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Taylor rules and the Canadian–US equilibrium exchange rate

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A B S T R A C T

This paper identifies the Canadian–US equilibrium exchange rate based on a simple structural model of the real exchange rate, in which monetary policy follows a Taylor-rule interest rate reaction function. The exchange rate is explained by relative output and inflation as observable variables, and by unobserved equilibrium rates as well as unobserved transitory components in output and the exchange rate. Using Canadian data over 1974–2009 we jointly estimate the unobserved components and the structural parameters using the Kalman filter and Bayesian technique. We find that Canada's equilibrium exchange rate evolves smoothly and follows a trend depreciation. The transitory component is found to be very persistent but much more volatile than the equilibrium rate, resulting in few but prolonged periods of currency misalignments.

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1. Introduction

The identification and estimation of equilibrium exchange rates is a controversial topic in international macroeconomics. The literature has come up with a number of different ways of determining equilibrium rates, and results strongly depend on which particular approach is used. Yet knowledge of equilibrium rates is indispensable for a variety of issues in exchange rate economics, including assessments of currency misalignments, the decision of opting for fixed or flexible exchange rates, or questions regarding the reform of the international monetary system. It is also of particular relevance when large movements in the exchange rate coincide with broad stability in economic fundamentals, as was recently experienced in Canada (OECD, 2004, p. 53).

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In this paper we propose a new approach to estimating equilibrium exchange rates. Our approach is based on a simple structural two-country open-economy model, in which monetary policy is described by Taylor-rule reaction functions. Standard monetary models of exchange rate determination have long been discredited by their failure to explain exchange rate behavior, as forcefully documented by Meese and Rogoff (1983), Meese (1990), or Flood and Rose (1995). A new strand of literature allows for the endogeneity of monetary policy by incorporating Taylor-rule reaction functions into otherwise standard exchange rate models (Engel and West, 2006; Engel et al., 2008). Such models display exchange rate behavior quite different from traditional exchange rate models. For example, whereas in standard flexible-price monetary models an increase in the current inflation rate causes the exchange rate to depreciate, in Taylor-rule models the exchange rate appreciates because higher inflation induces expectations of tighter future monetary policy (Clarida and Waldman, 2008).

The emerging evidence on the empirical performance of Taylor-rule models of the open economy is quite encouraging. Engel and West (2006) and Mark (2009) use the forecasts from VAR models for the fundamentals as measures of exchange rate expectations and compare the properties of exchange rates generated from such models with actual German–US bilaterals. Both are shown to be highly volatile and persistent, and the Taylor-rule exchange rate turns out to be substantially more strongly correlated with the actual data than exchange rates generated by traditional models. Molodtsova and Papell (2009) analyze the out-of-sample predictability of exchange rates with Taylor-rule fundamentals by employing an error-correction formulation for the Taylor-rule model. They find that the evidence of exchange rate predictability is much stronger compared to conventional models, particularly at shorter forecast horizons.

We base our analysis on a variant of the two-country Taylor-rule model introduced by Engel and West (2006). In the model, the two countries differ in terms of the macroeconomic fundamentals included in their respective monetary reaction functions. Beside (expected) inflation and the output gap, the Taylor rule of one of the two countries also contains the real exchange rate as an argument. This feature is frequently, although not exclusively, associated with the small country assumption.[1] In this paper, we utilize the model to identify the Canadian–US equilibrium exchange rate. Canada is an archetypical small open economy, and the Bank of Canada has traditionally engaged in exchange market management, with the bilateral Canadian–US exchange rate as the primary target of these intervention activities (Weymark, 1995, 1997).

Whereas Engel and West (2006) use their model to explain the real exchange rate exclusively in terms of observable macroeconomic aggregates, we link these fundamentals with the transitory component of the exchange rate only, and let both the transitory and the long-run equilibrium real exchange rates be also influenced by random determinants. The unobserved components and the structural parameters are jointly estimated in a Bayesian framework.

The remainder of the paper is structured as follows: Section 2 provides a brief overview of the various concepts of equilibrium real exchange rates, Section 3 introduces the stylized small open-economy model, Section 4 elaborates on our estimation methodology, Section 5 presents the estimation results, and Section 6 concludes.

2. Equilibrium real exchange rates

Equilibrium real exchange rates can be identified in various different ways. The most commonly used are the (enhanced) purchasing power parity (PPP), the fundamental equilibrium exchange rate (FEER), the behavioral equilibrium exchange rate (BEER), and the permanent equilibrium exchange rate (PEER).[2]

The simplest approach to determining equilibrium exchange rates is based on PPP, according to which an exchange rate is in equilibrium if it equalizes the purchasing power of national currencies in terms of particular goods or output bundles. A variant of this paradigm is the so-called enhanced PPP

[1] Based on evidence that the real exchange rate enters an interest rate rule for Germany with a small, but statistically significant coefficient, Engel and West (2006) apply the model to the German–US real exchange rate.

[2] For more complete taxonomies of equilibrium exchange rates, see MacDonald (2000) and Driver and Westaway (2004).

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