

Foreign exchange forecasting by using artificial neural networks: A survey of literature

Soleh Ardiansyah¹, Mazlina Abdul Majid², Jasni Mohamad Zain³

^{1,2,3}Faculty of Computer Systems and Software Engineering, Gambang Kuantan, Malaysia
¹ardiansyah.soleh@gmail.com, ²mazlina@ump.edu.my, ³jasni@ump.edu.my

ABSTRACT: Foreign exchange (Forex) is the global scale trading of currency and the most liquid financial market. Therefore, predicting Forex has been challenged for many years. On the other hand, Artificial Neural Network (ANN) was widely used by researchers as a prediction technique since it can provide the best prediction result. This paper surveys recent literature in the domain of ANN which used to forecast foreign exchange. This paper classifies the literature based on forecasting model, input data type, forecasting intervals, and evaluation method. This paper reveals progressive applications in addition to existing gap and less considered area and determines the future work of researchers.

Key words: Neural networks, exchange rate, forecasting, time series

1. INTRODUCTION

Foreign exchange (Forex) is the global scale trading of currency and the most liquid financial market. Forex also a very risky market and governed by many factors such as political, correlated economies, supply and demand, and ever psychological factors.

Foreign exchange forecasting has been always the most challenging subject and area of research. On the other hand, artificial neural network (ANN) was widely used by researchers as a prediction technique since it can provide the best prediction result.

This paper surveys recent literature on last two decades in the domain of ANN which used to forecast foreign exchange. This paper classifies the literatures based on forecasting model, input data type, forecasting intervals, and evaluation method. This paper aims to provide a comprehensive overview of recent research in foreign exchange forecasting and to identify possible opportunities for future research works.

2. FORECASTING MODEL

An artificial neural network is an information processing system which its characteristics are same with biological nervous systems. There is a large number of predicting technique in literature which make the classification become difficult.

This paper divides the prediction model of literature into an ANN model, optimization and evolutionary ANN, hybrid ANN model with another technique, combine multiple ANN, and others (comparative analysis different models).

Figure 1 shows that variations of ANN model and optimization and evolutionary ANN are very popular in recent literature since ANN provides better performance and result on forecasting [2-2,7,12,46]. There is a clear trend among researchers to use conventional ANN models and improve them with the others training algorithm or combine ANN with emerging techniques into hybrid systems. Researcher found that the performance of hybrid technique gives better results than single techniques [1,6,8-9,11,13,24,48]

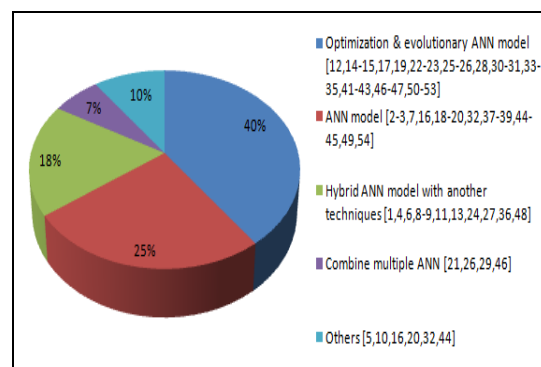


Fig. 1. Surveyed literatures classified by forecasting model.

3. INPUT DATA TYPE

A neural network can be used to find complex relationship between data. Usually amount of data that has some unknown relationship between input and output. A neural network can be used to find that unknown relationship and then compute the output for similar (but usually different). Therefore, selecting the right input data variable is very important for ANN. This paper divides the input data types of literature into technical indicators, exchange rates, fundamental indicators and others (different data type or undefined).

Figure 2 shows over 80% of researchers use currency exchange rates as an input data type and contain of high-low-close-volume price of currency pairs.

The technical indicators which commonly used in the literatures are Moving Average (MA), Simple Moving Average (SMA), Stochastics, Momentum, Relative Strength Index (RSI) William%R, Moving Average Convergence Divergence (MACD), and Directional Movement Index (DMI).

The most common fundamental indicators which used in the literature are interest rates, Gross Domestic Product (GDP), purchasing power, monetary approach, balance of international payment (export and import), inflation rates, quarterly trade balance number and Customer Price Index (CPI).

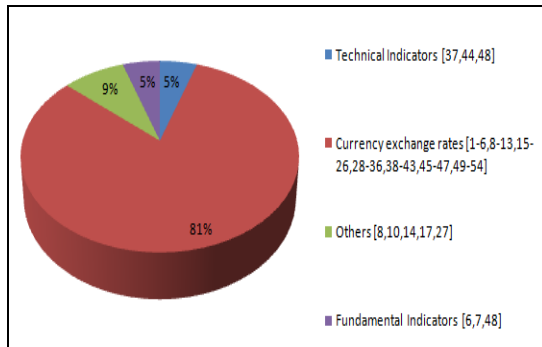


Fig. 2. Surveyed literatures classified by input data types

4. FORECASTING INTERVALS

The forecasting interval indicates how demand transactions are accumulated into time series for forecasting. The forecasting intervals are equally important in order to capture the market behavior of the forex. This section gives an overview of type of forecasting intervals which used in the literature.

This paper categorizes the forecasting intervals into hourly, daily, weekly, monthly, and others (different forecast interval or not defined).

Figure 3 shows that mostly researcher used daily forecasting interval since the daily forecasting intervals can represent the market behavior and it gives more accurate prediction results.

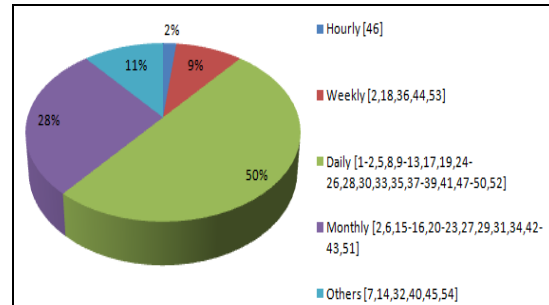


Fig. 3. Surveyed literatures classified by forecasting interval

5. VALIDATION AND EVALUATION

This section gives an overview of evaluation and validation method which used in the literatures. The evaluation methods as a benchmark model is needed in order to assess the feasibility and effectiveness of forecasting models.

This paper categorized the evaluation and validation method into statistical techniques, trend (buy and sell), other techniques (perform comparative studies of multiple evaluation model or not defined), and no benchmark [55].

Figure 4 shows that the statistical techniques were widely used by researchers as an evaluation method. Statistical techniques used to drawing conclusions from data sets arising from systems affected by random variation, such as observational error and random sampling.

The finding shows that over 85% of their forecasting model provide the best result and outperform the traditional model.

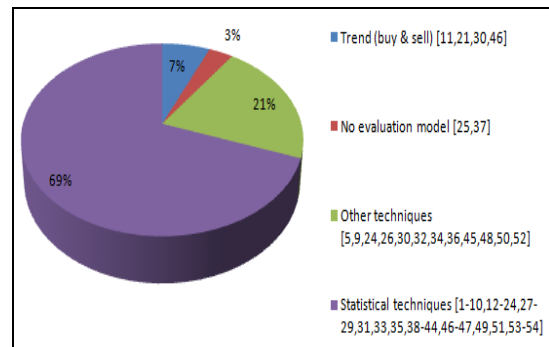


Fig. 4. Surveyed literatures classified by evaluation method

6. CONCLUSION

This paper surveys recent literature in the domain of ANN which used to forecast foreign exchange. The publication is categorized according to the ANN methodology used, the forecasting intervals, the variable used, and the evaluation and validation method.

For the forecasting model there is a clear trend to use conventional ANN models and improve them with the others training algorithm or combine ANN with emerging techniques into hybrid systems. Over 80% of researchers used currency exchange rates as input data types to forecast foreign exchange rates and mostly they used daily forecasting interval in order to capture the behavior of the forex.

The statistical techniques have been identified as the most popular evaluation method. This paper aims to provide a comprehensive overview of recent research in foreign exchange forecasting and to identify possible opportunities for future research works

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