Using Interactive Artificial Bee Colony to Forecast Exchange Rate

I. INTRODUCTION

Exchange rate forecasting is an important issue in finance. However, the problems of the forecasting model selection and the improvement on forecasting accuracy are not easy to be solved. The reason is that the exchange rate is quite sensitive to many factors such as price index, interest rates, money supply, balance of trade, and so forth. As the matter of fact, the forecasting accuracy is directed affected by the selection of the referenced variables and information. Although it is known that the monetary theory model has higher accuracy than the random walk method [12], the performance of the monetary theory model is still limited. [5] In addition, most of the literatures focus on the long-turn exchange rate forecasting, only a few literatures discussed about the short-term, i.e. the daily exchange rate forecasting.

In order to overcome this problem, the need of new exchange rate forecasting model is clear. Responding to need, we propose a new exchange rate forecasting model based on the support from Interactive Artificial Bee Colony (IABC) optimization. The rest part of this paper is composed as follows: the literature review is given in section 2, our proposed method is described in section 3, the experiment design is depicted in section 4, the experimental results are given in section 5, and finally, the conclusion is made in section 6.

II. LITERATURE REVIEW

A. Foreign Exchange Rate Theories

There are many theories on exchange rate determination, including purchasing power parity (PPP), monetary model, interest rate parity (IRP), balance of payment model, and portfolio balance model. The brief review of the models listed above are given as follows:

a) Purchasing Power Par: The theory claims that the exchange rate between two countries’ currencies are equal to the ratio of their price levels. In addition, the Purchasing Power of a country’s currency is reflected in the country’s price level, the money price of a reference basket of goods and its services. This theory is built on the concept of arbitrage across goods markets and the law of one price. [8]

b) Monetary Model: Monetary School uses the monetary supply and the demand side to define the exchanges of exchange rates. This model is proposed based on the PPP. [11]

c) Interest Rate Parity Theory: Interest Rate Parity establishes the joint between the spot currency market and the forward currency market with foreign and domestic market. IRP is maintained by arbitrage.

d) Portfolio Balance Model: This theory model is an extension of montary school. This model proposed by Tobin asserts that people having different assets undertake different returns and risks should assess their returns and risks. They want to determine the optimal asset portfolio. This model also deems the expected returns of different financial assets existing in different countries as the primary factors which affect the exchange rate. The main factors which affect these expected returns are the interest rates of domestic, foreign financial assets and the expectation of exchange rate between domestic and foreign countries.

e) Balance of Payment Model: The balance of payment model deems that the equilibrium exchange rate should be the one that makes the surplus or the deficit of balance from the payment of the country equals to zero. If it does not, it will cause some change of the exchange rate [3].

Many practical exchange rate forecasting models are introduced in the past, e.g., balance of payment model [3], monetary model [11] and purchasing power parity model [8]. These models use a single structural model to find out which factors give the effects on the exchange rate. In recent years,
It is easy to observe that the forecasted daily exchange rate is quite close to the actual daily exchange rate. As shown in Table I, the MSE, MAE, and RMSE values of the forecasting result to the actual daily exchange rate are calculated based on the data in one year. The error between the forecasting results of our method to the actual exchange rates are quite small. We can find some vibrations on the forecasting results of our method to the actual exchange rate, as shown in Table I, the MSE, MAE, and RMSE values of the forecasting result to the actual daily exchange rate are calculated based on the data in one year. The error between the forecasting results of our method to the actual exchange rates are quite small. We can find some vibrations on the forecasting results in 2006 and 2007, the vibrations result in the drop of the forecasting accuracy. It is caused by the failure in finding the global optimum solution. However, it does not provide much turbulence for our proposed method.

VI. CONCLUSIONS

In this paper, we propose a new daily exchange rate forecasting method with IABC algorithm. IABC plays the role to construct the forecasting exchange rate by finding the optimum combination and weighting distribution from the past three trading day’s information. The experimental results indicate that our proposed method provides the forecasting result with high accuracy. Although the vibrations of the forecasting result sometimes appears, it still doesn’t cause much drop on the accuracy. The vibration may be overcame by increasing the population size or the iteration number. In the future, we plan to further use IABC to reduce the number of the referred factors. By doing so, the computational cost may be reduced.