Journal of International Money and Finance 43 (2014) 1–18

Contents lists available at ScienceDirect

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

Forecasting exchange rates out-of-sample with panel methods and real-time data

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JEL Classification:
C23
C53
E32
E52
F31
F47

Keywords:
Exchange rate forecasting
Taylor rules
Real-time data
Out-of-sample test Statistics

A B S T R A C T

This paper evaluates out-of-sample exchange rate forecasting with Purchasing Power Parity (PPP) and Taylor rule fundamentals for 9 OECD countries vis-à-vis the U.S. dollar over the period from 1973:Q1 to 2009:Q1 at short and long horizons. In contrast with previous work, which reports "forecasts" using revised data, I construct a quarterly real-time dataset that incorporates only the information available to market participants when the forecasts were made. Using bootstrapped out-of-sample test statistics, the exchange rate model with Taylor rule fundamentals performs better at the one-quarter horizon and panel estimation is not able to improve its performance. The PPP model, however, forecasts better at the 16-quarter horizon and its performance increases in panel framework. The results are in accord with previous research on PPP and Taylor rule models.

1. Introduction

Following the collapse of the Bretton–Woods system, the introduction of flexible exchange rate regimes attracted much attention to the area of international macroeconomics in an attempt to explain exchange rate behavior. Theoretical papers such as Dornbusch (1976), which extended the Mundell–Fleming model to incorporate rational expectations and sticky prices and introduced overshooting as an explanation for high exchange rate variability, and empirical work such as Frankel (1979), which

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http://dx.doi.org/10.1016/j.jimonfin.2013.12.004

found success in estimating empirical exchange rate models, inspired research in this field by pointing out the ability of macroeconomic models to explain exchange rate variability.

The seminal papers by Meese and Rogoff (1983a, 1983b) put an end to the atmosphere of optimism in exchange rate economics by concluding that empirical exchange rate models do not perform better than a random walk model out-of-sample. Their finding is still hard to overturn more than two decades later. Cheung et al. (2005), for example, examine out-of-sample performance of the interest rate parity, monetary, productivity-based and behavioral exchange rate models and conclude that none of the models consistently outperforms the random walk at any horizon.

Are empirical exchange rate models really as bad as we think? Recent studies have found evidence of exchange rate predictability using either panels or innovative modeling approaches. Engel et al. (2008) use panel specifications of the monetary, Purchasing Power Parity (PPP) and Taylor (1993) rule models, Rossi (2006) uses the monetary model in the presence of a structural break, Gourinchas and Rey (2007) use an external balance model, Molodtsova and Papell (2009) use a heterogeneous symmetric Taylor rule model with smoothing, and Cerra and Saxena (2010) use a broad panel specification of the monetary model.

A common problem with the papers discussed above is their reliance on ex-post revised data for the forecasting analysis. Macroeconomic data are updated when new data become available and frequently revised over time. These revisions can be substantial and were not available to either policymakers or market participants at the time forecasts were made. Therefore, out-of-sample forecast evaluations based on ex-post revised data yield misleading inference about the exchange rate models, and information problems of market agents are not accounted in the analysis. As Rossi (2005) emphasizes, to forecast economic variables which are driven by persistent and permanent shocks, the econometrician might measure agent's probability distribution poorly by using actual realized values of future explanatory variables. To forecast exchange rates, which are primarily driven by expectations, real-time data would be more advantageous due to capturing the information set of market participants as closely as possible in contrast to ex-post revised data and actual realized values of future explanatory variables.

Out-of-sample forecasts of exchange rate models may be influenced by data revisions in many different ways. First, estimated parameters of the candidate models will vary because the data used for in-sample estimation is different. Changes in the parameter estimates could be striking if the forecasting model contains a latent variable whose value is subject to variation due to data revisions, such as output gap in Taylor rule models. Second, changes in parameter estimates induce candidate models to produce different one- and multi-step ahead out-of-sample forecasts. Consequently, out-of-sample inferences based on forecast errors may suggest selecting a different model. Third, due to differences in timing and magnitudes of data revisions across countries, model specifications themselves can be subject to change. More specifically, forecasts generated with time-series regressions in real-time could dominate panel specifications when the level of heterogeneity, arises from differences in data revisions across countries, is high. Although all of the above-mentioned reasons suggest that out-of-sample predictive ability of exchange rate models should be evaluated using real-time data, it is still very rare in the exchange rate literature.

The first paper to use real-time data to evaluate nominal exchange rate predictability is Faust et al. (2003). Examining the predictive ability of Mark's (1995) monetary model using real-time data for Japan, Germany, Switzerland and Canada vis-à-vis the U.S, they report that the models consistently perform better using real-time data than fully revised data. However, none of the models perform better than the random walk model. More recently, Molodtsova et al. (2008, 2011) find evidence of predictability with Taylor rule fundamentals using real-time data for the Deutschmark/dollar and Euro/dollar exchange rates. Molodtsova et al. (2008) find evidence of out-of-sample predictability with Taylor rule fundamentals only using real-time data as opposed to ex-post revised data and confirm the conclusion of Faust et al. (2003) that exchange rate dynamics might react more to the market's contemporaneous beliefs about the fundamentals than true underlying fundamentals.

There are no studies on exchange rate forecasting with real-time data for a reasonably large number of countries over the post Bretton Woods period because of the limited availability of real-time data for countries other than the U.S. In this paper, I construct a quarterly real-time dataset that contains 9 OECD countries (Australia, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, the United