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The influence of Taylor rule deviations on the real exchange rate ☆

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ABSTRACT

This paper explores the influence of Taylor rule deviations on the Deutschmark-Dollar and Yen-Dollar real exchange rate. Taylor rule deviations occur if the short term interest rate persistently deviates from an interest rate path consistent with the Taylor rule. It uses the behavior rational expectation exchange rate model, where the monetary policy is captured by a Taylor rule. The set of exchange rate fundamentals is constructed in two different ways. In the baseline specification only the traditional macro fundamentals are considered, whereas in the second specification Taylor rule deviations are included as well. This paper finds that Taylor rule deviations are important determinants of the exchange rate as the second specification fits the data much better than the baseline.

1. Introduction

The exchange rate disconnect puzzle is still one of the major problems in international economics. Standard monetary models of exchange rate determination have long been discredited by their inability to explain the behavior of exchange rates (Meese & Rogoff, 1983). One of the main shortcomings of traditional exchange rate models is their inability to incorporate the endogeneity of monetary policy.

This problem is avoided by Taylor rule exchange rate models. This new strand of literature includes the endogeneity of monetary policy using an interest rate rule as proposed by Taylor (1993). Expectations concerning monetary policy can be captured by incorporating an interest rate rule into exchange rate models. Compared to traditional models, the Taylor approach necessitates a different set of fundamentals. The exchange rate is determined by expected inflation and the output gap in contrast to traditional models, which use current levels of these fundamentals.

Using Taylor rule fundamentals, Molodtsova and Papell (2009) find strong out-of-sample predictability for a group of major exchange rates. Engel, Mark, and West (2007) corroborated these findings using a panel regression framework. Clarida and Waldman (2007) find a significant appreciation of exchange rates in response to positive inflation surprises for inflation targeting countries, which is one of the major predictions of these types of models. The reported success in forecasting raises the question whether Taylor rule exchange rate models can explain the volatility and persistence frequently observed in real exchange rates. Engel and West (2006) and Mark (2009) (hereafter EW06 and M09) develop a present value behavior equation of the real

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exchange rate based on the Taylor rule exchange rate model. They construct a fitted exchange rate for the Deutschmark-Dollar real exchange rate based on the behavior equation. This fitted exchange rate is determined by Taylor rule fundamentals only.

The resulting time series is characterized by a high degree of persistence and volatility and thus successfully reproduces characteristics from observed exchange rates. The correlation between the fitted and the actual exchange rate is reported to be around 0.3. However the empirical strategy of both studies faces a major limitation. The deviation of the nominal interest rate from the Taylor rule is included in the theoretical model but treated as unobservable and discarded from the empirical analysis. Yet it is important to include this variable. A shift in monetary policy is indicated through persistent deviations of the nominal interest rate from the perceived interest rate rule. Agents are led through this to revise their expectations concerning future monetary policy and fundamentals. Future fundamentals are highly weighted in the present value notation of the exchange rate and thereby strongly influence the current exchange rate.

As the Taylor rule deviation is an unobservable variable, it has to be indirectly identified. Clarida, Galí, and Gertler (1998) (hereafter CGG98) estimate Taylor rules for major economies and construct a target series for the nominal short term interest rate consistent with the interest rate rule. Comparing the target series with the observed interest rate for the U.S. they find long term positive deviations in the late 1970s indicating an expansionary monetary policy, and negative deviations in the early 1980s pointing to a period characterized by a contractionary monetary policy.

In holding the interest rate too low for too long compared to the benchmark Taylor rule, Taylor (2007) and Kahn (2010) find the monetary policy stance of the Federal Reserve to be too expansionary between 2003 and 2006. These deviations from the Taylor rule are deemed to be causal for the strong increase in real estate prices and the subsequent subprime crisis.

The aim of this study is to determine whether the deviation from the Taylor rule is an important variable helping to explain the movement of the exchange rate. A strong influence of this new variable on exchange rates indicates that exchange rates are to a major part determined by economic fundamentals. Consequently, the set of fundamentals need to be extended towards unobservable fundamentals like Taylor rule deviations. As far as I am aware, this is the first paper analyzing the influence of Taylor rule deviations on exchange rates.

To assess the importance of this new variable on exchange rates I use the present value representation of the exchange rate introduced by EW06 and M09. In a first step the fitted exchange rate is constructed using only the output gap and inflation as fundamentals. Secondly I add the estimated time series for the Taylor rule deviation to the set of fundamentals. The properties of the fitted exchange rates are then compared with those of the actual exchange rates. This analysis is applied to the Deutschmark-Dollar and the Yen-Dollar real exchange rate. The inclusion of Taylor rule deviations to the fundamental set substantially increases the correlation between fitted and observed exchange rates. Long swings describe the long run movement of both exchange rates. The specification including the Taylor rule deviations improves the matching of these long swings.

Further alternative specifications are applied to control the results for robustness. They are robust in the sense that in all specifications the inclusion of Taylor rule deviations provides a considerably better fit with the data than specifications discarding this variable. This indicates that deviations from monetary policy rules are an important fundamental to explain the behavior of the exchange rate.

The remainder of this paper is organized as follows. In the following section the behavior equation for the fitted exchange rate is derived. Section three describes the estimation procedure to compute measures for the Taylor rule deviations. In section four the empirical estimation strategy is elucidated. Section five presents the empirical results. A final section concludes.

2. The model

This section briefly describes the theoretical model, which refers to the original specification introduced by EW06. It considers a two country model of a small open economy. Monetary policy is conducted using an interest rate reaction function of the form

$$i_t^h = \gamma_q q_t + \gamma_\pi E_t\left(p_{t+12}^h - p_t^h\right) + \gamma_y y_t^h + u_{mt}^h \tag{1}$$

$$i_t^* = \gamma_\pi E_t\left(p_{t+12}^* - p_t^*\right) + \gamma_y y_t^* + u_{mt}^* \tag{2}$$

for the home and foreign economies, respectively.[1] In Eqs. (1) and (2) variables with superscript $*$ denote foreign variables, whereas variables with superscript h refer to home (domestic) values. The frequency is monthly. Therefore one period t denotes one month. The annual interest rate in month t is defined as i_t, the annual inflation rate is denoted by $p_{t+12} - p_t$, y_t is the output gap and u_{mt} captures deviations of the observed nominal interest rate from the monetary policy rule.

A forward looking formulation of the Taylor rule is used. Hence the monetary authority is assumed to focus on expected annual inflation one year in the future.

I follow CGG98 by including the real exchange rate q_t into the interest rate reaction function. The exchange rate q_t is denoted as the domestic price for foreign currency. They find a statistically significant influence of the real exchange rate on the nominal short term interest rate for Germany and Japan.

[1] Following EW06 I omit constant terms in the monetary policy rule.