

CHAPTER I

INTRODUCTION

A. Background of Research Study

The best plan that creates is belong to their future. A successful businessperson, investor, institute or organization should have the necessary plans by forecasting the future situation. A large set of forecasts of future economic is usually obtained and then got this discard the other forecasts. Decision makers try to discover that is the best forecasts. Even though, the discarded forecasts may have some independent valuable information and including them in the forecasting process may provide more result that is correct. When multiple forecasts are obtained from different models or sources are possible to mix these in order to make state of all available information on the variable to imply a result and to possibly make better forecasts. Timmermann (2005) had written that multiple forecasts of the same variable are often available to decision-making. This could reflect differences in forecasts' subjective judgments due to heterogeneity in their information, which sets in the presence of private information or due to differences in modeling approaches. Advocates of rational expectations have often emphasized for the economy to act in a fashion that is roughly harmonious with rational expectations. Nowadays, because of different fields of human sciences try to work on forecasting, such as forecasting atmosphere situation, economic situation of communities, the earnings and expenditures of an institution, a country's budget and the forecast of companies' stock price (Salehi, Khodadadi, and Abdolkhani, 2011). All that is made necessary for agents to notice the forecasts of a several number of professionals. Those professionals are motivated to make rational unbiased forecasts. Supplementing point forecasts with some measure of uncertainty, however, can increase the value of the forecasts. For example, interval forecasts are reflected significance on part of the communication from central banks to the public and to decision-making process on

financial asset allocation. Most of applications can be interesting on macroeconomic data, but small amount of evidence there is with financial data. Following Billio et al. (2011a), we can put to practical use a general combination approach based on a Bayesian state space description of the combination scheme. Since, the theories and application of combining forecasts have become important and interested area in forecasting. The combined forecast is a forecasting method that mixes several different forecasting models in an appropriate way. The main purpose of combining forecast is to better use the useful information provided by different forecasting models in order to improve the forecast accuracy. Moreover, in the combination model, the weights follow logistic autoregressive processes change over time, and their dynamics can be driven by the past forecasting manner of function. In the latter case, two forecasters maybe come in different situation to keep in existence indentifying their forecasting models, for example, constant versus time-varying parameters, linear versus non-linear forecasting models, etc. Forecast combinations have been successfully used in empirical work in such diverse areas as prices, meteorological data, city populations, and outcome of football games, wilderness area use, check volume and political risk (Clemen, 1989).

Each year, Wilmington Trust's Investment Strategy Team (IST) undertakes a multi-year forecast of financial market performance. In preparing the forecast, the IST is concerned primarily with valuations. Its implicit approach is the idea that extreme evaluations tend to revert, over extended periods, toward long-term, historical averages. The allocated recommendations in making tactical asset, the IST considers not only its impressions about valuations and forecasts for longer-term market performance, but it also considers shorter-term trends in securities prices. Ultimately, its tactical recommendations reflect on collective judgments and expectations of team members. The IST aims to deliver higher-than-benchmark total returns for investors with varying appetites for risk (Wilmington, 2011). Then, the forecasted capital markets provides an opportunity, at least once a year, to assess light

of recent market action, which has further confirmed it, including the currently all-important, incipient aftershock double double-dip in business cycle. It would be inappropriate to say what “all investors” should do in light of forecasts. That said, some themes in the forecast suggest actions that may benefit for many investors. Investors identify investment strategies and opportunities that are suitable in light of their circumstances, including their time horizons, financial resources, and risk tolerance. Everyone with a new prediction method wants to try it out on returns from a speculative asset, such as stock market prices, rather than series are known to be forecast-able (Timmermann and Granger, 2004). By the way, Mohsen et al. (2010) had commented that stock markets are affected by many highly interrelated economic, political, and sentimental factors, which often interact one another in very complex manner. As such, it has always been very difficult to forecast the movement of stock price and market indices. Nowadays, investing in stock is an important part of society and economy, in the other hand, stock price volatility in all stock exchanges is commonplace. That why, the stock price prediction for capitalists is very important to be able to return most of their investment will earn (Hassan, Beitollah and Saeed, 2011).

The generalized forecast with cost functions and forecast combination are increasing evidence and opened up a completely new sub-field in forecasting. A good forecasting model is a critical importance to investors for forming their portfolio decisions and to governments or business leaders for decision-making policy. Often there are a number of predictors for a variable of interest. They are full of their thoughts on where more research was needed, and their ideas are on how research could be developed. For example, Stock and Watson (2003a) had found that for predicting output growth in seven countries forecast combinations generally perform better than forecasts based on single models. However, several alternative combination schemes were available and not clear which was the best scheme, either in frequent or in Bayesian framework. Bayesian interpretations had been presented.

The results have been virtually unanimous: combining multiple forecasts leads to increased forecast accuracy. This had been result whether forecasts were judgmental or statistical, econometric or extrapolation. Furthermore, in many cases one can make dramatically improvement performance in simply averaging forecast. Simple combinations often give better performance than more sophisticated approaches. They are defined that combinations with model weights that do not involve unknown parameters to be estimated; arithmetic averages constitute a simple example. Complex combinations are defined as combinations that rely on estimating weights. They depend on full variance-covariance matrix and possibly allow for time varying model weights. Indeed, parameter, model and weight uncertainty are taken into account in the combination scheme. For illustrative purpose, we provide an application to forecast in the Indonesian Stock Exchange (IDX) Market.

The Index is denominated in Indonesia rupiah (IDR) and published throughout the trading hours of the IDX (www.idx.co.id), as a proxy of stock price is stock price index as representative. The most widely quoted stock price index has been supplemented by other popular indices that are constructed in a different way and fewer poses of problems as a measure of stock prices. At present, several companies report numbers of stock price indices that we will consider in this paper. Stock price indices differ according to the number and characteristics of stocks included in index, as well as given weights to each stock. Furthermore, Forecasting stock exchange index is an interesting and challenging issue for both investors and academics (Phaisarn and Wichian, 2010).

Indonesia Stock Exchange (IDX) or in Indonesian Bursa Efek Indonesia (BEI) is a stock exchange based in Jakarta, Indonesia. The Jakarta Composite Index (JCI or in Indonesian language as *Indeks Harga Saham Gabungan* (IHSG) and index is \wedge JKSE), the main price indicator at the Indonesian Stock Exchange (IDX), is confident investors pumped more funds into the local stock market. It is an index of all stocks which trade on the Indonesia Stock Exchange (formerly known as Jakarta

Stock Exchange). It was previously known as Jakarta Stock Exchange (JSX) before its name changed in 2007 after merging with Surabaya Stock Exchange (SSX). It is Indonesian share prices. It is closed higher on Friday, with the main index breaking the psychological barrier of 4,000 for the first time ever amid improved investor confidence in the global market. Here are some historical IDX which had transaction in several annual reports in 2004 to 2010. Annual report IDX (2004:9) had showed that market capitalization rose 48% to Rp 679.9 trillion in 2004, from Rp 460.4 trillion in 2003. At end of 2005, it extended upward 17.84% to Rp 801.253 trillion compare to 2004 (Annual report IDX 2005:14). In 2006 for instance, reached Rp 1,249.07 trillion, increasing 55.89% if we made comparison last year (Annual report IDX 2006:51). It rose 103.84% to Rp 2,546.13 trillion in 2007 from examining in 2006 (Annual report IDX 2007:27). Market capitalization had complex to estimate and predict in 2007 to 2008 because in that time Indonesia and other countries in the world had met financial crisis. It is easy to descript it; we try to say different way in quarter. In the first quarter of 2008, investors' optimism began to increase as the average daily stock transaction value reached Rp 5.57 trillion or grew as much as 119.27% compared to the first quarter of 2007. Venturing into the second quarter of 2008, the average daily stock transaction value, reached Rp 5.72 trillion or increased 33.03% compared to the second quarter of 2007. On the other side, the Composite Index declined 14.45% from the level of 2,349.105 achieved in early 2008 and Bank Indonesia's benchmark rate started to crawl up to a level of 8.50%. By the third quarter of 2008, the financial crisis that occur in US since the end of 2007 has worsen and affected not only the economic condition in the US, but also worldwide. The effects began with the collapse of one of the leading investment banks in the US, decline in the Dow Jones index, global oil price fluctuation, and high inflation, which subsequently led to a global economic slowdown. In Indonesia, the crisis affected the Rupiah's exchange rate against the US Dollar that weakened to the level of Rp 9,416. The benchmark rate of Bank Indonesia also rose to 9.25%, while the Exchange's average daily stock transaction value decreased 9.46% to Rp 3.82 trillion from Rp

4.22 trillion in the third quarter of 2007 and the Composite Index fell 33.26% compared to that in the early 2007 to a level of 1,832.507. Thus, year 2008 ended with lower global as well as Indonesia's economic indicators compared to that achieved in 2007. The Composite Index was closed lower by as much as 50.64% to a level of 1,355.408 by the end of 2008 while, at the same time, the Rupiah's exchange rate against the US Dollar closed at a level of Rp 10,950 and Bank Indonesia's benchmark rate remained at a level of 9.25%. Despite this, the Exchange's average daily stock transaction value in 2008 reached Rp 4.43 trillion or 3.90% higher compared to Rp 4.27 trillion within the same period in 2007. By the end of 2008, it registered Net Income of Rp232.44 billion or 24.46% lower compared to that achieved in 2007 of Rp307.70 billion (Annual report IDX 2008:27-28). In line with the foregoing developments, stock market capitalization soared 87.59% from Rp 1,076.49 trillion to Rp 2,019.38 trillion. The market capitalization of Government Securities rose 10.66% from Rp525.69 trillion to Rp581.75 trillion, while the market capitalization of Corporate Bonds saw a 21.76% increase from Rp73.01 trillion to Rp88.90 trillion. In 2009, the average daily stock transaction value, reached Rp 4.05 trillion, 8.0% above the revised target of Rp 3.75 trillion and 47.3% above the original target at the beginning of the year. This value is 8.78% below the average daily stock transaction value in 2008 worth Rp 4.44 trillion. The average daily trading frequency in 2009 was 87,040 times, a 55.69% increase from that of 2008 with an average of 55,905 times. Total funds accumulated by Listed Companies in 2009 amounted to Rp14.91 trillion, consisting of Rp3.85 trillion worth of initial public offering (13 new Listed Companies), Rp 8.56 trillion in rights issuance (11 Listed Companies) and Rp2.50 trillion in warrants exercise (31 Listed Companies), (Annual report IDX 2009:21-22). During 2010, the IDX performance has shown positive results across the board. The Jakarta Composite Index (JCI) has increased significantly followed by an increase in market capitalization. JCI rose from the level 2,534.356 at the end of 2009 to 3,703.512 at the end of 2010, a 46.13% increase. The value of stock market capitalization at the end of December 2010 reached Rp3,247.1

trillion, an increase of 60.80% over the previous year. The average daily transaction value of shares in 2010 increased by 18.52%, to Rp4.80 trillion compared to 2009, which amounted to Rp4.05 trillion. Average daily frequency share transactions in 2010 reached 105,790, an increase of 21.54% over the previous year, which only registered an average of 87,040 transactions (Annual report IDX 2010:27).

This research is using Bayesian methods, either to do Bayesian model averaging (BMA) or to automate the model selection process. Bayesian Model Averaging is one of the most common established methods. This latter distribution is essentially a weighted average of the posterior distributions of two models and is similar to the result of a Bayesian Model Averaging procedure. See Hoeting et al. (1999) had give opinion on BMA with an historical perspective. BMA provides a probability to any individual models and combines them to get point and concentrate forecasts. Raftery et al. (2005), Montgomery and Nyhan (2010) had generally mention on BMA framework by presentation method for getting arguments forecasts from ensembles in the predictive form. Although, unpredictable parameter and model are taken into account, the model space is supposed to be competed and the correct model. It is assumed to exist in limitation. We will explain how BMA can help applied researchers to ensure that their estimates of effects of key independent variable are robust to a wide range of possible model specifications. Amendola and Storti (2009) had stated that constraints, in the building stage model, were often imposed on an α to a potentially high degree of model uncertainty which can have a struck special advantage on the volatility prediction created by competing different models. They had discussed a procedure based on the use of BMA technique. Most of the literature on forecast combination bargains with invariable time series while they were interested in the analysis of large dimensional multivariate processes. Forecasts are great importance and widely used in economics and finance. Quite simply, good forecasts lead to be good decision-making. The importance evaluation in forecast and combination techniques follows immediately. Forecast users naturally have a keen

interest in monitoring and improving forecast performance. More generally, forecast evaluation has showed evidence of figuring in many analyses which based on economics and finance, such as: rational expectation, financial markets efficient, noticed asset returns “too volatile,” asset returns for cast able over long horizons, and nominal interest rates in good forecasts of future inflation (Diebold and Lopez, 1996). Stock and Watson (2003) had declared that time series forecasting of economic variables has focused on low-dimensional models such as autoregressions, single-equation regression using leading indicators as predictors, or vector autoregressions with perhaps a half-dozen or fewer variables. To forecast using many predictors, one needs to impose sufficient restrictions that the number of estimated parameters is kept small. Clemen (1989) had provided a review and annotated bibliography containing over 200 items, which he had described as “an explosion in the number of articles on the combination of forecasts,” mostly concerning point forecasts; Wallis (2010) had considered extensions to the combination of interval and density forecasts. In their works, weights are assumed to follow random walk processes. Hoogerheide et al. (2010) had strongly stated intention on time-varying weights. Recently Billio et al. (2010) increase size of the state-space representation of Hoogerheide et al. (2010) by assuming time-varying weights and propose a Bayesian state-space representation of the predictive densities and of the combination scheme. To achieve this propose, a statistical approach to post-processing ensemble forecasts is based on BMA. This is a standard approach to inference in presence of multiple competing statistical models; here they extend it to forecasts from dynamical models (Raftery et al., 2005). The BMA deterministic forecast is just a weighted average of linear functions of ensemble forecast from. Montgomery, Hollenbach and Ward (2011) have comment that from a scientific standpoint, greater attention to forecasting would facilitate stringent validation of theoretical and statistical models since truly causal models should perform better in out-of-sample forecasting. The weight assigned each forecast is calibrated via its performance in some training period. These component models can be diverse. They need not share covariates, functional forms, or error structures.

Indeed, the components may not even be statistical models, but may be predictions generated by agent-based models, stochastic simulations, or subject-matter experts. The model space in this research paper is possible incomplete.

Following Billio et al. (2011a) has noticed that prophet for financial returns is very low and all models seem incorrect and unable to capture all the dynamics in such markets. Their function varies substantially over time. These parts should be respected when mixed financial return predictive densities, constructed standard for unappealing combination schemes. They showed their combination schemes in conditional terms create equations for producing predictive densities and not point forecasts for the variables of interest. In this limited factor, weights may be performed a finite in particular way of probability distribution over the set of predictors. They spoke about weighting schemes with continuous dynamics that allowed to smooth convex combination. A learning mechanism was showed to allow the dynamics of each weight to be driven by the past and current performances in the combination scheme (Billio et al., 2010b). The constraint that time-varying weights connected to simplex standard which makes the inference process nontrivial and calls for the use of nonlinear filtering methods. In fact, another contribution of this research is to apply simulation based filtering methods, such as Sequential Monte Carlo (SMC), in the context of combining forecasts.

Moreover, this research wants to be existed methods for Bayesian estimation of generalized autoregressive conditional heteroskedasticity (GARCH) models. Based on Liu and Maheu (2008), BMA can provide additionally correction to forecast when they moved away from linear models and average over specifications that allow for GARCH effects. For example, it provide improvements relative to a benchmark log-GARCH model for daily forecasts. The empirical including a simple equally weighted model average. Considering all data series and forecast horizon, the BMA is the dominate model. Furthermore, these observations motivate a wide range of useful specifications using realized volatility, power variation of several orders,

bipower variation, a jump and an asymmetric term. The importance of GARCH dynamics in time series models of log-volatility has been documented by Bollerslev et al. (2007). Therefore, these good performances of delivering BMA are no single specification dominates across markets, forecast horizons that are considerable model uncertainty in all applications, and base on the predictive likelihood that can dramatically improve forecasting power.

1. Problem Identification

A capital market is not full efficient. It has two reasons. Firstly, a capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices (Timmermann and Granger, 2004). In an informationally efficient market, price changes must be unforecastable if they are properly anticipated. The last, A weaker and economically more sensible version of the efficiency hypothesis says that prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed the marginal costs (Jensen, 1978). It means that forecasting can do work properly. As this reason, we can identify problem to reach out our research. Based on the explanation on the background on the research study, the problem formulation of the study is found out how to *forecasting stock price index using Bayesian Combination applies in Indonesia Stock Exchange (IDX) from July 1st, 1997 to February 29th, 2012.*

2. Problem Formulation

Based on above issues that can be explained by problem formulation post in this study, how does forecast estimate stock price index in IDX by using Bayesian combination model?

3. Scope of The Study

In conducting this research, the author applied the limitations in study as following:

- a. The data used for analysis from Jakarta Composite Index (JCI or JKSE, an index of all stocks that trade on the Indonesia Stock Exchange; formerly known as Jakarta Stock Exchange or *Indeks Harga Saham Gabungan* (IHSG)) in Indonesia Stock Exchange (IDX) index in the period of July 1st, 1997 to February 29th, 2012. Stock price index in IDX that performs secondary offering and rights issue relate in the object of study.
- b. Daily stock price data take from IDX index in finance.yahoo.com in the period of July 1st, 1997 to February 29th, 2012.
- c. Studying JCI during in the period of July 1st, 1997 to February 29th, 2012.
- d. Stock price index is the price that occurred during the close of trading.
- e. Forecasting stock price index is using a method based on a distributional state-space representation of the prediction model and Bayesian combination model.

4. Research Motivation

There are several motivations for trying to predict stock price index by using Bayesian combination. The most basic of these is financial gain. Any system that can consistently pick winners and losers in the dynamic market place would make the owner of the system very wealthy. The many individuals including researchers, investment professionals, and average investors are continually looking for this superior system, which will yield them high returns.

Bayesian combination is used to predict stock prices index because it is able to learn nonlinear mappings between input and output. Sequential Monte Carlo (SMC) is nonlinear deterministic process, which only appears random because it

cannot be easily expressed. With the Bayesian combination's ability to learn nonlinear, SMC, it may be possible to outperform traditional analysis and other computer-based methods.

In addition to stock price index prediction, Bayesian estimation GARCH models have been trained to perform a variety of financial related tasks. There are experimental and commercial systems used for tracking commodity markets and futures, foreign exchange trading, financial planning, company stability, and bankruptcy prediction.

5. Benefits of Research Study

The result of this study is expected to provide benefits to various parties, among others:

- a. For the author:
 - 1) To apply and inspire the theories that has been acquired in lectures, particularly the investment management.
 - 2) To add insight and practical knowledge of investment analysis, predict stock price index in particular.
- b. For Investors:
 - 1) The result of this study, investors can use and consider as the guidelines when they are making an investment in securities stocks. In addition, this study can be used as a picture for investors in making investment decisions.
- c. For other researchers:
 - 1) Researchers can be able to apply knowledge gained to the real world, both as investors and analysts.
 - 2) Adding insight to the researchers so that it can be used as capital in a future life as well as a useful material consideration when making investments.

d. For readers:

- 1) As the material to add insight and knowledge relating to investment are particularly on forecasting stock price index.
- 2) As the material to be useful for developing idea in predicting stock price in future.

6. The Originality of Writing

This research is carried out based on the previous researchers that have been done before. The researcher compiled this research study by himself. All the writings, the research data, data analysis and conclusions in thus research study was collected, analyzed, and explored by the researcher, except for the written sources, which were used as the references in this research study. For the data sources, the researcher recognizes that for several arc obtained from the website and some financial journals that were used as references in this research study.

- a. This research is based on the previous research performed by Billio, M., Casarin, R., Ravazzolo, F. and Dijk, H. K. about *Bayesian Combination of Stock Price Predictions with an Application to the Amsterdam Exchange Index*. This research is published in the year May 2nd, 2011a by Tinbergen institute, TI-082/4.
- b. Some researches related to this topic that are also used by the researchers to broaden the sources and to deepen knowledge of the empirical results related to forecast stock price index.
- c. This research tried to investigate how to *forecasting stock price index using Bayesian Combination applies in Indonesia Stock Exchange (IDX) from July 1st, 1997 to February 29th, 2012*.

B. Research Objectives

The purpose of this research focuses on forecasting stock price index in the Indonesia Stock Exchange (IDX), in the period of July 1st, 1997 to February 29th, 2012 through Bayesian estimation in GARCH models. It can be successful to predict the near future and to make profit. Once this was accomplished, the probability of an accurate forecast would be calculated. The given accuracy of the forecast, the benefits of network to investor would be determined.

C. Writing Structure

The writing of this research is build around the forecasting stock price index using Bayesian combination applies in Indonesia Stock Exchange (IDX), in the period of July 1st, 1997 to February 29th, 2012. The writing structure is divided into 5 chapters, which are:

Chapter I: Introduction

This chapter contains an introduction that describes background of research study, research objectives, and writing structure.

Chapter II: Literature Review

In this chapter describes the literature review that discusses the concepts underlying the research. There are is also theoretical basis, where as the basic theory used in this study. It is divided into two Parts, which are literature review and review on related studies. The literature review writes about the theory used in the research study to analyze the problem. The reviews on relating studies provide some discoveries form research studies on the same area of concern by other researchers.

Chapter III: Research Method

In this chapter describes the research design and it divided into 4 parts. It consists of type of methodology, sampling determination, research data, and method of analysis.

Chapter IV: Data Analysis

This chapter describes the analysis of the collected data and interpretation of data. It is divided into two parts, which are the image of research data and organization of the data.

Chapter V: Conclusion and Recommendations

This chapter concludes the research study, managerial implication and presents the limitation and further research, which provides some points for improvement in future research.