Dynamic Forecasting of Sticky-Price Monetary Exchange Rate Model

JAE-KWANG HWANG*

Abstract

The Dornbusch-Frankel monetary model is used to estimate the out-of-sample forecasting performance for the U.S. or Canadian dollar exchange rate. By using Johansen's multivariate cointegration, up to three cointegrating vectors were found between the exchange rate and macroeconomic fundamentals. This means that there is a long-run relationship between exchange rate and economic fundamentals. Based on error-correction models, the random-walk model outperforms the Dornbusch-Frankel model at every forecasting horizon. The random-walk model also dominates the Dornbusch-Frankel model with the modified money demand function at every forecasting horizon except one month. However, this paper shows that the share price variable can improve the accuracy of forecasts of exchange rates at short-run horizons. (JEL F31)

Introduction

It has long been believed that nominal exchange rate behavior is well described by the naïve random-walk model. This means that there are no systematic economic forces in determining the exchange rates. Meese and Rogoff [1983] show that none of the structural models (Frenkel-Bilson's flexible-price monetary model, Dornbusch-Frankel's sticky-price monetary model, Hooper-Morton's sticky-price asset model) outperform a simple random walk on the basis of the root-mean-square-error (RMSE) and mean-absolute-error criteria for forecast evaluation. The poor empirical performance of these structural exchange rate models could be the result of simultaneous equation bias, sampling error, stochastic movement in the true underlying parameters, and mis-specification of the underlying models.1

However, not all writers present results that reject structural exchange rate models. Woo [1985] incorporates a money demand function with a partial adjustment mechanism, and finds that a reformulated monetary approach can outperform the random-walk model in an out-of-sample forecast exercise. Somanath [1986] also finds that a monetary model with a lagged endogenous variable forecasts better than the naïve random-walk model. Finn [1986] finds that the simple flexible-price monetary model is not supported by the data while the rational-expectations monetary model is supported and performs as well as the random-walk model.

MacDonald and Taylor [1993; 1994] also claim some predictive power for the monetary model. MacDonald and Taylor [1993] examine the monetary model of the exchange rate between the Deutsche mark and the U.S. dollar over the period January 1976 to December 1990. They find that a dynamic error-correction model outperforms the random walk forecast at every forecast horizon. MacDonald and Taylor [1994] also find, using a multivariate cointe-

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*Ouachita Baptist University—U.S.A. The author would like to thank James P. Cover for his help and useful suggestions on earlier drafts.
igration technique, that an unrestricted monetary model outperforms the random walk and other models in an out-of-sample forecasting experiment for the sterling-dollar exchange rate.

Reinton and Ongena [1999] show that monetary exchange rate models outperform the random walk model at six and 12 months horizons by using Norwegian Krone vis-à-vis four major currencies from 1986-96. Tawadros [2001], using a cointegration and error correction model, examines the predictive power of monetary exchange rate model for the Australian dollar or the U.S. dollar. He presents that an unrestricted monetary model dominates the random walk model at all forecasting horizons.

This paper examines the forecasting performance of Dornbusch-Frankel's sticky-price monetary model vis-à-vis the random-walk model for the U.S. dollar-Canadian dollar exchange rate over the period January 1980 to December 2000. The motivation for this re-examination is to study the effect of the share prices on the demand for money. As mentioned above, a potential problem with the structural models might be the instability of their underlying money-demand specifications.

Choudhry [1996] finds that share prices are a statistically significant variable in the long-run real M1 and M2 demand functions in U.S. and Canada. Also, according to Friedman [1988], movements in share prices may have two kinds of effects on money demand: a positive wealth effect and a negative substitution effect. Therefore, if share prices do enter the money demand function, structural exchange rate models that do not include it are mis-specified.

In addition, some writers report a significant positive relationship between equity prices and exchange rates [Smith, 1992; Solnik, 1987], while others report a strong negative relationship between share prices and exchange rates [Soenen and Hennigar, 1988]. Ma and Kao [1990] find that domestic currency appreciation negatively affects domestic share prices for an export-dominant economy and positively affects share prices in an import-dominant economy.

Bahmani-Oskooee and Sohrabian [1992] show that there is a bidirectional causality between share prices and exchange rates in the short-run but not in the long-run. On the other hand, Abdalla and Murinde [1997] show unidirectional causality from exchange rates to share prices in three out of four developing countries. Ajayi and Mougoue [1996] show that an increase in aggregate domestic share prices has a negative short-run effect on the value of domestic currency but in the long-run increases in share prices have a positive effect on the value of domestic currency. However, currency depreciation has a negative short-run and long-run effect on share prices. These results suggest that including the effect of share prices on money demand might result in an improved structural exchange rates model.

The purpose of this paper is to determine whether Dornbusch-Frankel model with a modified money demand specification performs better than the random-walk model in an out-of-sample forecasting exercise at short horizons. If it does, then share prices become one of the macroeconomic fundamentals in exchange rate models. It is especially interesting to see whether Dornbusch-Frankel model outperforms the random-walk model at short-run horizons.

This paper uses the multivariate cointegration technique proposed by Johansen [1988] and Johansen and Juselius [1990] to determine the long-run multivariate relationship between our variables. This allows the specification of a dynamic error-correction model of the exchange rates. To construct out-of-sample forecasts, the short-run dynamic forecasts are made over four forecasting horizons, namely one, three, six, and twelve months for the period 1999:1-2000:12. RMSE is the principal criterion to test the out-of-sample forecast performance and when comparing the Dornbusch-Frankel model with the random-walk model.

Up to three cointegrating vectors are found in the Dornbusch-Frankel exchange rate models. In other words, there is a stable long-run relationship between the exchange rate and