CHAPTER 1
INTRODUCTION

1.1 Background

One of the most important creations of our society is the financial system, in which markets and institutions trade bonds, stocks and other forms of financial instrument. It enables movement of funds from those who save funds to those who need funds, e.g. for investment, buying goods or services. Madura (2008) points out that fund suppliers, often referred to as investors; must earn a certain amount of return as an incentive to ensure the continuity of fund supply to the financial markets.

As the financial industry grows, investors are developing trading techniques to maximize their returns. They do it by forecasting the movement of the securities which they are holding or those which they are interested in. Traditional forecasting techniques include regression analysis, time-series analysis and moving averages. Kosala and Kumaradjaja (2008) concluded that adaptation of machine learning algorithms is a promising platform for decision making in the financial market.

Turban and Trippi (1996) proposed the use of the Artificial Neural Networks (ANN) as an alternative computing technology. ANN is inspired by studies of

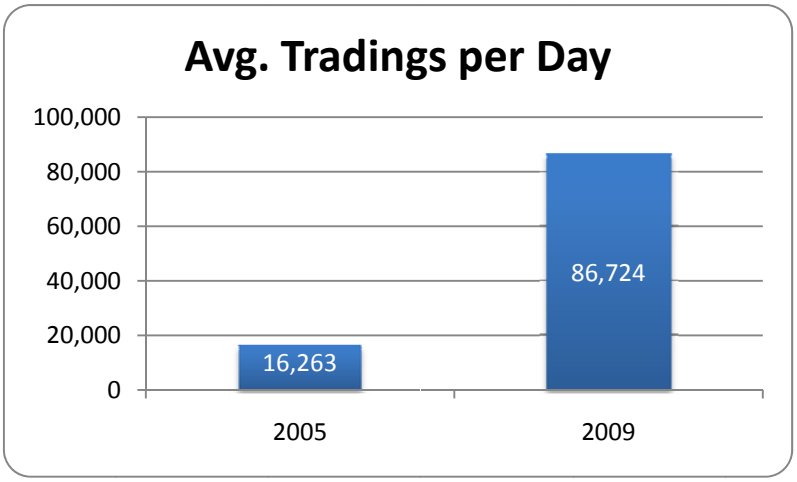
how the nervous system and the brain work. It is an adaptation of machine learning in a way that the model can adjust for a change in data input or the environment. Advances in the computer processing power have helped the field to gain pace and see its applications in various research fields, and even into the financial researches.

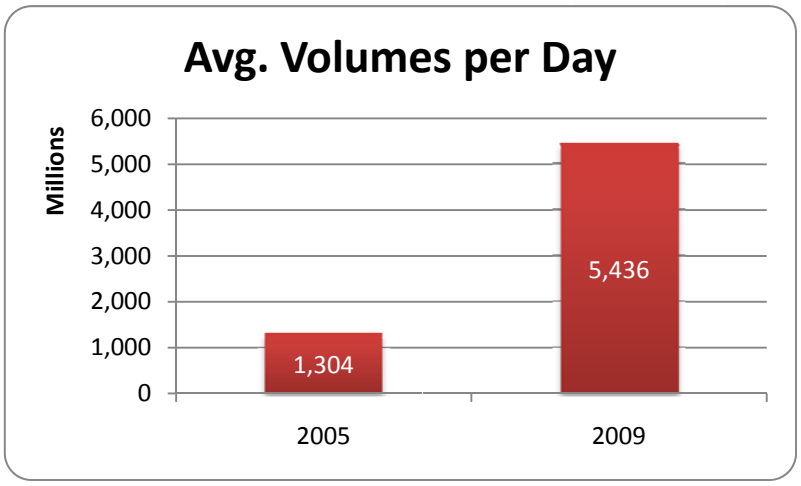
Kosala and Kusumadjaja (2008) separate forecasting methods as regression (predicting numbers) or classification (predicting the class). Studies in forecasting methods using regression commonly use ANN, in which the system tries to predict the next value of time series. While classification is more often be constructed using algorithms for evolving trading rules. The output for this system is decision to act, e.g. whether to buy, hold or sell the chosen securities.

Dempster (2001) finds that studies on financial research are mostly limited to daily data. However, as the numbers of intra-day transactions grow in a staggering pace over the past few years, there is a big gap of un-researched area of high frequency intra-day data. High frequency data in finance can be described as trading data which is recorded with higher frequency than the usual records of daily open, high, low, and closing prices.

In his book, Durbin (2010, pp vi-vii) points out that from 2005 to 2009, the average daily volume of the New York Stock Exchange (NYSE) doubles, the average daily trades grows by ten folds, but the average trade size gets smaller

by almost one third. Similar behaviors are also showing in the Indonesia Stock Market (IDX). The regular market trading frequency grows by over five times from 2005-2009, the volume goes up by more than four folds, but the average trading size of 2009 gets four-fifth smaller than those of 2005.





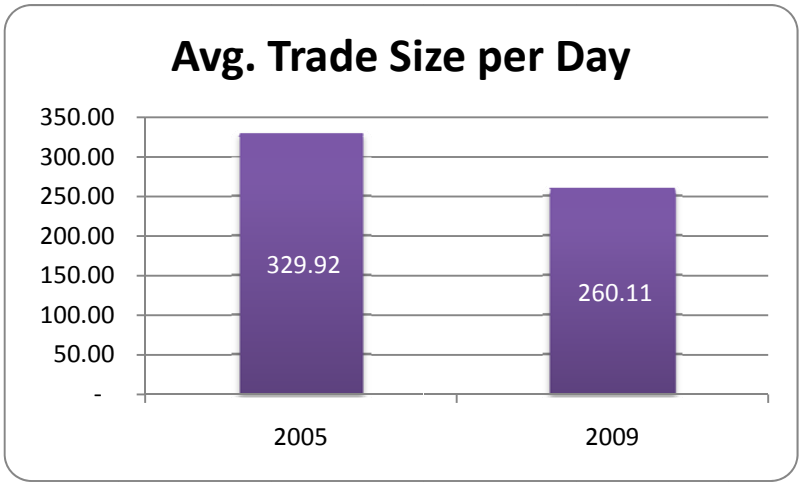


Figure 1.1 IDX Trading Statistics

This phenomenon suggests that investor is moving towards quick small sized intra-day trading to pocket quick profits as the market moves during the day. Hence, the importance of studying intra-day data become obvious as clearly the market is suggesting this is the trading style they like.

Intra-day traders mainly use technical analysis (TA), in which the decision is made by studying patterns created by the previous trading prices. In his popular book, Pring (2001) summarizes TA as an art to identify changes in trends as early as possible, and to hold to the trading position until it is evident that the trends has reversed. Technical analyst may switch between TA and other methods, whichever is they this provides the strongest signal to enter or exit a trade.

Hence, this research would focus on studying the performance of ANN in predicting trading signals, whether to buy, hold or sell the respective stock, by feeding in trading signals of popular technical indicators from IDX high frequency data. The methodology used in this research is a combination of high-frequency data usage proposed by Tsang and Jaramillo (2004), with the selection of popular technical indicators and the trading signals used by Dempster et al (2001) in their research.

1.2 Problem with Current Method

Forecasting is one of key activities in the financial world. Researchers and analysts constantly trying to figure how does the variables work dependently (or in-dependantly) between one another, and what would be the best model to predict their behavior. The most commonly used methods are regression models. However, be it linear or non-linear regression forecasting, Carvarhal (2007) notes that most of the applications in finance still yield a linear relations between the variables. Even the auto-regressive conditional heteroskedascity (ARCH) model, which allow for non-linear variance, still give an expected return which is a linear function of the lags of the returns.

Moreover, the Indonesia Stock Exchange (IDX) has not been exhaustively researched. It is especially true with high frequency intra-day trading data research methods, and the application of non linear forecasting methods such as

the ANN. Current studies mainly focused on the companies' financial reports, and the market's daily prices, which are fine for certain research purposes, but will not be beneficial to active portfolio managers and intra-day traders.

1.3 Aims and Benefits

The ANN approach has some benefits over the traditional statistical approach because as Tsang (2004) summarizes; it learns, it helps translating data into knowledge, it adapts to changes in the environment and it handles incomplete or incorrect data without affecting the performance of the model.

Carvalhal (2007) also points out that the ANN is a non-parametric modeling technique which often used to forecast nonlinear behavior common in the finance field. It does not need any prior knowledge on the functional form of the relation between the variables. Hence, it is a robust and adaptable platform because it does not rely on any assumption on the inputs and can adapt to dynamic changes in the process.

The purpose of this thesis is to study the performance of ANN when applied to popular technical indicators from high-frequency data to predict stock trading signals. The model would pursue trading signal outputs which result in the highest possible return from intra-day trading. The stocks chosen would be representatives of each 9 sectors in the IDX, with emphasize on the market

capitalization and trading frequency. Stocks with big capitalization are chosen as it will have greater impact on the performance of one's portfolio, and also because those stock are usually very liquid and actively traded intra-day.

1.4 Hypothesis

By using a high-frequency data to generate popular technical indicators, and feed the data ANN model, the author expects to have a better agent to predict the intra-day trading signals with consideration to maximize profits. This model would be an invaluable tool for active portfolio managers and intra-day traders to decide whether they should take a long or short position, or to sit back and hold the instrument.

The result of the ANN model will be compared to a standard benchmark of a Naïve buy-and-hold strategy, and a maximum possible return which always 'win' the trades.

1.5 Scope of Study

This research will focus on high frequency data intra-day trading data in the IDX during the period of January to April 2010. The first three months will be treated as training data, followed with a one month testing to check the performance of the model.

1.5.1 Assumptions

The model on this research is built with assumptions that the system is connected to the IDX trading system, in such ways that it can receive streaming of the trading data which are being done into spread sheet, and can inject trading signals output to immediately take actions according to the signal. It means that every trading signal outputs from the model would be instantly executed. It will also assume that there is always counterparty at the other end of the table to close the deal.

1.5.2 Constraints

Due to the limitation on the source data, the ANN model would not take into account the bid-offer price and the transaction cost. The model is built to achieve the highest possible return from intra-day trading with holding period of maximum 5 sessions. The performance of the model will only be determined by comparing the final return with benchmarks without taking into account other factors such as market risks, standard deviation of the model, etc.