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Real exchange rates and switching regimes

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Abstract

We suggest that the real exchange rate between the major currencies in the post-Bretton Woods period can be described by a stationary, 2-state Markov switching AR(1) model. Based on the forecast performance we find that this model outperforms two competing models where the real exchange rate is nonstationary. We also find that the existence of different regimes, as in the Markov switching model, is consistent with the common finding of unit roots in real exchange rates.

JEL classification: C22; C53; F31

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1. Introduction

The view that the law of one price, or its aggregate equivalent purchasing power parity, holds in the long-run but not necessarily in the short-run is widespread

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among economists.[1] This view is, however, not supported by strong empirical evidence, at least when examining the most recent period with floating exchange rates.[2] Usually, it is difficult to reject the null hypothesis that the real exchange rate contains a unit root. A potential reason for not rejecting unit roots is that standard tests usually have low power, in particular for near unit root processes.

The recent literature has suggested several solutions to this low power problem. For example, Perron (1990) has shown that standard unit root tests are biased towards a nonrejection of the null in the presence of a change in the intercept.[3] In more recent papers, Perron and Vogelsang (1992) and Dropsy (1996) develop unit root tests allowing for one-time changes in the mean. When applying their test statistics to real exchange rates, they find that unit roots can indeed be rejected when allowing for structural instability. Empirical evidence suggesting structural instability is also found when comparing out-of-sample forecasts based on different estimation sample lengths (see Siddique and Sweeney, 1998).

From an empirical point of view, it seems very restrictive to assume that there is only a one-time break in the intercept. It may actually be the case that the intercept varies over time where the different intercepts are associated with different regimes or states of nature. Another possibility is that all parameters of the model, e.g., the intercept and the variance, change over time. In the context of nominal exchange rates, it is natural to distinguish between two phases, exchange rate appreciation and depreciation regimes. To model such long swings in the data, Engel and Hamilton (1990) suggest a Markov switching random walk model with drift. They examined the out-of-sample forecast behavior of this model and compared it with a single regime random walk model. For the three nominal exchange rates in their sample, they found that mean squared errors from the Markov switching model were lower in many cases than for the single regime random walk model.[4]

In this paper we suggest that the level of the real exchange rate is generated by a stationary 2-state Markov switching autoregressive model of the first order, a model nested within the class of models studied by Engel and Hamilton (1990) and Engel (1994). We extend the earlier literature focusing on one-time structural shifts in the mean by allowing all parameters (the mean, the autoregressive parameter and the

[1] See Froot and Rogoff (1995) or Rogoff (1996) for recent evaluations of the purchasing power parity doctrine and the empirical evidence.

[2] See for example, Cheung and Lai (1993a, 1993b), Juselius (1995), Ott (1996) and Lothian (1997).

[3] Other approaches to solve low power problems when testing for PPP include using simulations (e.g., Edison et al., 1997), multivariate maximum likelihood methods (e.g., Cheung and Lai, 1993b), multivariate versions of standard unit root tests (e.g., Jorion and Sweeney, 1996; Lothian, 1997), panel data regressions (e.g., Oh, 1996) and nonlinear models (e.g., Creedy et al., 1996; Sarantis, 1999). However, Engel (2000) shows that tests of PPP have important size biases and argues that PPP may not hold after all.

[4] However, later research by Engel (1994) showed that the single regime random walk model often outperformed the Markov model for other nominal exchange rates.