The Search for Stationarity in Real Exchange Rates: An Unobserved Component Regime-Switching Approach

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The Purchasing Power Parity Puzzle raised in Rogoff (1996) questions how the observed large short-term volatility in real exchange rates (RERs) can be reconciled with their high persistence, when in theory, volatile shocks should be short-lived and persistent shocks should not occur so frequently. Despite many attempts in the past decade to address this issue, the consensus remains that it is very difficult to reduce the half-life estimates of RER shock to below a long 3-5 years. Mainly, the difficulty stems from having a relatively short amount of available data to distinguish among alternative time series models that may look very similar in small samples. For example, the current literature fails to come to a consensus regarding the stationarity (or lack thereof) of real exchange rates. While both hypotheses have theoretical backings, the data constraints simply have not allowed a settled answer to emerge.

Against this backdrop, this paper analyzes RER behavior using models that allow for both stationary and nonstationary components, rather than trying to force the data to choose one over the other. Theoretically, we motivate such a model setup with the observation that real shocks may prove to have permanent effects on RERs, such as through the Balassa-Samuelson effect, whereas monetary and financial shocks tend to
constitute volatile yet transitory disturbances. Allowing both types of shocks to affect the RER in different time periods, our model provide the flexibility for better understanding and characterizing the dynamic processes driving real exchange rates. In this endeavor, we also hope that this more proper characterization of shocks may help reduce the half-life of the transitory components of the real exchange rate processes to 1 or 2 years, which would be an accepted deviation from purchasing power parity that theory affords through price stickiness.

In this paper, we propose three models that characterize the RER as a stationary process with occasional permanent shocks. The models extend the Innovation Regime-Switching model of orders 1 and \((m, n)\) proposed in Kuan, Huang, and Tsay (2005, JBES). The setup permits the possibility that the transitory processes never switch on so that no stationarity ever exists. It also allows another outcome that once we control for the occasional real disturbances in the economy, characterized by a unit root process, the half-life of the remaining stationary process would fall below the 3-5 year interval found in previous research. To estimate the models, we employ the classical maximum likelihood techniques for estimating regime switching models. Our dataset includes annual data starting as far back as 1870 on 18 major OECD countries.

Our results suggest that having the shocks switch between permanent and stationary has merit because the estimations do not resemble those of the generated unit root series; we conclude that some stationarity must be present. Modeling each country separately rather than in a pooled panel also demonstrates clear cross-country heterogeneity in the behavior of real exchange rates. We find large variations in the likelihood values across all the model specifications, and the estimations for Japan appear
consistently different from those of other countries. In addition, for some countries, such as the United Kingdom, allowing for the unit root process reduces the half-life of the stationary process from 6 years to slightly above 2 years. Nonetheless, we also find many cross country similarities in the estimations. For example, the estimated dates of the permanent shocks are close across the models potentially reflecting the impact of major historical events, such as new currency regimes and wars, on the real exchange rate processes. Furthermore, post-Bretton Woods is characterized by highly probable unit root states, which support the current literature on the exchange rate disconnect puzzle where the Real Exchange Rate became much more volatile.