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Exchange rate determination under interest rate rules☆

Gianluca Benigno [a,*], Pierpaolo Benigno [b]

[a] Department of Economics, R426, London School of Economics, CEP and CEPR, Houghton Street, WC2A 2AE London, United Kingdom
[b] Dipartimento di Scienze Economiche e Aziendali, LUISS Guido Carli, CEPR, NBER, Viale Romani 32, 00197 Roma, Italy

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A B S T R A C T

We propose a theory of exchange rate determination under interest rate rules in a two-country model. We first show that simple interest rate feedback rules can determine a unique and stable equilibrium without any explicit reaction to the nominal exchange rate. We characterize how the behavior of the exchange rate and of the terms of trade depends in a critical way on the monetary regime chosen, though not necessarily on monetary shocks. We give a simple account of exchange rate volatility in terms of monetary policy rules, we provide an explanation of the relation between nominal exchange rate volatility and macroeconomic variability in terms of the monetary regime adopted by monetary authorities.

1. Introduction

This paper develops a theory of exchange rate determination under interest rate rules. The framework is a two-country optimizing-agent model with sticky prices, incorporating elements from both the recent closed-economy literature on the effects of monetary policy, in the spirit of the Neo-Wicksellian framework (Woodford, 2003), and the open-economy literature on exchange rate determination. We design monetary policy regimes by the interaction of interest rate rules followed by the monetary policymakers of both countries.[1]

As a first step, the design of monetary policy rules is crucial for the determinacy of the equilibrium. We show that simple interest rate feedback rules can determine a unique and stable equilibrium. The

☆ Appendix mentioned in the text is available upon request from the author.

* Corresponding author. Tel.: +44 (0) 20 79557807; fax: +44 (0) 20 79557595.
E-mail address: g.benigno@lse.ac.uk (G. Benigno).

[1] See Taylor (1999) for a collection of works on monetary rules.

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important result is that there is no need to include an explicit reaction toward the nominal exchange rate. In a floating regime, the Taylor's principle that monetary policy rules should be aggressive toward domestic inflation holds provided that the principle is applied to both rules. We further show that appropriately designed fixed exchange rate regimes are not destabilizing.

Once the equilibrium is determinate, we examine how the dynamic behavior of the terms of trade and of the nominal exchange rate depends on the exchange rate regime adopted.

Under a floating regime, the exchange rate is, in general, non-stationary. An important feature of our findings is that the source of perturbations in the nominal exchange rate is real shocks drawn from a stationary distribution. On the other hand, these real shocks generate a stationary pattern for the real macroeconomic variables of the model. The way monetary rules are designed is crucial for determining the non-stationary property of the nominal exchange rate: rules that target the level of the nominal exchange can stabilize its long-run value.

This paper is related to early contributions that have analyzed interest rate rules in open-economy macro-models as Ball (1999), Ghironi (1998), McCallum and Nelson (1999), Monacelli (2004), Svensson (1999, 2000) and Weeparana (1998).[2] In the recent years, after these works and our contribution, there have been an increasing number of studies in related open-economy models. One important example among others is the model of Laxton and Pesenti (2003) which presents features rich enough to be the base of more sophisticated models of open economies currently used by Central Banks and other institutions. De Fiore and Liu (2005) have studied the issue of determinacy in a small-open-economy model in which monetary frictions are non-negligible, while Galí and Monacelli (2005) have focused on a continuum of small open economies.

The structure of the paper is the following: in Section 2 we present the model and we briefly discuss its most novel aspects. We start our analysis from the log-linear approximation to the equilibrium conditions. We then specify the monetary policy rules that we are considering. The analysis of equilibrium determinacy is addressed in Section 3. Section 4 describes the allocation under flexible prices. In Section 5 we explore the positive consequences of different rules for the dynamic behavior of the terms of trade and the nominal exchange rate. Section 6 concludes.

2. The model

We consider a world economy composed of two countries labelled Home (H) and Foreign (F). The economy is populated by a continuum of agents on the interval [0, 1]. The population on the segment $[0, n)$ belongs to country H, while that on the segment $[n, 1]$ belongs to country F. A generic agent is both producer and consumer: a producer of a single differentiated product and a consumer of all the goods produced in both countries.

Each agent derives utility from consuming an index of consumption goods, a composite index of the Home and Foreign goods, and from the liquidity services of holding money,[3] while derives disutility from producing a single differentiated product. Households maximize the expected discounted value of the utility flow.

We assume that markets are complete within and across countries by allowing agents to trade in a set of nominal state-contingent bonds that span all the states of nature (as in Chari et al., 2002).

In order to give a role to monetary policy for the short-run fluctuations of the economy, we introduce nominal price rigidity rationalized in a context of a monopolistically competitive goods market. Nominal rigidities are modelled using a price-setting mechanism *a la* Calvo (1983).[4] In each period a firm can set a new price with a probability, $1 - \alpha$, which is the same for all firms and is independent of the amount of time elapsed since it last changed price. When a firm has an opportunity to set a new price, it does so in order to maximize the expected discounted value of its net profits. Under this

[2] For an empirical perspective, see Clarida et al. (1998) among others.

[3] We assume that utility is separable in these three components.

[4] Yun (1996), in a closed-economy model, and Kollman (1998), in an open-economy model, introduce Calvo's type of price-setting behavior into dynamic general equilibrium monetary models.