Chapter VIII

Modeling and Prediction of Foreign Currency Exchange Markets

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Abstract

In today's global market economy, currency exchange rates play a vital role in national economy of the trading nations. In this chapter, we present an overview of neural network-based forecasting models for foreign currency exchange (forex) rates. To demonstrate the suitability of neural network in forex forecasting, a case study on the forex rates of six different currencies against the Australian dollar is presented. We used three different learning algorithms in this case study, and a comparison based on several performance metrics and trading profitability is provided. Future research direction for enhancement of neural network models is also discussed.

Introduction

In an era of increasing global competition and integrated economies, the forex rate has become one of the key factors for international trading and open economics. Exchange rates become important when a business or individual purchases goods or services produced in another country because the buyers require to pay the total cost using an appropriate currency demanded by the producer. So the buyers have to purchase other currency for running their businesses. Foreign currency traders make a profit through buying and selling currencies at different rates with fluctuating demands. In fact, the exchange rates play a crucial role in controlling the dynamics of the import-export markets. For example, if the Australian currency is weaker than the U.S. currency, the U.S. traders would prefer to import certain Australian goods, and the Australian producers and traders would find the U.S. as an attractive export market. On the other hand, if Australia is dependent on the U.S. for importing certain goods, it will then be too costly for the Australian consumers under the current exchange rates. In that case, Australia may look for a cheaper source that means shifting from the U.S. to a new import market. As we can imagine, the trade relation and the cost of export/import of goods is directly dependent on the currency exchange rate of the trading partners. Although the foreign exchange market has been estimated at a daily turnover of more than US$1 trillion (Gan & Ng, 1995), the exchange rates vary continuously during the trading hours. As a result, an accurate prediction of exchange rates is a crucial factor for the success of many businesses and financial institutions.

The risk associated with exchange rate fluctuations that puts companies and individuals into risks has increased substantially over the past decades. In particular, after the breakdown of the Bretton Woods Agreement in the early 1970s, the foreign currency market has become volatile. The market has experienced unprecedented growth over the last few decades, mainly due to floating exchange rates and a push towards further liberalization of trades through the General Agreement on Trade and Tariffs. At times, combined with other financial risks, the exchange rate market becomes so volatile that it contributes to leading the whole national economy into crisis which, for example, was evident in Mexico (1994), Southeast Asia (1997), Russia (1998), and Argentina (2002).

Due to the reasons as outlined earlier, significant efforts have been made over the years to predict foreign exchange rates in order to facilitate financial decision making and risk management. However, exchange rate behavior may exhibit complex characteristics that make it difficult to predict exchange rates within an acceptable accuracy limit (Chinn, 2003). This is illustrated by a recent comment by Alan Greenspan (2002): "There may be more forecasting of exchange rates, with less success, than almost any other economic variable." Furthermore, opposing views existed for years between practicing and academic communities about statistical properties of exchange rates. Practitioners believed exchange rates to have persistent trends while academics considered evidences supporting random walk hypothesis and efficient market hypothesis, which implies that rate changes are independent. The recent empirical studies have presented strong evidence that exchange rates are not independent of the past changes and dismissed the prevalent view in economic literature that exchange rates follow a random walk (Tenti, 1996). There is evidence that shows little support for linear dependence and exhibits the existence of

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