

Comparing Prediction Power of Won-Dollar Exchange Rate: The Case of Korea

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The purpose of this study is to compare the prediction power in order to find a most accurate model to forecast won-dollar exchange rate by using Monte Carlo simulation model, AR model, random walk model and monetary approach model respectively. The main results are summarized as follows. Prediction power of the Monte Carlo simulation and the FPMM are more accurate than the other models in 1 month period. And then, monetary approach models appear with higher prediction power than Random walk model both the 3-month and 6-month period. For the 12 month period prediction, Monte Carlo Simulation model has the most accurate prediction power in order of SPMM, FPMM and random walk model.

JEL Codes: C22, E17 and F31

1. Introduction

In 1997, the beginning of Korean financial crisis, the foreign exchange holding of Korea was only 8.9 billion dollar. However, it came up to 240 billion dollar in 2008. In spite of increasing of exports and foreign exchange holding, trend of won-dollar exchange-rate rose. In the beginning of 2008, won-dollar exchange-rate was 930, and it rose to 1,537 in March 2009. It makes Korea exposed to global crisis, after the bankruptcy of Lehman Brothers in September 2008, despite 140 billion dollars of foreign exchange holding. The won's latest downward spiral is mostly driven by the dollar's strengthening amid broad fears of insolvencies in global markets, rather than by domestic factors.

Sangho Yi (2005) said with exchange-rate regime shifted to the free floating system in December 1997, and after the Korean financial crisis of 1997-1998, won-dollar exchange-rate uncertainty was highly increased. As a result, the reduction of exchange-rate uncertainty has become one of the crucial tasks for a stable and sustainable growth in Korea.

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Korea changed its exchange system from “the freely floating exchange-rate system” to “the market average exchange-rate system” after the Korean financial crisis in 1997. The freely floating exchange-rate system has an advantage of correcting the imbalance of international payments and a disadvantage of unstable volatility of exchange-rate. Specially, degree of dependence upon foreign trade is very high in Korea. Furthermore, the global financial crisis, which is started in U.S., makes the prediction of exchange-rate more important.

2. Literature review

Dong-Bek Shin (2007) predicted exchange-rate using Monte Carlo simulation. His result showed that the Monte Carlo simulation model has high prediction power of exchange-rate. For Lee (2007) found a more accurate model, compared both the time-series and the fundamental prediction models. Result showed that simple time series model that include variables such as the capital account and inflation rate differential between Korea and the US have relatively high forecasting power. Meese and Rogoff (1983) showed that the driftless random walk model is more efficient than the model with macro-economic variables.

D. Y. Choi and D. G. Sul (1997) presented that economic model is to forecasting power consistently more than random walk model from 1974 to 1991 long-term that include the fixed exchange-rate system from 1965 to 1992. It supported the study of Mark (1995) etc.

Guo and Savickas (2006)'s analysis suggest that the idiosyncratic risk of those assets forecast the U.S. dollar's behavior facing the G7's main currencies, and empirical analysis suggests, that the foreign exchange-rates do not follow a random walk. Chang-Beom Kim and Soo-Won Mo (2001) found out the co-integrating vector indicate that the monetary models can be interpreted as having long-run validity. They presented the results of the study suggest that the structural monetary models outperform the random walk model in the long-term forecasting from 1973 to 1998 about 10 OECD countries.

Moura and Lima (2007)'s study indicate that forecasting the future behavior of the exchange-rate for an emerging commodity exporter economy with independently floating regime. Moon-Sok Oh and Sang-Keun Lee (2000) compared the monetary model, real interest differential monetary model and Hooper and Morton model of asset market approaches with random walk and ARIMA to forecast won-dollar rate in long and short term. According to the empirical result, random walk model was excellent to forecast won-dollar exchange-rate in short-term but asset market approaches were better than random walk model and ARIMA model to forecast won-dollar exchange-rate in long-term. Cheung, Chinn and Pascual (2005) added other models and elements to the 1970s traditional specifications. And their finding that monetary models' exchange-rate forecasting power are no greater than that of the random walk forecast. Dornbusch (1976) introduces the idea of sticky prices in short term to the real exchange-rate beyond its long-term equilibrium value.

3. The methodology and model

The analysis uses monthly data for the United States and Korea from January 1999 to December 2008 at the month-end closing rate. The exchange-rate ($V/\$$) is all denoted as the prices of the U.S. dollar in foreign currencies. We obtain exchange-

rate, rate of CD as short-term interest rate (90 day), government bond as long-term interest rate (maturity of 3 years), balance of capital account, GDP Korean and U.S. respectively CPI, M2 from the Bank of Korea. Another data obtained Korean industrial production index from KOSIS and U.S. industrial production index, T-Bill (90day) of short-term, T-Bond (maturity of 3 years) of long-term interest rate from FRB.

Monte Carlo simulation is simulated as follow. Set up a stochastic model, measure a value of a deterministic variable that included in the model, generate random numbers that meet distribution of a stochastic variable to find out an approximate estimation.

$$dS = \mu S dt + \sigma S dz$$