CHAPTER 1

INTRODUCTION

1.1 Principles and Rationale

Nowadays, Thailand is facing many problems such as political problems, the Hamburger crisis and weather problems. These problems cause not only direct but also indirect impacts to economic system. For example, when the numbers of tourists in Thailand were reduced, the negatively repercussive value of Gross Domestic Product (GDP) may occur.

The stock market is one of the most important indicators of Thai economy and a major source of investment. It allows businesses to be publicity, in order to add capital for expansion. Value at risk is one of many factors that investors use to approximate the economic situation and decide to invest on any sectors of industry group index.

In this research, we estimate value at risk (beta (β)) and compare the result between two approaches, Bayesian and Ordinary Least Square (OLS). The Bayesian approach is the method of estimating the value from a probability based on seeking a value beneath the distribution specified inside the algebraic equation system. This helps us to obtain a value having proper distribution. In this case, the Markov Chain Monte Carlo (MCMC) method is used. When we have the desired data set we can conduct iterations for finding the best solution, which is the value at risk and returns estimated from Capital Asset Pricing Model (CAPM). The CAPM gives a risk value

(β) that may be compared standard error of β from ordinary least square method with Bayesian approach. Thus, we will find the method by the decision from standard error that is the least in order to apply assesses value at risk.

The study focuses on value at risk (β) from each model, this paper supposed data on the relationship between an 8-industry group index (Agro-industry and Food-industry, Consumer Products, Finance, Manufacture, Property and Construction, Resources, Services and Technology) and Thai SET index seeking relation of each industry group and assets index total up of Thailand (Thai index).

The study shows that we have standard error (SE) from applying the Bayesian approach that is less than standard error from the Ordinary Least Square (OLS) method. Then, we can affirm that the Bayesian-method forecast is more accurate than that of the OLS method.

1.2 Purpose of the study

In this research, we compare standard errors (S.E.) between the ordinary least squares (OLS) method and the Bayesian approach on the relationship between an 8-industry group index (Agro-industry and Food-industry, Consumer Products, Finance, Manufacture, Property and Construction, Resources, Services and Technology) and the Thai SET index. The analysis seeks the relation among each industry groups and assets index total up of Thailand (Thai index).

1.3 Application advantages

1.3.1 The benefit from least standard error from beta (β) value to guide investors who are interested in investment in Thailand.

1.3.2 The benefit from least standard error from beta (β) value to be an alternative for investors who are interested in investment in Thailand and used as a new instrument for decision making.

1.4. Research designs, scope and methods

1.4.1 Research designs

(1) Find topic and problem to study.

(2) Gather data (SET and 8-industry group index).

(3) Analyze data by Bayesian approach and OLS.

(4) Compare between two methods.

(5) Discuss and conclude.

1.4.2 Scope

This research is carried out the daily data of 8-industry group index (Agro-industry and Food-industry, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology) and SET index of Thai economy stock market over the period from January, 5 2004 to February, 11 2009.

1.4.3 Methods

There are three parts in this research. In the first section, we use a Bayesian approach for CAPM to estimate beta (β) and find standard error (S.E.) of this beta. In the second section, we use ordinary least square (OLS) for CAPM to estimate beta (β) and find the standard error (S.E.) of this beta (β) from OLS. In the last section, we compare the standard error (S.E.) from the Bayesian approach and ordinary least square (OLS) to identify the best method to determine risk and rate of return.

1.5 Overview of data sources

The study uses secondary data on the 8-industry group index and the Thai Stock Exchange Thailand index over the period started from January, 5 2004 to February, 11 2009 daily. The set of data is collected from program Reuters 2007's, Chiang Mai University.

1.6 Terminology

Algorithm is a sequence of finite instructions, generally used for calculation and data processing. It is formally a type of effective method in which a list of well-defined instructions for completing a task will, when given an initial state, proceed through a well-defined series of successive states, eventually terminating in an end-state.

Beta coefficient, in terms of finance and investing, describes how the expected return of a stock or portfolio is correlated to the return of the financial market as a whole.

An asset with a beta of 0 means that its price is not at all correlated with the market; that asset is independent. A positive beta means that the asset generally follows the market. A negative beta shows that the asset inversely follows the market; the asset generally decreases in value if the market goes up and vice versa (as is common with precious metals).

The beta coefficient is a key parameter in the capital asset pricing model (CAPM). It measures the part of the asset's statistical variance that cannot be mitigated by the diversification provided by the portfolio of many risky assets, because it is correlated with the return of the other assets that are in the portfolio. Beta can be estimated for individual company using regression analysis against a stock market index.

Coefficient is a constant multiplicative factor of a certain object. For example, in the expression 9x, the coefficient of x is 9.

Conjugate prior[1] In Bayesian probability theory, a class of prior probability distributions $p(\theta)$ is said to be conjugate to a class of likelihood functions $p(x|\theta)$ if the resulting posterior distributions $p(\theta|x)$ are in the same family as $p(\theta)$. For example, the Gaussian families are conjugate to it (or self-conjugate): if the likelihood function is Gaussian, choosing a Gaussian prior will ensure that the posterior distribution is also Gaussian

Covariance is a measurement of how much two variables change together (variance is a special case of the covariance when the two variables are identical).

If two variables tend to vary together (that is, when one of them is above its expected value, then the other variable tends to be above its expected value too), then the covariance between the two variables will be positive. On the other hand, if one of

[1] See Cameron, A. C., & Trivedi, P. K. (2005)

them tends to be above its expected value when the other variable is below its expected value, then the covariance between the two variables will be negative.

Joint probability distribution[2], in the study of probability, given two random variables X and Y, the joint distribution of X and Y is the distribution of the intersection of the events X and Y that is, of both events X and Y occurring together. In the case of only two random variables, this is called a bivariate distribution, but the concept generalizes to any number of events or random variables, giving a multivariate distribution.

Likelihood is a function of the parameters of a statistical model that plays the key role in statistical inference. Informally, if "probability" allows us to predict unknown outcomes based on known parameters, then "likelihood" allows us to estimate unknown parameters based on known outcomes.

Marginal probability[3] is then the unconditional probability P(A) of the event A; that is, the probability of A, regardless of whether event B did or did not occur. If B can be thought of the event that a random variable X has a given outcome, the marginal probability of A can be obtained by summarize (or integrating, more generally) the joint probabilities over all outcomes of X.

Prior probability[4] is a marginal probability, interpreted as a description of what is known about the specific variable in the absence of some evidence. The posterior probability is then the conditional probability of the variable taking the evidence into account. The posterior probability is computed from the prior and the likelihood function via Bayes' theorem.

[2] See Cameron, A. C., & Trivedi, P. K. (2005) for a review of the type that use in Bayesian probability.

[3] See Durlauf, S. N., & Blume, L. E. (2008)

[4] See Durlauf, S. N., & Blume, L. E. (2008)

Rate of return (ROR), also known as the return on investment (ROI), rate of profit or sometimes just return, is the ratio of money gained or lost (realized or unrealized) on the investment relative to the amount of money invested. The amount of money gained or lost may be referred to profit/loss, gain/loss, or net income/loss. The money invested may be referred to the asset, capital, principal, or the cost basis of the investment. ROI is usually expressed as the percentage rather than the fraction.

The initial value of an investment, V_i, does not always have a clearly defined monetary value, but for purposes of measuring ROI, the initial value must be clearly stated along with the rationale for this initial value. The final value of an investment, V_f, also does not always have a clearly defined monetary value, but for purposes of measuring ROI, the final value must be clearly stated along with the rationale for this final value.

The arithmetic return is defined as the following:

$$r_{arith} = \frac{V_f - V_i}{V_i}$$

r_{arith} is sometimes referred to as the yield.

The logarithmic return or continuously compounded return, also known as force of interest, is defined as:

$$r_{log} = ln\left(\frac{V_f}{V_i}\right).$$

It is the reciprocal of the e-folding time.

Risk is a concept that denotes the precise probability of specific eventualities. Technically, the notion of risk is independent from the notion of value and, as such, eventualities may have both beneficial and adverse consequences. However, in general usage, the convention is to focus only on the potential negative impact to some characteristics of value that may arise from the future.

Security is a functionable and negotiable instrument representing financial value. Securities are broadly categorized into debt securities (such as banknotes, bonds and debentures), and equity securities (common stocks). The company or other entity issuing the security is called the issuer. What specifically qualifies as a security is dependent on the regular structure of the country. For example, private investment pools may have some features of securities, but they may not be registered or regulated if they meet various restrictions.

Systematic risk, also sometimes called market risk, aggregate risk, or non-diverse risk is the risk associated with aggregate market returns. Systematic risk is a risk of security that cannot be reduced through diversification. It should not be confused with systemic risk, which is the risk that the entire financial system will collapse as a result of some catastrophic events.

In the capital asset pricing model, the rate of return required for an asset in market equilibrium depends on the systematic risk associated with returns on the asset, that is, on the covariance of the returns on the asset and the aggregate returns to the market.

Risk in asset returns that is uncorrelated with aggregate market returns is called 'specific risk', 'diversifiable risk', or 'idiosyncratic risk'. Given diversified holdings of assets, each individual investors exposure to idiosyncratic risk associated with any

particular asset is small and uncorrelated with the rest of their portfolio. Hence, the contribution of idiosyncratic risk to the riskiness of the portfolio as a whole is negligible. It follows that only systematic risk needs to be taken into account.

The SET Index is a composite economic indicator which is calculated from the prices of all common stocks (including unit trusts of property funds) on the main board of the Stock Exchange of Thailand (SET), except for stocks that have been suspended for more than one year. It is a market capitalization-weighted price index which compares the current market value of all listed common shares with its value on the base date of April 30, 1975, when was the Index was established and set at 100 points.

The formula of calculation is as follows:

SET Index = (Current Market Value x 100)/ Base Market Value

The SET Index calculation is adjusted in line with modifications in the values of stocks resulting from changes in the number of stocks due to various events, e.g., public offerings, exercised warrants, or conversions of preferred to common shares, in order to eliminate all effects other than price movements from the index.

The posterior probability[5] of a random event or an uncertain proposition is the conditional probability that is assigned after the relevant evidence is taken into account. The posterior probability distribution of one random variable given the value of another can be calculated with Bayes' theorem by multiplying the prior probability distribution by the likelihood function, and then divided by the normalizing constant.

[5] See Cameron, A. C., & Trivedi, P. K. (2005).

Unsystematic risk (**Diversifiable risk)** affects specific companies, such as bad management, lawsuits, and labor trouble. Diversifiable risk can be lowered by investing in different companies in different sectors or by investing in different asset classes, but can be minimized by investing in assets that have a negative correlation coefficient, where the lows of some assets are offset by the highs of other assets. The total risk of any investment is the summation of systematic risks and asset-specific risk.