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## Portfolio Optimization Using the Capital Asset Pricing Model (CAPM) at the IDX-30 Index company on the Indonesia Stock Exchange (IDX)

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### Abstract

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The purpose of this study was to find out how to optimize portfolios using the Capital Asset Pricing Model (CAPM) method at IDX-30 Index companies on the Indonesia Stock Exchange (IDX). This model based itself on equilibrium conditions. In market equilibrium conditions, the level of return required by investors for a stock would be affected by the risk of the stock.

### Keywords:

Return;  
Risk;  
CAPM;

The research method used was a descriptive method that explained how to optimize the portfolio using the CAPM method. This method focused on solving existing problems or actual problems. The data collected was initially arranged, explained and then analyzed (this method was often called the analytic method). In this study the data had been analyzed using the formula  $CAPM\ k_i = R_f + \beta_i(ER_m - R_f)$ .

Based on the results of the calculation of the CAPM analysis showed that shares of Lippo Karawaci Tbk with a risk level of -0.027395 and an expected rate of return of 5.2% were stocks that had the highest rate of return with little risk. There were also four stocks that had a high rate of return with little risk, namely Matahari Department Store Tbk shares had a risk level of -0.01845 and a return rate of 5.1%, shares of Bank Rakyat Indonesia (Persero) Tbk had a risk level of -0.015186 and a rate of return of 5.1%, Sawit Sumbermas Sarana Tbk had a risk level of -0.013846 and a rate of return of 5.1%, Indonesian cement shares (Persero) Tbk had a risk level of -0.00988 and the level a return of 5.1%. These stocks were stocks that formed portfolio optimization at the IDX-30 stock index on the Indonesia Stock Exchange.

Thus, the Capital Asset Pricing Model (CAPM) could explain how to optimize portfolios at the IDX-30 stock index. It could also be concluded that the optimal stock among stocks at the IDX-30 index was LPKR shares. While the efficient shares were LPPF shares, BBRI shares, SSMS shares, SMGR shares.

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## **1. Introduction**

The Indonesian Capital Market has shown a significant development, evidenced by the growing number of investors and the increase of desire from the business community to find out the sources of financing other than banks. Companies can get funding by selling their ownership in the form of financial instruments to the wider community through the issuance of shares in the capital market, in this case a company that has gained a status as a Go-Public Company or a company that has made an Initial Public Offering (IPO).

Maringka (2008: 4) states that the announcement of a public offering (IPO) issued by the company containing information that causes the market to react, and have fluctuating abnormal returns. Prospectus information becomes a factor that is considered by investors in making investment decisions. One of the investment forms in the capital market is stock investment. Shares can be defined as a sign of capital participation of a person or party (business entity) in a company or limited liability company. In stock investing, all investors who make investments expect a rate of return in accordance with the invested funds. However, the expected rate of return by the investors does not always the same with the actual rate of return which will be obtained, so that they do not know certainly the obtained results from the stock investments. This situation shows that the investors face risks in investing. There are two types of risk in a portfolio, namely systematic risk, and non-systematic risk. Systematic risk is a risk that cannot be avoided by the investors or is a common market risk which can affect the stock returns in the market. Non-systematic risk is a risk which is not common in the company and can be minimized by diversifying.

Diversify by forming a portfolio that is buying a large number of shares and investing funds into those shares. But the problem is how much proportion of funds must be invested in each stock in order to obtain the desired return with the minimum risk.

Capital Asset Pricing Model is a model that can determine the relationship between risk and obtained return by the investors in market equilibrium. In market equilibrium, the level of return required by the investors for a stock will be affected by the risk of the stock. Variable (Beta) is a measure of risk used in the Capital Asset Pricing Model. The greater an index, the greater the risk contained therein. The market rate of return used is the average rate of return on investment opportunities in the capital market (market index). In this case the IDX-30 index fluctuation value is used.



The IDX-30 index is an index consisting of 30 shares whose constituents are selected from the LQ-45 index constituents. The selected stocks from LQ-45 because the LQ-45 Index can provide a stock performance with high liquidity and large market capitalization. With a portfolio formed from the index, it can make it easier for the investors to choose an optimal and efficient portfolio with expected returns and certain risks.

## 2. Literature Review

### 1. Stock returns

According to Jogiyanto (2015), Return is the result obtained from investment. Return can be a realized return, which is an occurred return, and also expected return which is a return that has not yet occurred but is expected to occur in the future. Another understanding according to Jogiyanto (2015), stock returns can be defined as the change in value between the period  $t + 1$  with the period  $t$  added to the other incomes that occur during the period  $t$ . Return is the results obtained from stock investments consisting of capital gains (losses) and yields. Capital gain is the difference in profit (loss) from the relative current investments to the prices of the previous period. Yield is a percentage of periodic cash demand for the investment price of a certain period of an investment.

Stock returns can be calculated using the following formula:

$$R_{it} = \frac{P_t - (P_{t-1})}{P_{t-1}}$$

(Jogiyanto, 2015)

In which :

$R_{it}$  = Actual return of company I in period  $t$

$P_t$  = Company stock price I in period  $t$

$P_{t-1}$  = Company stock price I in period  $t - 1$

In addition to stock returns, there is also a market return ( $E(R_{mt})$ ) which can be calculated using the following formula:

$$R_m = \frac{IHS_{Gt} - (IHS_{Gt-1})}{IHS_{Gt-1}}$$

(Jogiyanto, 2015)

In which :

$R_m$  = Expected market return of the 1st stock for the  $t$ -period



IHSG<sub>t</sub> = Composite stock price index in period t

IHSG<sub>t-1</sub> = Composite stock price index in the t-1 period

## 2. Beta ()

According to Jogiyanto (2015), Beta is a systematic risk gauge of a stock or relative portfolio to the market risk. Beta also functions as a measurement of the volatility of stock returns, or portfolios of market returns. Volatility is the fluctuation in the return of a stock or portfolio in a given period, if statistically those fluctuations follow the fluctuations of the market returns, then it is said that the beta of the security is one. The stock beta can be formulated as follows:

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)}$$

(Ross et al, 2003)

In which :

Variances  $\text{Var}(R_m)$  = Overall return of capital market assets

Covariance (Cov), between = \* Individual asset return value ( $R_i$ )

\* Market return value ( $R_m$ )

## 3. Risk Free Assets

Risk-free assets are assets that guarantee the future returns. Risk-free assets in Indonesia are indicated by the interest rates of Bank Indonesia Certificates (Husnan, 2015).

## 4. Efficient Portfolio

An efficient portfolio is a portfolio that produces a certain level of profit with the lowest risk, or a certain risk with the highest level of profit. Every portfolio located in an frontier efficient is an efficient portfolio (Husnan, 2015).

## 5. Optimal Portfolio

The optimal portfolio is the best portfolio chosen by investors among the available efficient portfolios. By analyzing the optimal portfolio in investing, investors can determine the best stocks so they can invest in stocks that are included in the optimal portfolio (Husnan, 2015).

## 6. Capital Asset Pricing Model (CAPM)

According to Husnan (2015), the Capital Asset Pricing Model (CAPM) is a balance model that connects the level of risk, and the level of expected profit (Expected Return).

The assumptions underlying the formation of the CAPM (Husnan, 2015) are as follows :



1. There are no transaction fees. Based on this assumption, investors can buy or sell securities without covering transaction costs.
2. Investment can be fragmented (diversified). That is, investors can make the smallest investment for each type of security.
3. There is no income tax.
4. Investors cannot determine prices individually.
5. The investor's consideration is the expected value.
6. Investors can make short sales.
7. Investors can borrow and lend at the same interest rate.
8. Investors have homogeneous expectations.
9. All assets can be traded.

Referring to the assumptions used, then in the CAPM only systematic risk or market risk is calculated as the level of risk. Thus, the CAPM mathematical equation can be arranged in estimating stock returns as follows (Husnan 2009):

$$k_i = R_F + \beta_i (E(R_m) - R_F)$$

In which :

$k_i$  = The level of return required by investors in securities  $i$

$R_F$  = Risk-free rate of return ( Calculated on average interest rate of Bank Indonesia Certificate ) monthly applicable to Bank Indonesia for the period February 2016 to July 2018.

$\beta_i$  = Beta coefficient of securities  $i$

$E(R_m)$  = Expected market of portfolio return

### 3. Research Method (12pt)

This research was conducted at the companies on IDX-30 Index whose shares are traded on the Indonesia Stock Exchange with the method used was the quantitative method, in the form of data on monthly closing price reports incorporated in IDX-30 shares on the Stock Exchange Indonesia and Bank Indonesia Certificate Interest Rates. The population in this study was IDX-30 shares on the Indonesia Stock Exchange during the February 2016 period until July 2018. And the researcher determined 21



companies to be sampled based on criteria established by the researcher. To find out how to optimize portfolios using the Capital Asset Pricing Model (CAPM) method on IDX-30 index companies at the Indonesia Stock Exchange (IDX), thus the data analysis method used in this study was the Capital Asset Pricing Model (CAPM).

The stages carried out in data analysis according to Rumondor (2016) were as follows :

1. Calculate the rate of return of individual shares ( $R_i$ ) with the following formula:  $R_i = \frac{P_t - P_{t-1}}{P_{t-1}}$
2. Calculate the market rate of return ( $R_m$ ) with the following formula:  $R_m = \frac{IHS_{Gt} - IHS_{Gt-1}}{IHS_{Gt-1}}$
3. Calculate the systematic risk of each stock ( $i$ ) with the following formula:  $iCov (R_i, R_m) / Var (R_m)$
4. Calculate the profit rate of a CAPM model stock index with the following formula:  $k_i = R_f + i(E (R_m) - R_f)$
5. Selecting the best stocks that had optimal profits by ranking the stocks on IDX-30 based on the CAPM calculation.

#### 4. Results and Analysis (10pt)

Based on the above analysis, the results which could be obtained were as follow :

1. From the results of the calculation of the rate of return of shares  $E (R_i)$ , it could be explained that the price of each share fluctuated according to the demand and supply of stock prices. The level of negative stock returns was caused by negative sentiments from the stock market players about the conditions that affected the company, as well as the rate of positive stock returns caused by the positive perceptions of the stock market players about the conditions affecting the company.
2. From the results of the calculation of the market profit rate ( $R_m$ ) seen in table 4.25, it could be concluded that the stock index was positive because at that time the market experienced an increase in transaction or trade volumes which resulted in an increase of stock prices. The stock index was negative, because at that time the market experienced a decrease in trading volume, which affected the majority of the stock prices, and experienced a decline.



3. From the calculation of the level of risk of individual shares seen in table 4.26 as a whole of each of these companies, it could be concluded that all shares in the IDX-30 index were defensive stocks that had a less than one risk level. Which meant that the overall level of profit of each stock in the IDX-30 index increased smaller than the overall profit level of shares in the market. This indicated that the systematic risk of each stock in the IDX-30 index was smaller than the systematic risk of the market.
4. From the calculation based on the Capital Asset Pricing Model (CAPM), the 5 best stocks for portfolio formation were selected namely LPKR, LPPF, BBRI, SSMS, SMGR shares.
5. From the results of the calculation of the CAPM analysis showed that LPKR shares with a risk level of -0.027395 and an expected rate of return of 5.2% were stocks that had the highest rate of return with little risk. There were also four stocks that had a high rate of return with little risk, namely LPPF shares had a risk level of -0.01845 and an expected rate of return of 5.1%, BBRI shares had a level of risk of -0.015186 and a high rate of return expected at 5.1%, SSMS shares had a risk level of -0.013846 and an expected return of 5.1%, SMGR shares had a risk level of -0.009883 and an expected rate of return of 5.1%.

Thus, the Capital Asset Pricing Model (CAPM) could explain how portfolio optimization at the IDX-30 Index Company. The three studies above showed that the shares mentioned above had the highest rate of return with a low level of risk. And from the stocks that were included in the sample selection criteria at the IDX-30 stock index in the February 2016 period until July 2018, 5 best stocks were selected for portfolio formation, namely LPKR, LPPF, BBRI, SSMS, SMGR shares.

#### **4. Conclusion (10pt)**

1. Portfolio Optimization using the Capital Asset Pricing Model (CAPM) explained that stocks which were optimal portfolios on the IDX-30 index were stocks that had a low level of risk and expected returns of high  $E(R_i)$ . Thus efficient shares were obtained according to the CAPM calculation, namely LPPF, BBRI, SSMS, SMGR shares. While the optimal stock according to the CAPM calculation was LPKR shares.



2. With this Portfolio Optimization, it was expected that the investors could invest their fund properly so that they could get a maximum profitability with a certain risk rate, or a certain profit rate with the minimum risk rate at the next period.

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