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Fundamentals, forecast combinations and nominal exchange-rate predictability

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ABSTRACT

This paper investigates the out-predictability of fundamentals and forecast combinations. By adopting a panel-based specification, the paper obtains several interesting results. First, the Taylor-rule-based fundamental is the best among the four different fundamentals under consideration in out-of-sample contests. It provides strong evidence to out-predict the random walk over the PBW period. Second, relative to a single-equation prediction, panel predictions are generally able to enhance the statistical significance of beating the random walk. Third, combining forecasts from different fundamentals that have relatively strong out-predictability at a specific horizon does enhance both the statistical and economic significances of beating the random walk for the PBW period at short horizons.

1. Introduction

Since the seminal work of Meese and Rogoff (1983), the out-predictability of nominal exchange rates has been hotly debated within empirical international finance. Meese and Rogoff (1983) point out the difficulty of out-predicting nominal exchange rates, particularly for short-to-medium horizons, and suggest that fundamentals implied by structural models are not useful for out-predicting nominal exchange rates. This is called the Meese–Rogoff puzzle or the exchange rate disconnect puzzle (Obstfeld & Rogoff, 2000). Despite the difficulty in out-predicting nominal exchange rates over short horizons, some authors have found nominal exchange rates to be predictable over medium-to-long forecast horizons (Chinn & Meese, 1995; Kilian & Taylor, 2003; Mark, 1995; Mark & Sul, 2001). However, such evidence of predictability is uncertain with several authors challenging long-horizon predictability (Berben & van Dijik, 1998; Berkowitz & Giorgianni, 2001; Cheung, Chinn, & Pascual, 2005; Kilian, 1999; Rossi, 2005).

There are several reasons to explain the failure of defeating the random walk benchmark. The first one refers to the imprecise parameter estimates. Several authors employed panel estimation to improve the precision of parameter estimates and found evidence of beating random walks (Engel, Mark, & West, 2007; Groen, 2005; Mark & Sul, 2001). However, Ince (2010) points out that panel estimation is helpful to improve the out-predictability of purchasing power parity (PPP) rather than Taylor rule (TR) fundamentals. The second reason refers to measurement errors in fundamental exchange rates. Conventional literature applies monetary (M) or PPP fundamentals to measure fundamental exchange rates. Molodtsova and Papell (2009) and Ince (2010) find impressive evidence of rejecting the random walk benchmark over one-month horizon by measuring fundamental exchange rate with Taylor-rule fundamentals. Wide (2012) finds that Taylor rule deviations are important determinants of the exchange rate. The third reason refers to the failure of including useful information from other relevant variables. A straightforward solution to this issue

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is to include relevant variables in long-horizon prediction equations but this leads to efficiency loss in estimation and results in computation complexity. Instead of including all relevant variables in a model, forecast combinations provide a judicious way to combine information in many variables that avoids the estimation of a large number of unrestricted parameters. Rogoff and Stavrakeva (2008) examine if pooling forecasts from a random walk and a fundamental-based forecast with exogenous weights is able to enhance the evidence of beating the random walk. Their results reveal that the superiority of forecast combination in out-of-sample contests is sensitive to forecast horizons.

According to the previous discussion, the purpose of this paper is therefore twofold. First, it adopts a panel specification to examine whether deviations from different fundamental-based exchange rates are relevant to predict exchange rates. An interesting question that has not been addressed in literature is the robustness of the out-predictability of the TR-based fundamental to forecast horizons, sample periods, detrending methods and parameter calibrations. Moreover, it analyzes whether panel specifications are superior to time-series specifications in out-of-sample contests. Second, it investigates the usefulness of combining two fundamental-based forecasts in enhancing the statistical and economic significance of defeating the random walk. In short, this paper sheds light on the superiority of panel specifications in out-of-sample prediction of exchange rates. In addition, it also examines the usefulness of forecast combination in improving predictive accuracy.

Applying the data of 9 industrial countries over 1973–2010, this paper obtains several interesting results. First, among the four fundamental-based forecasts, the TR-based fundamental is the best one that beats the random walk in out-of-sample contests. In addition, the out-predictability of the TR-based fundamental is strong over the PBW period. Second, relative to single-equation specifications, panel specifications are able to improve the out-predictability of fundamentals. Third, combining forecasts from different fundamentals that have relatively strong out-predictability at a specific horizon does enhance both the statistical and economic significances of beating the random walk for the PBW period at short horizons.

The remainder of the paper is organized as follows. Section 2 discusses empirical specifications. Section 3 examines the statistical and economic significance of the fundamentals and forecast combinations. Section 4 summarizes the major results of this paper.

2. Out-of-sample prediction

2.1. Long-horizon prediction equations

A large number of exchange rate models exists over the floating rate period. Any evaluation of these models must, as a consequence, be selective. Following Molodtsova and Papell (2009) and Ince (2010), this paper selects four fundamentals that are implied, respectively, by an asymmetric TR model, flexible-price monetary model, purchasing power parity, and interest-rate-parity (IRP).

The fundamental-based forecasts of nominal exchange rates are constructed by the following long-horizon predictive equation:

$$\begin{aligned} s_{j,t+h}-s_{j,t} &= \beta_{k,h} z_{j,k,t} + \varepsilon_{j,k,t+h},\ k=1,\ldots,4;\ j=1,\ldots,N;\ h=1,\ldots,H, \\ \varepsilon_{j,k,t} &= \alpha_{j,k,h} + u_{j,k,t}, \end{aligned} \tag{1}$$

where the subscripts j, k, t and h indicate the country, the fundamental, the time period and the forecast horizon, respectively. $s_{j,t}$ is the log of nominal exchange rates for country j (US dollars per foreign currency), $z_{j,k,t} \equiv f_{j,k,t} - s_{j,t}$ is the deviation of the nominal exchange rate from that implied by the kth fundamental for country j $(f_{j,k,t})$. The regression error $\varepsilon_{j,k,t+h}$ includes an individual specific effect, $\alpha_{j,k,h}$. Ince (2010), Engel et al. (2007), and Mark and Sul (2001) included a time-specific effect and used the recursively-estimated time average as a projection of the future time effect. We simply set the future time effect to zero as the average time effect in exchange rate changes is zero. Note that, unless $\beta_{k,h}$ differs significantly from zero, Eq. (1) degenerates to a random walk with drift. Eq. (1) therefore nests a random walk with drift as a special case. Therefore, the benchmark of the paper is a random walk with drift (Kilian, 1999).

Before examining the out-predictability of forecast combinations, we need to construct fundamental-based forecasts separately. Following Mark and Sul (2001), this paper applies the least squares dummy variable (LSDV) method to estimate Eq. (1) and then constructs fundamental-based forecasts accordingly. Because of the appearance of the time effect in the predictive regression, the h-period ahead forecast requires a forecast of the time effect. The forecasts of nominal exchange rate changes are constructed as follows:

$$\hat{s}_{j,t+h} - s_{j,t} = \hat{\alpha}_{j,k,h} + \hat{\beta}_{k,h} z_{j,k,t} \tag{2}$$

Four different models are employed to construct fundamental exchange rates. The first one is an asymmetric Taylor rule model in which a foreign (rather than domestic) central bank adjusts its interest rate according to its exchange rate target. This type of Taylor rule is also considered in Engel and West (2006), Engel et al. (2007), Molodtsova and Papell (2009), and Ince (2010). By applying the uncovered interest rate parity, the change in the nominal exchange rate is derived as follows:

$$\Delta s_{j,t+1} = \gamma_j q_{j,t} + \alpha_j \left(y^{gap}_{*,t} - y^{gap}_{j,t} \right) + \left(1 + \delta_j \right) \left(\pi_{*,t} - \pi_{j,t} \right) + \eta_{j,t+1}, \tag{3}$$