CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

In this chapter, the research methodology used for each case studies is briefly discussed in the following sequence: the research framework, multi-layer perceptron neural network forecasting model, rule extraction from multi-layer perceptron neural network by using decision tree, data collection, data analysis and pre-processing, and performance measurement. The conclusions that can be made as a result of using this methodology are discussed at the end of the chapter.

3.2 RESEARCH FRAMEWORKS

In this research, there are several phases which are literature study, logical design, implementation, training and testing, and analysis. The result on every phase in this methodology will be divided into several steps that can be achieved in a suitable time frame. During the literature study phase, this study review on foreign exchange rate, current issue or enhancement of artificial neural network and decision tree, the combination model, data collection and analysis.

The framework of the forecasting model will be designed during the logical design phase. After that, we will build the multi-layer perceptron (MLP) neural network forecasting model based on the framework design. During the implementation phase, the algorithm will be applied into programs. All the developments will use appropriate programming techniques and development tools. Next, the model will be trained and tested using foreign exchange datasets until it can be well function. The result will be
analysed and the report can be produced. If not, the logical design will be revised and follow with the implementation. The research framework is summarized in flowchart, see Figure 3.1.
3.3 DATASET DESCRIPTION

3.3.1 Data Collection

When collecting the data for chosen variable, we must consider the cost and availability of the data. The technical data is readily available from many vendors at a reasonable cost whereas fundamental data is more difficult to obtain. This study used technical data of foreign currency exchange rates which obtain from *Meta Trader* software. *Meta Trader* (latest version is MT5) is an electronic trading platform widely used by online retail foreign exchange speculative trader. It was developed by *Meta Quotes Software* and licensed to foreign exchange brokers who provide the software to their clients. The software consists of both a client and server component. The server component is run by the broker and the client software is provided to the broker’s customers, which use it to see live streaming prices, charts and to place orders as well as manage their account.

Even the data provider have a reputation of providing high quality data, all the data must be checked for error by examining day to day changes, range, logical consistency, and missing observation. This study used daily time series data of foreign currency exchange rates of European Euro (EUR), British Pound sterling (GBP), and Japanese Yen (JPY) against US Dollars (USD). The goal of forecasting model is to predict the next day of the currency exchange rates. The period of the data that being used is from January 2000 to December 2012 daily exchange rates.

3.3.2 Data Pre-processing

Data pre-processing refers to analysing and transforming the input and output variables to minimize the noise, highlight important relationships, and detect the trend of the data. Since ANN uses pattern matching, the representation of the data is critical in designing a successful network. The input and the output variables for which the data was collected are rarely fed into the network in raw form. The raw data must be scaled into the transfer function ranges which usually between 0 to 1 or -1 to 1, starting from