneous beliefs that are not tied to economic fundamentals. As an example, consumers might react to unsubstantiated newspaper accounts of worsening economic conditions by working harder, even though output growth is in line with expectations. Under indeterminacy, the monetary authority would validate these beliefs by lowering interest rates, thereby stimulating output, which requires a higher labor supply. This leaves agent worse off since they would otherwise have preferred to keep leisure at the level implied by fundamentals.[2] In a determinate equilibrium, however, the central bank would tighten policy, which counters the expansionary beliefs; sunspot-driven business cycles could therefore never arise in the first place. The seemingly purely theoretical issue of equilibrium determinacy thus becomes a matter of policy design.

We derive a taxonomy of determinacy for a simple forward-looking monetary model in the New Keynesian vein. We analyze monetary policy rules that include pure inflation targeting (current, forward and backward looking); rules with both inflation and output targeting (current, forward and backward looking), and rules with interest rate inertia (current and forward looking). As discussed by McCallum and Nelson (1999), the rules employed in this paper are all 'operational' in the sense that policy makers either react to: (i) lagged values of inflation and output deviations from their respective targets; or (ii) react to their expectations of current values of inflation deviations and the output gap. This line of analysis has been succinctly summarized by Woodford (2003) who also presents some results in a model similar to ours.

Our paper contributes to the literature in that it derives determinacy properties for a wide range of policy rules in a unified framework. We develop a richly parameterized version of the standard New Keynesian framework used for the analysis of monetary policy. A key element is the formal derivation of

[2] Christiano and Harrison (1999) point out that in an economy with sub-optimal equilibria due to production externalities, sunspot equilibria could be welfare-improving.