CAPITAL ASSET PRICING MODEL (CAPM): THE THEORY AND EVIDENCE IN INDONESIA STOCK EXCHANGE (IDX) AT THE PERIOD 2004-2009

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Stating that the thesis entitled CAPITAL ASSET PRICING MODEL (CAPM): THE THEORY AND EVIDENCE IN INDONESIA STOCK EXCHANGE (IDX) AT THE PERIODE 2004-2009 is my work. Things that are not my work in this thesis are marked *citasi* and shown in the bibliography.

If at a later date proved that my statement was not true, I am willing to receive academic sanctions such as revocation of a degree thesis.

Surakarta, September 2010

Arum Setyowati
PREFACE

All praise to Allah SWT for all the abundance and his grace so that the preparation of the thesis with the title "Capital Asset Pricing Model (CAPM): The Theory and Evidence in Indonesia Stock Exchange (IDX) at the Period of 2004-2009" has been successfully finished. This thesis examines the validity of CAPM theory by taking the object of research in Indonesia Stock Exchange (IDX).

In the preparation process of this report, the authors obtained a lot of instructions, guidance and support from various parties. Therefore, with all humility, I say thank you to:

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6. All parties who cannot mention one by one author who has helped many writers in preparing this paper.

I realize that the writing of this report is far from perfect. To the authors are looking forward to critiques and suggestions for improvement and perfection of this simple masterpiece. Finally, I hope that this modest work can be beneficial to all parties.

Surakarta, 11 October 2010
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ABSTRACT

This research aims to examine the validity of the CAPM that was developed by Sharpe [1964], Litner [1965], and Mossin [1966] for all of the stock in Indonesia Stock Index (IDX). The study uses monthly stock returns from 213 companies listed on the Indonesia stock Exchange, certificate of Bank Indonesia as $r_f$, and stock price index for seek $r_m$.

The sample of this thesis is enterprise who listed in Indonesia Stock Exchange at the period 2004 – 2009 and I got 213 samples. The findings of this research are not supported the theory’s basic statement that higher risk (beta) is associated with higher levels of return. The CAPM’s prediction for the intercept is that it should equal zero, the results of the study refute the above hypothesis and offer evidence against the CAPM theory.

Keywords: CAPM, return, risk, market risk, risk free
CHAPTER I

INTRODUCTION

A. Background

Capital market is a long-term investment alternative for the investors. Each investment option has a rate of return and different risk. In fact, the return and risk of stocks would differ even within the same industry. This is caused by the different internal factors (management, marketing, financial condition, product quality and competitive ability) and external factors (government policy, competitors, and the taste and purchasing power of people).

Based on the data from website Indonesia Stock Exchange (IDX), the capital market in Indonesia has actually existed long before the Independence of Indonesia. The first stock exchange in Indonesia was established on 1912 in Batavia during the Dutch colonial era. At that time, the Exchange was established for the interest of the Dutch East Indies (VOC). During those eras, the capital market grew gradually, and even became inactive for a period of time due to various conditions, such as the World War I and II, power transition from the Dutch government to Indonesian government, etc. Indonesian government reactivated its capital market in 1977, and it grew rapidly ever since, along with the support of incentives and regulations issued by the government.
As an investment tool, capital market can be utilized for the investors to invest their funds and increase investment choices. As a result of the many investment choices offered, of course, investors need some considerations such as financial information, computation and analysis of sufficient and need to understand the situation and prospects of companies whose sell their stock in the capital market. In deciding to invest their stock, investors should be more selective in choosing stocks return. First, investors must estimate the risks and the advantages to be gained or estimate the expected return is greater than the realize return is not good to buy. Because it shows that it can not meet the expectations of investors. Thus, a good stock to buy is stocks with realized return greater than the expected return.

Many strategies and methods that can be used to estimate the return of a security, it can be determined what level of benefits and risk of the stock. Capital Asset Pricing Model (CAPM) is one of the many theories that explain the relationship between risks and return level. Andre F [2004] said that a fundamental question in finance is how the risk of an investment should affect its expected return. The Capital Asset Pricing Model (CAPM) provided the first coherent framework for answering this question. The CAPM is based on the idea that not all risks should affect asset prices. In particular, a risk that can be diversified away when held along with other investments in a portfolio is, in a very real way, not a risk at all. The CAPM gives us insights about what kind of risk is related to return.

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CAPM theory developed by Sharpe [1964], Litner [1965], and Mossin [1966] became a major model used in the discussion of financial management to estimate the return based on its risk. CAPM suggests that high expected returns are associated with high levels of risk. Simply stated, CAPM postulates that the expected return on an asset above the risk-free rate is linearly related to the systematic risk/market risk as measured by the asset’s beta. Unsystematic risk or unique risk of each asset is assumed can be eliminated with diversification.

Many empirical studies conducted to test the validity of the CAPM model. Black, Jensen and Scholes [1972], using monthly return data tested whether the cross-section of expected returns is linear in beta. The author found that the relation between the average return and beta is very close to linear and that portfolios with high (low) betas have high (low) average returns. Fama and MacBeth [1973] examined that there is a positive linear relation between average returns and beta. They investigated that the squared value of beta and the volatility of asset returns can explain the residual variation in average returns across assets that are not explained by beta alone. While unsystematic risk or unique risk of each asset is assumed to be eliminated because diversify.

Then some other researcher goes to measure the validity of CAPM model by Sharpe [1964], Litner [1965], dan Mossin [1966]. Banz [1981], he tested the CAPM by checking whether the size of firms can explain the residual variation in average returns across assets that remain unexplained by
the CAPM's beta. He concluded that the average returns on stocks of small firms (those with low market values of equity) were higher than the average returns on stocks of large firms (those with high market values of equity). This finding has become known as the size effect.

Other researchers are Fama and French [1992]. They used the same procedure as Fama and McBeth [1973] but arrived at very different conclusions. Fama and McBeth find a positive relation between return and risk while Fama and French find no relation at all. While, Pettengill, Sundaram and Mathur (1995) with different method found based on estimation conditional on the signs of the market excess returns indicate that betas and returns are positively related in the US capital market.

Fama and French [2004] said the capital asset pricing model (CAPM) is still widely used in applications, such as estimating the cost of capital for firms and evaluating the performance of managed portfolios. It is the centerpiece of MBA investment courses. Indeed, it is often the only asset pricing model taught in these courses. The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk. Unfortunately, the empirical record of the model is poor-poor enough to invalidate the way it is used in applications.

Zhang and Wihlborg [2004] said that Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966) can be applied to emerging capital markets to examine the risk-return relationship
and to estimate the cost of equity capital is an issue receiving attention only recently. Since each emerging market has its own unique market structure, institutional background, history, level of the market integration, and local risk-free return, the answer may differ across countries. Moreover, whether the CAPM is an appropriate model to the asset pricing in developed markets is still controversial. In theory, beta as a single systematic risk measure has been challenged by the alternative equilibrium asset-pricing model, the Arbitrage Pricing Theory (APT).

Pettengill et al. (1995) propose a different methodology to estimate the relationship between betas and returns. Their argument is that since the CAPM is estimated with realized returns as proxies for expected returns, it is likely that negative realized premium risk will be observed in some periods. The model of Pettengill et al. is conditional on the realized risk premium, whether it is positive or negative. When the realized risk premium is positive, there should be a positive relationship between the beta and return, and when the premium is negative, the beta and return should be negatively related. The reason is that high beta stocks will be more sensitive to the negative realized risk premium and have a lower return than low beta stocks.

The last, Michailidis, Tsopoglou, Papanastasiou [2006] measured validity of CAPM model and the result are not supported the theory’s basic CAPM model. The higher risk (beta) is not associated with higher levels of return. The intercept is not equal zero and the slope is not equal the excess
returns on the market portfolio. And residual risk has no effect on the expected returns of portfolios.

This thesis will reexamine validity of CAPM model by Sharpe [1964], Litner [1965], dan Mossin [1966] in the capital market of Indonesia. The samples that used are the companies listed in Indonesia Stock Exchange (IDX) during the period 2004-2009. Therefore this research takes the title: CAPITAL ASSET PRICING MODEL (CAPM): THE THEORY AND EVIDENCE IN INDONESIA STOCK EXCHANGE (IDX) AT THE PERIOD 2004 - 2009.

B. Problems

Based on previous research about the validity of CAPM theory, I will reexamine the validity of CAPM theory with Indonesia Capital Market as sample. The research question that can be formulated are:

1. There is a positive linear relationship between the stock’s expected returns and its systematic risk (beta). Does higher risk (beta) associate with a higher level of return?

2. Based on the CAPM model with use method from Fama and MacBeth (1973), is the intercept (expected excess return on a zero beta portfolio) is equal to zero?
3. Based on the CAPM model with by using the method from Fama and MacBeth (1973), is the intercept of risk premium \( (r_{me} - r_f) \) significantly positive?

4. Based on CAPM model by using the method from Pettengill et al. [1995], is the intercept of premium risk significantly positive \( (\beta_1 > 0) \) when up market (excess return is positive)?

5. Based on CAPM model, by using the method from Pettengill et al. (1995), is the intercept of premium risk significantly negative \( (\beta_2 < 0) \) when down market (excess return is negative)?

C. Objectives

The purpose of this study is to re-test the validity of CAPM model. Is the CAPM model developed by Sharpe [1964], Litner [1965], and Mossin [1966] still consistent in case capital market in Indonesia? This research will prove empirically from the problems and previous findings that is:

1. To know whether there is or there isn’t a positive linear relationship between the stock’s expected returns and its systematic risk (beta) and the higher risk (beta) associate with a higher level of return.

2. To know whether intercept (expected excess return on a zero beta portfolio) is equal to zero or not based on the CAPM model by using the method from Fama and MacBeth (1973).
3. To know whether the intercept of premium risk \((r_{m} - r_{f})\) is significantly positive or not based on the CAPM model by using the method from Fama and MacBeth (1973).

4. To know whether the intercept of premium risk is significantly positive \((r_{2} > 0)\) when up market (excess return is positive) based on CAPM model by using the method from Pettengill et al. (1995).

5. To know whether the intercept of premium risk is significantly negative \((r_{2} < 0)\) when down market (excess return is negative) based on CAPM model by using the method from Pettengill et al. (1995).
CHAPTER II
THEORITICAL FRAMEWORK

A. Return

Return can be a realized return has happened and the expected return that have not happened, but is expected to occur in the future. In measure return, the realization of widely used measurement of total return, this is the overall return from an investment in a period. The calculation of return is also based on historical data. This realized return can be used as one measure of company performance and can be as basic determinants of return expectations and risk in future (Brigham and Daves, 2004).

Otherwise, expected return is return that be expected will be earned by investors in the future. Thus, the difference between the two is the realization of its returns has already happened, while the return expectation of it’s yet to happen. Jogianto [1998] suggested that the return as a result can be obtained from the investment return and the realization of expected return.

1. Realized return ($r_i$)

Brigham and Daves [2004] said that realized return is the return that has occurred and is calculated based on historical data. Return the realization of these can function both as one measure of company
performance as well as the basis for determining the risk and expected return in the future. One type of measurement that is often used realization of return is total return, i.e., the overall return from an investment in a given period.

\[ r_i = \frac{P_t - P_{t-1}}{P_{t-1}} \]

- \( r_i \) = realized return at time \( t \) for the enterprise
- \( P_t \) = stock price at time \( t \)
- \( P_{t-1} \) = stock price at time \( t-1 \)

2. The expected return (\( E(r_i) \))

Brigham and Daves [2004] said that the very important principle that should always be kept in the mind is “regardless of the number of assets held in a portfolio, or the proportion of total investable funds placed in each asset, the expected return on the portfolio is always a weighted average of the expected returns for individual assets in the portfolio.”

The percentage of portfolio’s total value that are invested in each portfolio asset are referred to as portfolio weights, which we will denote by "\( w \)". The combined portfolio weights are assumed to sum to 100
percent of total investable funds or 1.0, indicating that all portfolio funds are invested, that is:

\[ w_1 + w_2 + \cdots + w_n = \sum_{i=1}^{n} w_i = 1.0 \]

If we multiply each possible outcome by its probability of occurrence and then sum the products, we have a weighted average of outcomes. The weights are the probabilities, and the weighted average is expected return \( E(r_i) \). The expected rate of return calculation can also be expressed as an equation:

\[ E(r_i) = w_1 r_1 + w_2 r_2 + \cdots + w_n r_n \]

\[ E(r_i) = \sum_{i=1}^{n} w_i r_i \]

\( E(r_i) \) = is the expected return

\( w_i \) = the probability of the \( i^{th} \) outcome

\[ \sum w_i = 1.0 \]

\( r_i \) = is the \( i^{th} \) possible outcome

3. Market Return

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We can call also “market portfolio”. It is required rate of return portfolio consisting of all stocks. It is also the required rate of return on an average (β = 1) stock (Brigham and Daves, 2004).

B. Risk

1. Portfolio Risk

Risk is defined as the uncertainty about the actual return that will be earned on an investment (John, 2007). The remaining computation in investment analysis is that of the risk of the portfolio. Brigham and Daves [2004] measure portfolio risk by the standard deviation of its return with probability distribution. One such measure is the standard deviation, the symbol for which is σ, pronounced “sigma”. The smaller the standard deviation, the tighter the probability distribution, and accordingly the less risky the stock.

To calculate the standard deviation, we taking step:

a. Calculate expected return:

$$ E(\eta_i) = \sum_{i=1}^{n} w_i \eta_i $$

b. Subtract the expected rate of return $E(\eta_i)$ from each possible outcome ($\eta_i$) to obtain a set of deviations:

$$ \text{deviation} = \eta_i - E(\eta_i) $$
c. Square each deviation, then multiply the result by the probability of occurrence for its related outcome:

\[ \text{variance} = \sigma_i^2 = \sum_{i=1}^{n} (r_i - \mathbb{E}(r_i))^2 w_i \]

d. Finally, find the square root of the variance to obtain the standard deviation:

\[ \text{standard deviation} = \sigma_i = \sqrt{\sum_{i=1}^{n} (r_i - \mathbb{E}(r_i))^2 w_i} \]

Where \( \sigma_i \) is the portfolio’s standard deviation; \( r_i \) is the return on in the \( i \)th state of the economy; \( \mathbb{E}(r_i) \) is the expected rate of return; \( w_i \) is the probability of occurrence of the \( i \)th state of the economy; and there are \( n \) economic states.

When the data aren’t in the form of a known probability distribution, and if only sample returns data over some past period are available, the standard deviation of returns can be estimated using this formula:

\[ \text{estimated } \sigma = \tilde{\sigma} = \sqrt{\frac{\sum_{i=1}^{n} (r_i - \mathbb{E}(r_i))^2}{n-1}} \]
Unlike return, the risk portfolio, $\sigma_p$, is generally not the weighted average of the standard deviations of the individual assets in the portfolio. The portfolio risk will almost always be smaller than weighted average of the asset’s $\sigma$’s. In fact, it is theoretically possible to combine stocks that are individually quite risky as measured by their standard deviations to form a portfolio that is completely risk, with $\sigma_p = 0$.

For example, stocks W and M can be combined to form a riskless portfolio if their return move counter cyclically to each other when W’s returns fall, those of M rise, and vice versa. The tendency of two variables to move together is called ‘correlation’, and the correlation coefficients measure this tendency. The symbol for the correlation coefficient is $\rho$ (pronounced ‘roe’). In statistical terms, we say that the returns on stocks W and M are perfectly negatively correlated, with $\rho = -1,0$.

The opposite, it is perfect positive correlation, with $\rho = +1,0$, when the returns M and W are move up and down together, and a portfolio consisting of two such stocks would be exactly as risky as each individual stock.

2. **Market Risk ($\sigma_m^2$)**
Market risk is stems from factors that systematically affect most firms: war, inflation, recessions, and high interest rate. Since most stocks are negatively affected by these factors, market risk can not be eliminated by diversification (Daves and Bringham, 2004).

3. **Risk Free Rate** ($r_f$)

Brigham and Daves [2004] said that the one assumption of capital market theory is that investors can borrow and lend at the risk free rate. Investors can invest part of their wealth in this asset and the remainder in any of the risky portfolios in the Markowitz efficient set. This allows Markowitz portfolio theory to be extended in such way that the efficient frontier is completely changed, which in turn leads to a general theory for pricing assets under uncertainty.

The risk free asset can be defined as one with a certain-to-be-earned expected return and variance of return of zero. Since variance = 0, the nominal risk free rate in each period will be equal to its expected value. Furthermore, the covariance between the risk free assets and the any risky asset i will be zero (Jones, 2007).

4. **The Components of portfolio Risk (Correlation and Variance)**

**Variance**
Daves and Brigham [2004] said that two key concepts in portfolio analysis are covariance and the correlation coefficient.

a. Weighted individual security risk (i.e., the variance of each individual security, weighted by the percentage of investable funds placed in each individual security).

b. Weighted comovements between securities return (i.e., the covariance between the securities returns, again weighted by the percentage of investable funds placed in each security).

Covariance is a measure that combines the variance (or volatility) of stock’s return with the tendency of those returns to move up or down at the same time other stocks move up or down. This equation defines the covariance between stocks A and B.

$$\text{cov}(AB) = \sigma_{AB} = \sum_{i=1}^{n} (r_{Ai} - E(r_A)) (r_{Bi} - E(r_B)) w_i$$

Where:

- $\sigma_{AB}$ = the covariance between securities A and B
- $r_{Ai}$ = one possible return on security A
- $E(r_A)$ = the expected value of the return on security A
- $n$ = the number of likely outcomes for a security for the period
- $w_i$ = the probability of the $i^{th}$ outcome
When the data aren’t in the form of a known probability distribution, and if only sample returns data over some past period are available, the covariance of returns can be estimated using this formula:

\[
\text{cov}(A,B) = \sigma_{AB} = \frac{\sum_{t=1}^{n}(A_t - \bar{A})(B_t - \bar{B})}{n-1}
\]

**Correlation coefficient**

It is difficult to interpret the magnitude of the covariance term, so a related statistic, the correlation coefficient, is generally used to measure the degree of co-movement between two variables. The correlation coefficient standardizes the covariance by dividing by a product term, which facilitates comparisons by putting things on a similar scale. The correlation coefficient, \( \rho \), is calculated as follows for variables \( A \) and \( B \):

\[
\text{correlation coefficient}(AB) = \rho_{AB} = \frac{\text{cov}AB}{\sigma_A \sigma_B}
\]

It measures the extent to which the return on any two securities is related; however, it denotes only association that is bounded by +1.0 and -1.0 with:

\[
\rho_{AB} = +1.0 \text{ (perfect positive correlation)}
\]
The return has a perfect direct linear relationship. When the returns are perfectly positively correlated, the risk of a portfolio is simply weighted average of the individual risk of the securities.

\[ \rho_{AB} = -1.0 \] (perfect negative/inverse correlation)

In a perfect negative correlation, the securities returns have a perfect inverse linear relationship to each other. Therefore, knowing the return on one security provides full knowledge about the return on the second security. When one security’s return is high, the other is low.

\[ \rho_{AB} = 1.0 \] zero correlation

If the correlation is zero, there is no linear relationship between the returns on the two securities. Combining two securities with zero correlation (statistical independence) with each other reduces the risk of portfolio.

**Relating the correlation coefficient and the covariance**

The variance and the correlation coefficient can be related in the following manner:

\[ \rho_{AB} = \frac{\sigma_{AB}}{\sigma_A \sigma_B} \]

Or we can write that variance can calculate:

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\[ \sigma_{p} = \rho_{s,b} \sigma_{s} \sigma_{b} \]

**The two asset case**

Under the assumption that the distributions of returns on the individual securities are normal, a complicated looking but operationally simple equation can be used to determine the risk of a two-asset portfolio.

\[
\text{portfolio SD} = \sigma_p = \sqrt{w_a^2 \sigma_a^2 + (1-w_a)^2 \sigma_b^2 + 2w_a(1-w_a)\rho_{ab} \sigma_a \sigma_b}
\]

**C. Capital Asset Pricing Model**

The CAPM builds on the model of portfolio choice developed by Harry Markowitz [1959]. In Markowitz's model, an investor selects a portfolio at time t-1 that produces a stochastic return at t. The model assumes investors are risk averse and, when choosing among portfolios, they care only about the mean and variance of their one-period investment return. As a result, investors choose "mean-variance-efficient" portfolios, in the sense that the portfolios 1) minimize the variance of portfolio return, given expected return, and 2) maximize expected return, given variance. Thus, the Markowitz approach is often called a "mean-variance model" (Fama and French, 2004).
Capital asset pricing model is an important tool to analyze the relationship between risk and rates of return. The primary conclusion of the CAPM is this: the relevant risk of an individual stock is its contribution to the risk of a well-diversified portfolio.

The model was developed to explain the differences in the risk premium across assets. According to the theory these differences are due to differences in the riskiness of the returns on the assets. The model states that the correct measure of the riskiness of an asset is its beta and that the risk premium per unit of riskiness is the same across all assets. Given the risk free rate and the beta of an asset, the CAPM predicts the expected risk premium for an asset (Michalidis, et al., 2006).

1. **CAPM Assumption**

Brigham and Daves [2004] said that the CAPM is often criticized as being unrealistic because of the assumptions on which it is based, so it is important to be aware of these assumptions and the reasons why they are criticized. The assumptions are as follows:

a. All investors focus on a single holding period, and they seek to maximize the expected utility of their terminal wealth by choosing among alternative portfolios on the basis of each portfolio’s expected return and standard deviation.

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b. All investors can borrow or lend an unlimited amount at a given risk-free rate of interest, \( r_f \), and there are no restrictions on short sales of any asset.

c. All investors have identical estimates of the expected returns, variances, and covariances among all assets; that is investors have homogeneous expectations.

d. All assets are perfectly divisible and perfectly liquid (that is, marketable at the going price).

e. There are no transactions costs.

f. There are no taxes.

g. All investors are price takers (that is, all investors assume that their own buying and selling activity will not affect stock prices).

h. The quantities of all assets are given and fixed.

2. **The Capital Market Line**

This straight line, usually referred to as the Capital Market Line (CML), depicts the equilibrium condition that prevail in the market for efficient portfolios consisting of the optimal portfolio of risky asset and the risk-free asset.

The CML is a straight line without the now-dominated Markowitz frontier. We know that this line has an intercept of \( r_f \). If investors are to invest in risky asset, they must be compensated for this additional risk with a risk premium. The vertical distance between the
risk free rate and the CML at point M is the amount of return expected of bearing the risk of owning a portfolio of stock, that is, the excess return above the risk free rate. At that point, the amount of risk for the risky portfolio of stock is given by the horizontal dotted line between $r_f$ and $\sigma_m$.

The slope of CML is the market price of risk for efficient portfolio. It is also called the equilibrium market price of risk. It indicates the additional return that the market demands of each percentage increase in a portfolio risk, that is, in its standard deviation of return.

The equation for the Capital Market Line is:

$$slope\ of\ the\ CML = \frac{E(r_m) - r_f}{\sigma_m}$$
3. The Concept of Beta

Brigham and Daves [2004] said that the benchmark for a well diversified stock portfolio is the market portfolio, which is a portfolio containing all stocks. Therefore, the relevant risk of an individual stock, which is called its beta coefficient, is defined under the CAPM as the amount of risk that the stock contributes to the market portfolio. In the literature on the CAPM, it is proved that the beta coefficient of the $i^{th}$ stock, denoted by $\beta_i$, can be found as follows:

$$\beta_i = \left( \frac{\sigma_i}{\sigma_m} \right) \rho_{im}$$

Or we can explain:

$$\beta_i = \frac{\sum_{t=1}^{T-1} (r_{it} - E(r_i)) (r_{mt} - E(r_m))}{\sigma_m^2}$$

Here, $\rho_{im}$ is the correlation between the $i^{th}$ stock’s return and the return on the market, $\sigma_i$ is the standard deviation of the $i^{th}$ stock’s return, and $\sigma_m$ is the standard deviation of the market’s return.

The model was developed in the early 1960’s by Sharpe [1964], Lintner [1965] and Mossin [1966]. In its simple form, the CAPM predicts that the expected return on an asset above the risk-free rate is linearly related to the non-diversifiable risk, which is measured by the asset’s beta.
The linear relationship between the return required on an investment (whether in stock market securities or in business operations) and its systematic risk is represented by the CAPM formula:

\[
E(r_i) = r_f + \beta_i (r_m - r_f)
\]

Where:
- \(E(r_i)\) = return required on financial asset i
- \(r_f\) = risk-free rate of return
- \(\beta_i\) = beta value for financial asset i
- \(r_m\) = average return on the capital market

4. Test of CAPM Model Validity

Zhang and Wihlborg [2004], the CAPM states that there is a positive, linear relationship between the stock’s expected returns and its systematic risk, beta, and that beta is a sufficient variable to explain cross-sectional stock returns. The empirical evidence from the developed equity markets generally shows only a weak relationship between betas and returns (Fama and French 1992).

The CAPM predicts a positive linear relation between risk and expected return of a risky asset of the form:

\[
E(r_i) = r_f + \beta_i (r_m - r_f)
\]
Next, based on the method of Fama and MacBeth [1973], beta estimated by regression model:

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + \epsilon_{it}$$  \hspace{1cm} (2)

The $r_{it}$ is the return on stock $i$, $r_{ft}$ is the rate of return on a risk-free asset, $r_{mt}$ is the rate of return on the market index, $\alpha_i$ is the estimate of beta for the stock $i$, and $\epsilon_{it}$ is the corresponding random disturbance term in the regression equation. Equation 1 could also be expressed using excess return notation, where $\{r_{it} - r_{ft} = R_{it}\}$ and $\{r_{mt} - r_{ft} = R_{mt}\}$ (Michailidis, et al., 2006).

The unconditional relationship between the beta and return is estimated as:

$$r_{it} - r_{ft} = \gamma_{it} + \gamma_{ft} + \sigma_{it}$$  \hspace{1cm} (3)

Where the regressions model from Eq. (2) and Eq. (3), $\gamma_{it}$ and $\gamma_{ft}$ are first estimated by OLS. Then, they are averaged by the $t$, respectively. The average value, $\bar{\gamma}_{it}$ or $\bar{\gamma}_{ft}$, is tested whether they are significantly different from zero using the $t$-test of Fama and MacBeth.
(1973). Based on Eq. (2), $\gamma_{ul}$ should be equal to zero and $\gamma_{ur}$ should be significantly positive for a positive risk premium.

Pettengill et al. [1995] in Zhang and Wihlborg [2004] propose a different methodology to estimate the relationship between betas and returns. Their argument is that since the CAPM is estimated with realized returns as proxies for expected returns, it is likely that negative realized risk premium will be observed in some periods. The model of Pettengill et al. is conditional on the realized risk premium, whether it is positive or negative. When the realized risk premium is positive, there should be a positive relationship between the beta and return, and when the premium is negative, the beta and return should be negatively related. The reason is that high beta stocks will be more sensitive to the negative realized risk premium and have a lower return than low beta stocks. According to the methodology of Pettengill et al., the conditional relationship between the beta and return is estimated as:

$$r_{1t} - r_{f1} = \gamma_{02} + \gamma_{12} D \beta_2 + \gamma_{22} (1 - D) \beta_2 + \epsilon_{1t}$$

Where $D$ is the dummy variable that equals one (1) if the realized premium is positive and zero (0) if it is negative, $\gamma_{12}$ is the estimated risk premium in the up market period (with positive risk premia) and $\gamma_{22}$ is the estimated risk premium in the down market
period (with negative premium risk). The average values, $\gamma_{1t}$, $\gamma_{2t}$, $\gamma_{3t}$, are tested for whether they are significantly different from zero using the same $t$-test of Fama and MacBeth (1973). Thus, the null hypotheses can be tested $\gamma_{1t} = 0$, $\gamma_{2t} = 0$ against $\gamma_{1t} \geq 0$, $\gamma_{2t} < 0$. Pettengill et al. (1995) point out that in order to guarantee a positive risk and return tradeoff, two conditions should be met: i) the average risk premium should be positive, and ii) the distribution of the up market periods and down market periods should be symmetric.

5. Research Framework

This thesis re-tests the validity of CAPM model by Sharpe [1964], Lintner [1965] and Mossin [1966] by using sample of Indonesia Stock Exchange (IDX). In the later period, many researchers tested the validity of CAPM model. Black et al. [1972], found that the relation between the average return and beta is very close to linear and the portfolios with high (low) betas have high (low) average returns. Fama [1973], Black tried to retest and they found that there was a positive linear relation between average returns and beta. They investigated that the squared value of beta and the volatility of asset returns can explain the residual variation in average returns across assets which are not only explained by beta. While unsystematic risk or unique risk of each asset is assumed to be eliminated because of diversify. Fama and French [1992] used the same procedure as Fama and McBeth.
[1973], they arrived at very different conclusions. There was not a positive relation between return and risk.

Pettengill et al. [1995], with different method based on estimation, found when the realized risk premium is positive, there should be a positive relationship between the beta and return, and when the premium is negative, the beta and return should be negatively related.

This research retested the CAPM model by Sharpe [1964], Lintner [1965] and Mossin [1966], with the method 'two pass regression’ that was used by Fama and McBeth [1973] and the method used by Pettengill et al. [1995].

Framework

CAPM model by Sharpe [1964], Lintner [1965] and Mossin [1966]

\[
E(r_i) = r_f + \beta_i \lambda
\]
6. **Hypothesis**

This thesis is a research that will test the validity of CAPM model by Sharpe [1964], Lintner [1965] and Mossin [1966]. The CAPM states that there is **commit to user**
a positive linear relationship between the stocks’s expected returns and its systematic risk ($\beta$) and that beta is a sufficient variable to explain cross sectional stock returns (Zhang and Wihlborg, 2004). CAPM suggests that high expected returns are associated with high levels of risk (Michailidis et al., 2006). From this theory, the author proposes hypothesis:

H1: There is not a positive linear relationship between the stock’s expected returns and its systematic risk (beta).

The Sharpe - Lintner CAPM says that the expected value of an asset's excess return (the asset's return minus the risk-free interest rate, $r_t - r_f$) is completely explained by its expected CAPM risk premium (its beta times the expected value of $r_{rs} - r_f$). This implies that “Jensen’s alpha”, the intercept term in the time-series regression, is zero for each asset (Fama and French, 2004). From this theory, the author proposes hypothesis:

H2: The intercept (expected excess return on a zero beta portfolio) is not equal to zero based on CAPM model ($\gamma_0 \neq 0$).

Fama and MacBeth [1973] said, based on CAPM model, in a market of risk-averse investors, higher risk should be associated with higher expected return, that is $(r_{rs} - r_f) > 0$. From this theory, the author proposes hypothesis:
H3: The intercept of remium risk \((\gamma_2 - \gamma_3)\) is not significantly positive \((\gamma_2 \geq 0)\).

Pettengill et al. [1995] argue that when the realized risk premium is positive, there should be a positively relationship between the beta and return, while if the premium is negative, the beta and return should be negatively related since high beta stocks will be more sensitive to the negative risk premium and have a lower return than low beta stocks. Based on the validity test of CAPM procedure, the author proposes hypothesis 4 and 5:

H4: The intercept of premium risk is not significantly positive \((\gamma_1 \geq 0)\) when up market (excess return is positive).

H5: The intercept of premium risk is not significantly negative \((\gamma_1 < 0)\) when down market (excess return is negative).
CHAPTER III

DESCRIPTION OF DATA AND METHODOLOGY

A. Research Method

This research is a case study research that has objective to retest the validity of the theory of CAPM on the stock market in Indonesia with the object of research all companies listed in Indonesia Stock Exchange and qualified as a sample. The observation uses monthly data from December 2003 to December 2009.

B. The Method of Data Collection

Population is the entire group, event, or an interest which will be investigated by researchers (Sekaran, 2000). The population in this study is all companies listed in Indonesia Stock Exchange (IDX). Data of companies’ stock price and the market return are obtained from www.yahoofinance.com, while the risk free asset for the data is obtained from the monthly publication of Bank Indonesia on Bank Indonesia Online Library.

Sekaran [2000], sample is a subset of the population. In this study, the sample is determined by purposive sampling method on the basis of certain criteria. The criteria used include:

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2. The companies traded every month during the period December 2003 - December 2009.

3. The companies have an average positive return during the study period.

Based on these criteria we get 213 enterprises for the sample. The enterprises are in appendix.

C. Analysis Method

The aims of this thesis are to measure the CAPM theory and the evidence in Indonesia capital market. For regression testing, this study uses SPSS software version 16 to know the relationship between risk and return, and also to know the value of intercept. The regression model uses Fama dan MacBeth [1973] procedure “two pass regression”.

The first step is to estimate a beta coefficient for each stock using monthly returns during the period of January 2004 to December 2009. The beta is estimated by regressing each stock’s monthly return against the market index according to the following equation:

\[ r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + e_{it} \]  

\[ 1) \]
The next step is to compute the average of portfolio excess returns of stocks \( r_{kt} \) ordered according to their beta coefficient computed by Equation 1. Let,

\[
    r_{pt} = \frac{\sum_{i=1}^{k} R_{it}}{k}
\]

Where, \( k \) is the number of stocks included in each portfolio, \( p \) is the number of portfolio, and \( r_{pt} \) is the excess return on stocks that form each portfolio comprised of \( k \) stocks each. The procedure used is by dividing all samples to 10 portfolios, so the author gets 22/21 for each portfolio. By forming portfolios, the spread in betas across portfolios is maximized so that the effect of beta on return can be clearly examined. The most obvious way to form portfolios is to rank stocks into portfolios by the true beta. But, all that is available observes beta. Ranking into portfolios by observed beta would introduce selection bias. Stocks with high-observed beta (in the highest group) would be more likely to have a positive measurement error in estimating beta. This would introduce a positive bias into beta for high-beta portfolios and would introduce a negative bias into an estimate of the intercept (Elton and Gruber [1995], p. 333 in Michailidis et al., 2006).

To find hypothesis 1, the first step is compare the relationship of beta and the return on each portfolio and the second step see a scatter plot of linearity beta and return portfolio.
The following equation is used to estimate portfolio betas:

\[ r_{p,t} = \alpha_p + \beta_p, R_m + \epsilon_{p,t} \]  

Where \( r_{p,t} \) is the average excess portfolio return, \( \beta_p \) is the calculated portfolio beta. The study is continued by estimating the ex-post Security Market Line (SML) by regressing the portfolio returns against the portfolio betas obtained by Equation 3. The relation examined is the following:

\[ r_p = r_{p,0} + \gamma_r \beta_p + \epsilon_p \]  

Where, \( r_p \) is the average excess return on a portfolio \( p \) (the difference between the return on the portfolio and the return on a risk-free asset); \( \beta_p \) is an estimate of beta of the portfolio \( p \); \( \gamma_r \) is the market price of risk, the risk premium for bearing one unit of beta risk; \( r_f \) is the zero-beta rate, the expected return on an asset which has a beta of zero, and \( \epsilon_p \) is random disturbance term in the regression equation.

Pettengill et al. (1995) argued that the CAPM models the expected returns, yet, in empirical research the realized returns are used as proxies for the expected ones. Realized returns on the market portfolio often fall below the returns of the risk-free asset, so that negative ex post premium risk are
observed in some periods. They propose an alternative methodology to estimate the relationship between betas and returns. Their model is conditional on whether the realized risk premium is positive or negative. When the realized risk premium is positive, there should be a positive relationship between the beta and return, while when the premium is negative, the beta and return should be negatively related since high beta stocks will be more sensitive to the negative risk premium and have a lower return than low beta stocks (Zhang and Wihlborg, 2004). According to the methodology of Pettengill et al, the conditional relationship between the beta and return is estimated as:

\[ r_{it} - r_{f} = \gamma_{20} + \gamma_{21}D\beta_i + \gamma_{22}(1-D)R_f + \epsilon_{it} \]  

4)
CHAPTER IV

THE RESULT

The main objective of this research is to reexamine the validity of CAPM model by Sharpe [1964], Litner [1965], and Mossin [1966]. This research uses Fama and McBeth [1973] procedure. First step is to estimates a beta coefficient for each stock using monthly returns during the period of December 2003 to December 2009. For calculating beta we need to know the realized return, the market return and the risk free rate.

Realized return

To calculate the stock return, we need the stock price at the end of monthly period. This paper uses 213 sample companies listed in Indonesia Stock Exchange during the period of 2004 - 2009. Table 4.1. shows the value of the stock price 213 companies listed in Indonesia Stock Exchange during the years 2004 - 2009.

To get realized return the author uses the formula:

\[ r_t = \frac{P_t - P_{t-1}}{P_{t-1}} \]
Risk Free Asset ($r_f$)

One form of the financial instrument that can be invested in Indonesia and has risk free is Certificate of Bank Indonesia (SBI). Certificates of Bank Indonesia are issued by the government so it obtains assurance. Risk obtained by investors when investing in this asset is 0 because the certificates are issued and guaranteed by the government (Bank Indonesia), so the possibility of Bank Indonesia is not able to pay interest on the certificates is very small. Return to be received by the investors in accordance with the amount of the interest rate is set by the government. To calculate the return from risk-free asset uses SBI interest rate monthly. The following tables show the value in monthly SBI during the period of 2004 - 2009. The value of monthly $r_f$ will be shown in table 4.1.

To calculate $r_f$, we must find the average interest rate of SBI

$$r_f = \frac{\sum_{t=1}^{n} \text{return of SBI}}{n}$$

Market Risk ($r_m$)

The market risk can be represented by assessing the average Composite Stock Price Index. By looking at the rise and decline in market indices, we can
say whether the market in a state of bullish (up) or bearish (weak). This market
indicts to help investors as an analysis tool in the decision whether to invest in the
stock market or not. We can calculate the market return using the value of the
stock price index (IHSG). The monthly Stock Price Index (IHSG) was shown in
table 4.1.

To calculate $r_m$, we must seek the average level of the Stock Price Index:

$$r_m = \frac{\text{IHSG}_t - \text{IHSG}_{t-1}}{\text{IHSG}_{t-1}}$$

To seek the average of $r_m$, we can use the formula:
Table 4.1. The average of return $E(r_t)$, market risk $r_m$, and risk free asset $r_f$

<table>
<thead>
<tr>
<th>Period</th>
<th>$E(r_t)$</th>
<th>$r_m$</th>
<th>$r_f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec-09</td>
<td>0.037409</td>
<td>0.026737</td>
<td>0.005383</td>
</tr>
<tr>
<td>Nov-09</td>
<td>0.004754</td>
<td>0.004105</td>
<td>0.005392</td>
</tr>
<tr>
<td>Oct-09</td>
<td>-0.02362</td>
<td>0.053403</td>
<td>0.005408</td>
</tr>
<tr>
<td>Sep-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Aug-09</td>
<td>-0.0236</td>
<td>0.053403</td>
<td>0.005408</td>
</tr>
<tr>
<td>Jul-09</td>
<td>0.004754</td>
<td>0.004105</td>
<td>0.005392</td>
</tr>
<tr>
<td>Jun-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>May-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Apr-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Mar-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Feb-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Jan-09</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Dec-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Nov-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Oct-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Sep-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
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<tr>
<td>Aug-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
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<td>Jul-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
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<td>Jun-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
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<tr>
<td>May-08</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
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<td>Apr-08</td>
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<td>0.041731</td>
<td>0.005483</td>
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<td>0.041731</td>
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<tr>
<td>Feb-08</td>
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<td>0.041731</td>
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<td>Jan-08</td>
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<td>Nov-07</td>
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<td>0.041731</td>
<td>0.005483</td>
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<td>Oct-07</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
<tr>
<td>Sep-07</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
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<td>Aug-07</td>
<td>0.055655</td>
<td>0.041731</td>
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<td>Jul-07</td>
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<td>0.041731</td>
<td>0.005483</td>
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<td>Jun-07</td>
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<td>Apr-07</td>
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<td>0.005483</td>
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<tr>
<td>Jan-07</td>
<td>0.055655</td>
<td>0.041731</td>
<td>0.005483</td>
</tr>
</tbody>
</table>

Average $E(r_t)$ | $r_m$ | $r_f$ |
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.032154</td>
<td>0.021858</td>
<td>0.007432</td>
</tr>
</tbody>
</table>

Max $E(r_t)$ | $r_m$ | $r_f$ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1822882</td>
<td>0.201315</td>
<td>0.016025</td>
</tr>
</tbody>
</table>

Min $E(r_t)$ | $r_m$ | $r_f$ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.14662</td>
<td>-0.31422</td>
<td>0.005383</td>
</tr>
</tbody>
</table>

Source: Bank Indonesia Data and [www.yahoofinance.com](http://www.yahoofinance.com) (data are processed)
From the average value of $r_m$ and $r_f$, we can see that the average value of risk free asset is (0.7432%) par month. That is lower than the average value of (market return) which amounted to 2.1858%. The difference between these two values is at 1.4426%. This shows that investing in the period 2004-2009 in the Indonesia Stock exchange would be more profitable than investing in certificate of Bank Indonesia.

Equation 1

The first part of the methodology requires the estimation of betas for individual stocks by using observations on rates of return for a sequence of dates. Useful remarks can be derived from the results of this procedure, for the assets used in this study. The range of the estimated stock betas is between -0.92 the minimum and 0.88 the maximum.
Table 4.2.
Stock beta coefficient estimates

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Beta</th>
<th>No</th>
<th>Name</th>
<th>Beta</th>
<th>No</th>
<th>Name</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AALI</td>
<td>0.56</td>
<td>26</td>
<td>BBNI</td>
<td>0.671</td>
<td>51</td>
<td>CKRA</td>
<td>0.422</td>
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<tr>
<td>2</td>
<td>ABDA</td>
<td>0.033</td>
<td>27</td>
<td>BBNP</td>
<td>0.069</td>
<td>52</td>
<td>CLPI</td>
<td>0.21</td>
</tr>
<tr>
<td>3</td>
<td>ADES</td>
<td>0.245</td>
<td>28</td>
<td>BBRI</td>
<td>0.765</td>
<td>53</td>
<td>CMNP</td>
<td>0.448</td>
</tr>
<tr>
<td>4</td>
<td>ADMF</td>
<td>0.265</td>
<td>29</td>
<td>BCAP</td>
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<td>54</td>
<td>CMPP.JK</td>
<td>0.1</td>
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<td>5</td>
<td>ADMG</td>
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<td>30</td>
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<td>55</td>
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<tr>
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<td>AIMS</td>
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<td>BHIT</td>
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<td>57</td>
<td>CNTXJK</td>
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<tr>
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<td>AISA</td>
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<td>CPDWJK</td>
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<tr>
<td>9</td>
<td>AKPI</td>
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<td>34</td>
<td>BKSW</td>
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<td>CTTTHJK</td>
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<tr>
<td>10</td>
<td>ALMI</td>
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<td>35</td>
<td>BLTA</td>
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<td>60</td>
<td>DARTJK</td>
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<tr>
<td>11</td>
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<td>BMRI</td>
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<td>DLTAKJ</td>
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</tr>
<tr>
<td>12</td>
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<td>37</td>
<td>BMSR</td>
<td>0.081</td>
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Source: Data are processed
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Source: Data are processed
Based on the table 4.1., it can be concluded that the 213 companies sampled, all companies are the companies that have defensive stock because they have the value ($\beta < 1$). The minimum value of beta in this sample is -0.92, the maximum is 0.88 and the average is 0.2726.

Investors who are rational will choose the investment that is less risky if they are faced with two investment options that provide the same return with a different risk. Investors can assess the relationship between risk and return by using the approach of Capital Assets Pricing Model (CAPM) to assess the appropriate investment choices. Measurement of risk in the CAPM uses a $\beta$ from the previous calculation, while the return is measured by summing the risk-free asset return with the excess of the average market return and return risk-free asset. Difference in average-market return and return risk-free asset is also called the Risk Premium.

In order to diversify away most of the firm-specific part of returns, thereby enhancing the precision of the beta estimates, the securities are previously combined into portfolios. This approach mitigates the statistical problems that arise from measurement errors in individual beta estimates. These portfolios are created for several reasons: (i) the random influences on individual stocks tend to be larger compared to those on suitably constructed portfolios (hence, the intercept and beta are easier to estimate for portfolios) and (ii) the tests for the intercept are easier to implement for portfolios because by construction their estimated coefficients are less likely to be correlated with one another than the shares of individual companies.
Equation 2

The article argues that certain hypotheses can be tested no matter of whether one believes in the validity of the simple CAPM or in any other version of the theory. Firstly, the theory indicates that higher risk (beta) is associated with a higher level of return. However, the results of the study do not support this hypothesis. The beta coefficients of the 10 portfolios do not indicate that higher beta portfolios are related with higher returns. For example the portfolio 1 with beta value -0.265 has return 0.034517 and portfolio 2 who has lower return 0.031161, in contrast has higher beta 0.269. And portfolio 4 who has lower return 0.019933 than portfolio 2, it has higher beta value of portfolio 2 0.415. These contradicting results can be partially explained by the significant fluctuations of stock returns over the period examined (Table 4.3). The intercept in all of portfolio is not equal to zero too.
Table 4.3.
Average excess portfolio returns and betas

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</table>

From the table 4.3, we can say that we can not accept hypothesis, is that, there is not a positive liner relationship between the stock’s expected returns and its systematic risk (beta). The higher risk (beta) does not associate with a higher level of return.

The Sharpe - Lintner CAPM predicts that the portfolios plot along a straight line, with an intercept equal to the risk-free rate, $r_f$, and a slope equal to the expected excess return on the market, $(r_m - r_f)$. We use the one-month Certificate of Bank Indonesia rate and the market return of enterprises in Indonesia Stock exchange for 2004 - 2009 to estimate the predicted line in figure 2. From this figure we can not see that there is relation between return and beta.
Equation 3

In order to test the CAPM hypothesis 2 and 3, it is necessary to find the counterparts to the theoretical values that must be used in the CAPM equation. In this study the Certificate of Bank Indonesia on the 1-month is used as an approximation of the risk-free rate $r_f$. For $r_m$, the Composite Stock Index of Indonesia Stock Exchange is taken as the best approximation for the market portfolio.

The basic equation used is

$$r_p = r_0 + r_1 \beta_p + \epsilon_p$$
Where \( r_0 \) is the expected excess return on a zero beta portfolio and \( \gamma_2 \) is the market price of risk, the difference between the expected rate of return on the market and a zero beta portfolio. This regression model was tested by Fama and MacBeth (1973) model. Based on the CAPM theory \( \gamma_0 \) should be equal to zero and \( \gamma_1 \) should be significantly positive for a positive risk premium.

One way for allowing to the possibility that the CAPM does not hold true is to add an intercept in the estimation of the SML. The CAPM considers that the intercept is zero for every asset. Hence, a test can be constructed to examine this hypothesis.

### Table 4.4
Statistics of the estimation of the SML by Fama and MacBeth (1973) Model

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>( r_0 )</th>
<th>( \gamma_1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.034</td>
<td>-0.018</td>
</tr>
<tr>
<td>p-value</td>
<td>0.000*</td>
<td>0.000*</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.811</td>
<td></td>
</tr>
</tbody>
</table>

Source: Data are processed by SPSS

The results in table 4.4 indicate that the CAPM’s prediction for \( r_0 \) is that it should be equal to zero. The calculated value of the intercept is small (0.034) but it is not significantly different from zero (the p value is not greater than 0.005). Based on the intercept criterion the CAPM hypothesis 2 is clearly
rejected. Based on CAPM model, intercept (expected excess return on a zero beta portfolio) is not equal to zero.

According to CAPM the intercept of beta, $\beta_1$ (risk premium) should be positive. The value of $\beta_1$ is -0.018 (negative), so we can conclude that based on Fama and MacBeth (1973) model, we reject the hypothesis 3 that the intercept of premium risk ($\mu_m - \mu_p$) is not significantly positive ($\beta_1 \neq 0$).

From the hypothesis 2 and 3 we conclude that we can not accept the base theory CAPM that intercept is equal to zero and premium risk is positive.

**Equation 4**

The last test, we test the propose methodology from Pettengill et al. [1995] to estimate the relationship between betas and returns. Their model is conditional on the realized risk premium, whether it is positive or negative. When the realized risk premium is positive, there should be a positive relationship between the beta and return, and when the premium is negative, the beta and return should be negatively related. The reason is that high beta stocks will be more sensitive to the negative realized risk premium and have a lower return than low beta stocks.

$$r_{it} - r_{ft} = \gamma_0 + \gamma_1 \beta_i + \gamma_2 (1 - D) \beta_i + \gamma_3 e_t$$

**Table 4.5.**


<table>
<thead>
<tr>
<th>Coefficient</th>
<th>$\gamma_1$</th>
<th>$\gamma_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_3$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
The results in table 4.5 indicate that the coefficients for $\gamma_1$ (0.134) is positive and those for $\gamma_2$ (-0.026) is negative. All the coefficients are significant. These results indicate that shares with higher betas have higher returns when the local market excess return is positive and lower returns when the local market excess return is negative. So, I can conclude that I can accept hypothesis 4 and 5, based on CAPM model by Pettengill et al. (1995), intercept of premium risk is significantly positive ($\gamma_1 > 0$) when up market (excess return is positive) with p value 0.037, and intercept of premium risk is significantly negative ($\gamma_2 < 0$) when down market (excess return is negative) with p value 0.016. The intercept $\gamma_0$, is not equal to zero too.

| $\gamma_0$ | 0.066 | 0.038 |
| Value      | 0.134 | -0.026 |
| p-value    | 0.037 | 0.016 |
| $R^2$      | 0.777 |       |

Sorce: Data are processed by SPSS
CHAPTER V

CONCLUSION

This thesis examines the validity of the CAPM for the all of stock in Indonesia Stock Index (IDX). The study uses monthly stock returns from 213 companies listed on the Indonesia Stock Exchange from December 2003 to December 2009. The data of return individual \((r_i)\) and stock price index for measure market risk \((r_m)\) are obtained from www.yahoofinance.com. And for variable risk free asset we use certificate of Bank Indonesia and get data from library online of Bank Indonesia.

From the average value of \(r_m\) and \(r_f\), we can see that the average value of risk free asset (0.7432%) par month is lower than the average value of (market return) which amounted to 2.1858%. The difference between these two values is at 1.4426%. This shows that investing in the period 2004-2009 in the Indonesia Stock exchange would be more profitable than investing in certificate of Bank Indonesia.
Based on the result of the betas value from each enterprise, we can conclude that the 213 companies sampled, all companies, are the companies that have defensive stock because they have the value ($\beta < 1$). The minimum value of beta in this sample is -0.92, the maximum is 0.88 and the average is 0.2726.

The findings of this thesis are: we don’t accept hypothesis 1, 2, 3. From the result we can see that the beta coefficients of the 10 portfolios do not indicate that higher beta portfolios are related with higher returns. The CAPM’s prediction for $\beta$ is that it should be equal to zero. Based on CAPM model, intercept (expected excess return on a zero beta portfolio) is not equal to zero, and based on the intercept criterion of the CAPM the hypothesis is clearly rejected.

According to CAPM the intercept of beta, $\beta_i$ (risk premium) should be positive. The result is based on Fama and MacBeth (1973) model, we reject the hypothesis 3 that premium risk ($\mu_{m} - \mu_{f}$) is not significantly positive ($\beta > 0$).

The last, the result of hypothesis 4 and 5 indicate that the coefficients for $\beta_1$ is positive and these for $\beta_2$ is negative. All the coefficients are significant. So, I conclude that I can accept hypothesis 4 and 5.

**Limitation and Advice**

This study has limitation in the selection of Certificate of Bank Indonesia (SBI) as variable of risk free asset. Bank Indonesia Certificates less able to represent the risk free asset because it has volatility, so it hasn’t variance 0. In the
future studies researchers should use other types of risk-free investment that can represent more risk-free rate such as government bonds interest rates that relatively has stable value. And for the future studies researchers could test CAPM model that is being developed by researchers and financial practitioners with multi-beta model also. In the multi-beta model market risk is measured against the risk factors that determine the behavior of asset returns, while the CAPM only measure the risks associated with market returns. Risk factors in a multi-beta model include all the risks that can not be diversified.