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Exchange rate predictability in a changing world

Joseph P. Byrne [a], Dimitris Korobilis [b], Pinho J. Ribeiro [b,*]

[a] School of Management and Languages, Heriot-Watt University, Edinburgh EH14 4AS, United Kingdom
[b] Adam Smith Business School, University of Glasgow, Glasgow G12 8RT, United Kingdom

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ABSTRACT

An expanding literature articulates the view that Taylor rules are helpful in predicting exchange rates. In a changing world, however, Taylor rule parameters may be subject to structural instabilities, for example in the aftermath of the Global Financial Crisis. This paper forecasts exchange rates using Taylor rules with Time-Varying Parameters (TVP) estimated by Bayesian methods. Focusing on the data from the crisis, we improve upon the random walk for at least half, and for as many as seven out of 10, of the currencies considered. Results are stronger when we allow the TVP of the Taylor rules to differ between countries.

1. Introduction

Academics and market practitioners have both sought to predict exchange rate fluctuations. A long held view, initiated by Meese and Rogoff (1983), proposed that forecasts based upon macroeconomic fundamentals could not improve upon a random walk benchmark. Rossi (2013) provides a survey of the subsequent literature that examined the predictive content of macroeconomic fundamentals, using theoretical and empirical innovations. Theoretical improvements have included studying the behavior of exchange rates in present-value models (Engel and West, 2005). Separately, empirical advances have included nonlinear methods, such as the exponential smooth transition auto-regressive model

* Corresponding author. Tel.: +44(0)141 330 8506.
E-mail address: p.ribeiro.1@research.gla.ac.uk (P.J. Ribeiro).

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of Kilian and Taylor (2003) and time-varying parameter models (e.g., Rossi, 2006; Wolff, 1987).[1] This paper seeks to combine these theoretical and empirical innovations in predicting exchange rates, in a changing world.

Engel and West (2005) and Engel et al. (2008) illustrate that models that can be cast in the standard present-value asset pricing framework imply that exchange rates are approximately random walks. This result holds under the assumptions of non-stationary fundamentals and a near unity discount factor. However, Engel and West (2004) present evidence that even when the discount factor is near one, a class of models based on observable fundamentals can still account for a fairly large fraction of the variance in exchange rates. An example in this class includes structural exchange rate models in which monetary policy follows the Taylor (1993) rule. Engel et al. (2008), Molodtsova and Papell (2009), and Rossi (2013) find that empirical exchange rate models conditioned on information sets from Taylor rules outperform the random walk benchmark in out-of-sample forecasting, particularly at short-horizons.

Despite the optimism instilled by this emerging research one area remains unresolved. Exchange rate forecasting models are subject to parameter instability. Rossi and Sekhposyan (2011), for example, detect significant instabilities in models that employ classic and Taylor rule fundamentals. In their study, Meese and Rogoff (1983) had already conjectured that parameter instability may rationalize the poor forecasting performance of exchange rate models. To address the issue, several researchers have attempted to account for time-variation in parameters when forecasting exchange rates. Nonetheless, as Rossi (2013) and Rogoff and Stavrakeva (2008) point out, the problem has not yet been fully resolved. In fact, Rossi (2013) questions whether instabilities can be exploited to improve exchange rate forecasts.

In this paper we revisit the issue of forecasting exchange rates with time-varying parameter models. In a major break with the earlier literature, our starting point is that macroeconomic conditions and policy actions evolve, often suddenly.[2] Following this idea, our modeling strategy allows for fast changing dynamics in the process that determine macroeconomic fundamentals, which in turn influence the path of the exchange rate. Only after these dynamics have been accounted for, we then proceed and allow for time-variation in parameters when predicting exchange rates. To help achieve efficiency when estimating the parameters we use information in the likelihood based upon Bayesian methods. As Kim and Nelson (1999) refer, Bayesian methods treat all the unknown parameters in the system as jointly distributed random variables, such that each parameter estimate reflects uncertainty about the other parameters. In contrast, estimates based on classical maximum likelihood are prone to errors, since a large number of likelihood functions have to be evaluated. Therefore, unlike the previous literature, we do not rely on classical maximum likelihood methods (as in Rossi, 2006) or calibration (e.g. Wolff, 1987; Bacchetta et al., 2009), which can also be subjective and may give less accurate parameter estimates and inferior forecasting performance.[3]

It is straightforward to recognize the relevance of allowing for time-evolving macroeconomic fundamentals. If the process underlying macroeconomic fundamentals changes rapidly over time, their predictive content may depend upon statistically modeling it. And empirically, there is widespread evidence pointing out to time-evolving dynamics in fundamentals. In the context of fundamentals determined by Taylor rules, Boivin (2006), Kim and Nelson (2006), and Cogley et al. (2010) find that the U.S. Federal Reserve conduct of monetary policy is better characterized by a changing-coefficients Taylor rule. Trecroci and Vassalli (2010) present similar findings for the U.S., U.K., Germany, France and Italy.

There is also a large literature documenting time-evolving relationships between fundamentals and exchange rates. Bacchetta and van Wincoop (2004), for instance, explain this relationship on the basis of a scapegoat theory. Traders in foreign exchange markets seek explanations for fluctuations in the exchange rate, such that even when an unobservable variable is the cause of the fluctuation, they explain

[1] See Rossi (2013) for a review of other empirical approaches.

[2] See, for example, Stock and Watson (1996) for evidence on structural instabilities in macroeconomic time series in general.

[3] Giannone (2009) provides a helpful critique of the results based on Bacchetta et al.'s (2009) calibration and shows how using the full maximum likelihood setup in a Bayesian framework is important in accounting for instabilities. Balke et al. (2013) also use Bayesian methods and focus upon modeling exchange rates in-sample with monetary fundamentals.