CHAPTER 1

INTRODUCTION

Trade decisions on a stock market are made on the basis of predicting the trend which it is driven by many direct and indirect factors. Effective decisions depend on accurate prediction. Even though there have been many empirical researches which deal with the issue of predicting stock price index; most empirical findings are associated with the developed financial markets. There are few researches exist in the literature to predict the direct of stock price index movement in emerging markets, especially in Indonesian Stock exchange. Accurate predictions of movement of stock price indexes are very important for developing effective market trading strategies (Leung et al. 2000) the stock market is essentially dynamic, nonlinear, complicated, nonparametric, and chaotic in nature (Abu-Mostafa & Atiya 1996). In addition, stock market is affected by many macro economical factors such as political events, firms' policies, general economic conditions, investors' expectations, institutional investors' choices, movement of other stock market, and psychology of investors etc. (Tan et al. 2007).

So far, there are many techniques are applied to predict the market in order to maximize profit and minimize risks, it can be categorized into four groups; these techniques are included fundamental analysis, technical analysis, time series analysis, and machine learning. The results from these techniques is different, for example the fundamental analysis is used to define models which

calculate the future price according to current indicators such as the gross domestic product (GDP), consumer price index, interest rate and exchange rate; the technical analysis is used for forecast the future price direction by studying past market data - primarily stock price and volume. The technical analysis basically use trading rules such as single moving trend, composite moving trend, and channel breakout. However, these techniques don't have ability to learn nonlinear variables as artificial intelligent (IA) approach does.

Artificial neural network (ANN) technique is one of data mining techniques that is gaining increasing acceptance in the business area due to its ability to learn and detect relationship among nonlinear variables. Also, it allows deeper analysis of larger set of data especially those that have the tendency to fluctuate within a short of period of time. If stock market return fluctuations are affected by their recent historic behaviour, neural networks which can model such temporal stock market changes can prove to be better predictors (Tang et al. 1991). The elasticity and adaptability advantages of the artificial neural network models have attracted the interest of many other researchers (Adebiyi Ayodele A. et al 2012). Since the last decade, the artificial neural network models have been used extensively in various branches such as computer science, engineering, medical and criminal diagnostics, biological investigation, analysing the business data, and econometric analysis research. Also they can be used for analysing relations among economic and financial phenomena, forecasting, data filtration,

generating financial time-series, and optimization (Shachmurove & Witkowska 2000).

Why neural network is best for prediction? Because there are several distinguished features that propound the use of neural network as a preferred tool over other traditional models of prediction. Artificial neural networks are nonlinear in nature and where most of the natural real world systems are non linear in nature, artificial neural networks are preferred over the traditional linear models. This is because the linear models generally fail to understand the data pattern and analyse when the underlying system is a nonlinear one. ANNs are data driven models. It has ability to discover nonlinear relationship in the input data set without a priori assumption of the knowledge of relation between the input and the output. The input variables are mapped to the output variables by squashing or transforming by a special function known as activation function. They independently learn the relationship inherent in the variables from a set of labelled training example and therefore involves in modification of the network parameters (Soni 2011).

It is of interest to study the extent of stock price index movement predictability using data from emerging markets such as of the Indonesia stock market. This emerging market's performance is incredible for a long period of time. For example, in December 2002, composite index stand at 424.495 points, it was rapidly upwards to 2,745.826 at the end of 2007 and then decreased to 1,135.408 at the end of 2008 (-50.64%) due to the impact of global financial crisis and upwards again at the beginning of 2009 until

November 2012, it reached 4,317. 277 points and 4,985.58 points on May 28, 2014. On an average day, transactions worth of between IDR 5 to 6 trillion (US $520 million to US $620 million), and it has an average daily volume of about six billion shares. In 2012, foreign investors purchased assets in the Indonesian capital markets totaled IDR 19.55 trillion (about US $2 billion). In the period of January to March in 2013, net foreign purchases already stood at IDR 18.5 trillion nearly 100% increase comparing to the previous year, which shows the attractiveness of these markets (David 2013). Market capitalization has increased 412% from IDR 801 trillion in 2005 to IDR 4,099.34 trillion - November 2012. In term of trade value, showed a significant increased after 2006 (US$ 49.4 billion) to US$114.9 billion in 2007 and quite stable since then i.e. eleven months of 2012 totaled of US$104.6 billion.

There are very little previous researches exist (accessible) in related to stock price prediction by using ANN techniques at IDX, such as Putra and Kosala (2011) used ANN to predict intraday trading signals and Veri and Baba (2013) forecasting the next closing price.

As we understand the characteristic that all stock markets, including IDX, have in common is the uncertainty, which is related with their short and long-term future state. This feature is undesirable for the investor but it is also unavoidable whenever the stock market is selected as the investment tool. The best that one can do is to try to reduce this uncertainty. In this research ANN model is proposed to forecast the movement of stock price in the daily IDX Index.

1.1. Problem Identification

How to forecast the stock price index? The stock market index direction prediction is regarded as one of the crucial issues in recent financial analysis studies (Wang & Choi 2013). Many techniques are employed to predict stock prices in the stock markets but the past results are being questioned. Generally, there are three schools of thought in terms of the ability to profit from the equity market. The first school believes that no investor can achieve above average trading advantages based on the historical and present information. The major theories include the Random Walk Hypothesis and the Efficient Market Hypothesis (Peters 1991). The Random Walk Hypothesis states that prices on the stock market wander in a purely random and unpredictable way. Each price change occurs without any influence by past prices. The Efficient Market Hypothesis states that the markets fully reflect all of the freely available information and prices are adjusted fully and immediately once new information becomes available. If this is true then there should not be any benefit for prediction, because the market will react and compensate for any action made from these available information. The second school's view is the so-called fundamental analysis. It looks in depth at the financial conditions and operating results of a specific company and the underlying behavior of its common stock. The value of a stock is established by analysing the fundamental information associated with the company such as accounting, competition, and management. The fundamental factors are overshadowed by the speculators trading.

Technical analysis assumes that the stock market moves in trends and these trends can be captured and used for forecasting. Technical analysis belongs to the third school of thought. It attempts to use past stock price and volume information to predict future price movements The technical analyst believes that there are recurring patterns in the market behavior that are predictable. In fact, there is not any research proved the existing of such patterns due to each stock market has different characteristics, depending on the economies they are related to, and varying from time to time. Most of the techniques used by technical analysts have not been shown to be statistically valid and many lack a rational explanation for their use. However, technical analysis has its value on forecasting.

Artificial Neural Networks are regarded by many as one of the more suitable techniques for stock market forecasting (Yao & Tan 2001). It has been demonstrated to be an effective technique for capturing dynamic non-linear relationships in stock markets, while technical analysis techniques unable to do so.

1.2. Objective of the Research

The core objective of this research is to forecast the direction of movement in the daily JKSE or IDX using artificial neural network, also to compare a financial performance model and statistical model of ANN on its precision of stock price prediction. At the same times, its empirical result will be comparing with some recently researcher's works in this market that used ANN models. Also, this research will seek to prove against a validity of the

Efficient Market Hypothesis and the Random Walk Hypothesis for short-term trading advantages in this stock market, which is considered as one of the most important emerging markets in Asia.

1.3. Contribution of the Research

Recently, a number of researchers have explored artificial intelligence techniques such as ANNs to solve financial problems significantly increased, but most has targeted the United States market (Suchira Chaigusin, 2011). There have been limited attempts to research stock markets of developing economies such as Indonesia. At the beginning of this research, the author find that there are some previous research using intelligent approach in this market, but there are not many existing research using artificial neural network technique, specifically, to predict the index movements of the JKSE.

The major contributions of this study are to demonstrate and verify the predictability of stock price index direction using the financial and statistical performances of ANN model. It also benefit to other researchers/students who are interested in studying stock market price movement with ANN model.

This study is one step along the path towards applying ANN to the IDX in order to clarify and predict stock performances. Enhancing the use of ANN in financial areas and contributing incrementally to the growing knowledge base of this financial forecasting field.

1.4. Scope of the Research

As there are many ANN research techniques were used to predict stock price movement index mentioned in 1.1; some of recently research are using international market indicators, technical & fundamental indicators as inputs which it's called "hybrid". But some try to combined a lot of indicators as input variable. However, the research finding indicated that many indicators/ or higher number of input variables is not mean such forecasting technique (model) will give a result more accuracy.

In this research, we will attempt to forecast daily stock price movement at JKSE, using financial performance and statistical performance evaluations of ANN models. The data collection with total period of 9 years and 5 months, starting from January 3, 2005 to May 28, 2014. The reason we start from 2005 because the index prices at the beginning 2005 reached RP1.000 and has dramatically increased until the end of 2007 and then in the direction of decrease. At the beginning of 2009 index prices had in the direction of increased again. So, we would like to see how ANN model perform in the different period and direction. The data be divided into two separate sets, a period of January 3, 2005 to December 30, 2010 is for network training purposes. From January 3, 2005 to May 28, 2014 is for testing the predictive ability of the network. A three-layered feed-forward ANN model will be constructed (see Figure. 2). This ANN model consists of an input layer, a hidden layer and an output layer, each of which is connected to the other. Inputs for the network are twelve technical indicators which are represented by twelve neurons in the input layer (see table 2).

The forecasting ability of the ANN model is accessed by using back-propagation neural network of errors such as MAE, RMSE, MAPE, and R^2, to improve their prediction performances two comprehensive parameter setting experiments for both technical indicators and the levels of the index in the market are performed. The logistic sigmoid transfer function will be used in neural network; this function converts an input value to an output ranging from 0 to 1 (see 2.3). If the connection weight is negative or (value < 0) then tomorrow close price value < than today's price (loss). If the value is positive (value > 0.5) then tomorrow close price value > than today's price (profit). As we want to see the direction of movement decrease or increase so the output will be categorized as 0 and 1. Therefore, if the forecasting value smaller than 0.5 it will be categorized as decreased direction.

Published stock data will be collected from Yahoo.Finance especially daily closing price, daily high price, and daily low price of total price index.

1.5. Organization of the Thesis

This thesis is composed of six Chapters. The remaining portion of the thesis is broken up into the following Chapters: Chapter 2 describes Artificial Neural Network and related literature. Chapter 3 describes the research methodology which includes ANN modeling, research data and technical input variables. In Chapter 4 descriptive statistics are used simply to describe the sample. Chapter 5 the empirical results are summarized and discussed. Chapter 6 brief conclusion with some suggestions for the future work on the field of stock market prediction