# THE APPLICATION OF ARTIFICIAL NEURAL NETWORKS TECHNIQUES TO THE PREDICTION OF RINGGIT EXCHANGE RATES

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## ABSTRACT (ENGLISH)

This research examines and analyzes the use of neural networks as a forecasting tool. Specifically a neural network's ability to predict future trends of foreign exchange rates is tested. Accuracy is compared against a traditional forecasting method, multiple linear regression analysis. Time series data and technical indicators are fed to neural nets to capture the underlying 'rules' of the movement in currency exchange rates. Three neural network models; Multi-layer Perceptron , Radial Basis Function and Recurrent neural networks forecast the exchange rates between Ringgit Malaysia and four other major currencies, Japanese Yen , Yuan, British Pound and Deutch Mark are desorbed . The four currencies were chosen because all the main volumes of operations on Forex are made with these currencies. Obtained results show that neural networks are able to give forecast with coefficient of multiple determinations. It was concluded that neural networks do have the capability to forecast financial markets and, if properly trained, the individual investor could benefit from the use of this forecasting tool.

## ABSTRACT (BAHASA MELAYU)

Kajian ini dijalankan bertujuan untuk mengkaji dan menganalisa kebolehan rangkaian neural buatan sebagai alat bantu untuk membuat ramalan. Khususnya menguji keupayaan rangkaian neural buatan didalam meramal tren masa depan pasaran tukaran matawang asing di Malaysia. Ketepatan ramalan dibandingkan dan diuji menggunakan kaedah ramalan secara traditional iaitu menggunakan *Multiple Linear Regression* (MLR). Data tukaran wang asing dan pembolehubah yang lain dimasukkan ke dalam rangkaian untuk dilatih dan untuk mendapatkan tren atau *'rules'* di dalam kadar tukarang wang asing. Tiga model rangkaian neural buatan yang digunakan di dalam kajian ini ialah; *Multi-layer perceptron, Radial basis finction* dan *Recurrent networks*. Model ini digunakan untuk meramal kadar tukaran Ringgit Malaysia (MYR) berbanding empat matawang asing utama iaitu Yuan (CHF), Deuscth Mark (DEM), British Pound (GBP) dan Japanese Yen (JPY100). Keempat-empat matawang ini dipilih kerana kepentingan dan sumbangan yang besar di dalam pasaran dagangan dunia. Keputusan yang diperolehi menunjukkan bahawa rangkaian neural buatan berupaya untuk meramal kadar tukaran matawang asing sehingga mencapai lebih 90 peratus ketepatan, jika dilatih secara teratur, pelabur-pelabur asing dan tempatan boleh menggunakan kaedah ini sebagai satu alat untuk meramal nilai hadapan tukaran matawang asing di dalam pasaran tukaran matawang asing.

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# CHAPTER 1

# INTRODUCTION

## 1.1 The Context of study

Foreign exchange rate is one of the important economic indexes in the international monetary markets. Since 1973, with the abandonment of the fixed foreign exchange rates and the implementation of the floating rate exchange rate system by industrialized countries, researchers have been striving for an explanation of the movement of exchange rate. Foreign exchange rates are affected by many highly correlated factors. These factors could be economic, political, and even psychological factors. The interaction of these factors is in a very complex fashion. Therefore to forecast the changes of foreign exchange rates is generally very difficult. Technical and fundamental analyses are the major forecasting methods which are popular in the financial area.

In addition, due to the classical time series forecasting method such as Box-Jenkins (Box and Jenkins, 1994) and the neural networks method is now widely used for financial forecasting (Kuan and Liu, 1994; Yao *et al.,* 1996; Giles *et al.,* 1997). Examples using neural networks in foreign exchange include Feed forward backpropagation networks are the most commonly used in variety of applications.

Theoretically, a neural network model that fits any kind of functions and data could be built (Yao *et al.*, 1996). The main consideration when building a suitable neural network for forecasting exchange rate is to make trade-off convergence and

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