Comparison of Optimal Portfolio Performance Between Single Index Models and Markowitz Models  
(Case Study of Daily Return Implementation of OJK Rules Regarding Investments of State Values For Non-Bank Financial Institutions 2016-2017)

1) Kaolina Savitri Setyantho  
2) Sasmito Hadi Wibowo  
Postgraduate Program in Management in Trisakti University  
E-mail: Savitrikaolina@yahoo.com

ABSTRACT

The problem of this research is the implementation of optimal portfolio of Government Security investment by Non-Bank Financial institutions. Otoritas Jasa Keuangan (OJK) provides rules for it. This study utilizes several financial indexes to find the optimal portfolio. Some portfolios are developed and tested by comparing risk levels through single index model and Markowitz Models. Furthermore, the returns of standard deviation and coefficient of variance are used to identify this optimal model. The result shows that developing optimal portfolio through Single Index Model yields higher expected return than that of Markowitz Model. Choosing Kompas 100 Index as the reference index may help higher expected return. Due to the nature of the Indonesia Health Care Agency, is suggested that agency is excluded from the Financial Service Authority rules regarding obligation and stock investment. The limitation of this research is as follows: it focuses on two approaches, analyses on investment obligations and stocks, and the healthcare agency only.

Keywords: Infovesta Index; Kompas 100 Stock; Corporate Bonds; SBN; Optimal Portfolio; Return; Single Index Model; Markowitz Model.
INTRODUCTION

In 2016 the Financial Services Authority issued a regulation for Non-Bank Financial Institutions to fulfill the obligations of part of their Investments in Government Securities (SBN) within the stipulated deadline.

Table 1: Minimum SBN Investment (%) in Non-Bank Financial Institutions

| No. | Company          | Minimum SBN Investment             | Time Target          |
|-----|------------------|------------------------------------|----------------------|
| 1   | Life insurance   | 20% of the total investment        | 31 Dec 2016          |
|     |                  | 30% of the total investment        | 31 Dec 2017          |
| 2   | General insurance| 10% of the total investment        | 31 Dec 2016          |
|     |                  | 20% of the total investment        | 31 Dec 2017          |
| 3   | Reinsurance      | 10% of the total investment        | 31 Dec 2016          |
|     |                  | 20% of the total investment        | 31 Dec 2017          |
| 4   | Guarantee Agency | 10% of the total investment        | 31 Dec 2016          |
|     |                  | 20% of the total investment        | 31 Dec 2017          |
| 5   | Pension fund     | 20% of the total investment        | 31 Dec 2016          |
|     |                  | 30% of the total investment        | 31 Dec 2017          |
| 6   | BPJS Employment  | 50% of the investment amount       | 31 Dec 2016          |
|     |                  | Old Age Insurance Program          |                      |
|     |                  | 50% of the investment amount       | 31 Dec 2016          |
|     |                  | Accident Insurance Work Program    |                      |
|     |                  | 50% of the total investment        | 31 Dec 2016          |
|     |                  | Death Guarantee Program            |                      |
|     |                  | 30% of the total investment        | 31 Dec 2016          |
| 7   | Health BPJS      | 30% of the total investment        | 31 Dec 2016          |

Source: PEROJK Number 1 / POJK / 2016 2016
In the regulation of the Financial Services Authority (OJK) Number 1 / POJK.05 / 2016 article 1 (one) referred to as a non-bank Financial Institution is:

Life Insurance Company, is an agency that provides protection services in the form of transferring economic risk to the insured or policy holder for loss, damage, or legal liability and costs incurred due to a disaster that befell the policyholder.

General Insurance Company is a service agency that has services in terms of handling losses or risks caused by an uncertain event.

Reinsurance Company, is a service agency that has services in terms of providing guarantees for an effect experienced by other insurance companies.

Guarantee Institution is a guarantee company, sharia guarantee company, re-guarantee company, and sharia re-guarantee company that runs guarantee activities.

Pension fund is an institution formed by a company that is used as a container in terms of fund collection in order to improve the welfare of its employees in the future.

BPJS Employment, the Social Security Organizing Body better known as the BPJS is a legal institution that was established with the aim of implementing a social security program. The Employment Social Security Administration Agency in accordance with the law implements 4 social security programs, namely Guarantees for Old Age, Guarantees at retirement, Guarantees in the event of an accident at work, and guarantees when they die. Funds for each program are separate funds in accordance with the program. Funds per program cannot cross each other.

BPJS Health, the Social Security Organizing Agency called BPJS is a legal institution that is directed to implementing social security programs. The Health Insurance Administering Agency in accordance with the law implements a health insurance program (Ramli, 2013; Ramli & Sjahruddin, 2015; Imran & Ramli, 2019; Ramli & Maniagasi, 2018; Ramli & Yudhistira, 2018). The national social security system is a program established by the state with the aim of providing certainty in terms of the protection and welfare of the Indonesian people and to realize this it is necessary to establish an organizing body in the form of a legal entity based on the principles of mutual cooperation, non-profit, openness, prudence, accountability, portability, membership in nature mandatory, mandate funds, and the results of the management of social security funds entirely for the development of the program and for the maximum benefit of participants (Law No. 24 of 2011).
The current slowing economic conditions have forced the government to act to think about funding sources to finance long-term programs by issuing SBN. The characteristics of this SBN are very much in accordance with the characteristics of non-bank financial service institutions which are long-term investors (Explanation of PEROJK No. 1 / POJK.05 / 2016).

Herwin Surajman Purba (2017), said that the need for funds in the state budget and the increase in the portion of government debt is one of the reasons for the emergence of regulations regarding the minimum investment obligation on Government Securities (SBN) and the maximum time limit for Non-Bank Financial Services Institutions to implement these regulations.

The selection of portfolios for investments is done by considering the level of risk and the rate of return. The optimal portfolio is prepared with the best combination of return and risk (Takaya, Ramli & Lukito, 2019). One model in determining the optimal portfolio is the Markowitz model. In 1952 Harry Markowitz introduced the portfolio selection model. The Markowitz model identifies portfolios that are in the efficient set. According to Marcin Sirucek and Lukas Kren (2015), the Markowitz Model is assumed to have different security options that are very risk-dependent. In capital market theory, an investor can put assets without risk into a portfolio if it has a fixed rate of return.

Minimum investment obligation and time limit of SBN investment for non-bank financial institutions (table 1.1). Based on the report on the debt profile and central government guarantees the portion of government debt through Government Securities is 80.9% and is the largest portion. Because of this, the government hopes that the Government Securities that have been and will be issued can be absorbed domestically and the issuance of government regulations regarding the obligations of non-bank financial institutions to invest their funds in SBN to support the government's expectations. In addition to funding requirements for the government, OJK's consideration in issuing the regulation is to anticipate investment placements in accordance with the characteristics of non-bank financial service institutions which are more dominated by long-term investments and consider the level of investment security.

This research is a replication of Herwin Surajman Purba's research (2017) which in his research Herwin analyzed the impact of the implementation of Financial Services
Authority Regulation Number 1 / POJK.05 / 2016 on Portfolio Management in Non-Bank Financial Institutions, where in this study Herwin used the Markowitz method to find the optimal portfolio composition. The update in this study is that there is an additional 1 (one) method as a comparison of the Markowitz method used in weighting the optimal portfolio. Optimal portfolio is the single index model method. In addition, in this study, what SBN will be elaborated which gives the best return among the SBN options. It has been stated in OJK Regulation number 1 / POJK.05 / 2016 which has been renewed to OJK Regulation number 36 / POJK.05 / 2016 and made a second change to OJK Regulation number 56 / POJK.05 / 2017. Based on the explanation of this background, the title of this study is: "COMPARISON OF OPTIMAL PORTFOLIO PERFORMANCE BETWEEN SINGLE INDEX MODELS AND MARKOWITZ MODELS (IMPLEMENTATION OF OJK REGULATIONS ON INVESTING OF VALUABLE LETTERS."

LITERATURE REVIEW

Money Market, consists of short-term securities issued by the government, banks and other public companies.

Capital Market, a market that has a long-term effect in the form of debt or equity (equity) and other derivative products.

Some types of securities (securities) offered on the Indonesia Stock Exchange are:

Stock is one of the instruments that can be used as a sign of capital participation made by investors in a company. Stocks are investment instruments that are most in demand by investors, because they are able to provide a high rate of return. As the owner, shareholders have special rights, namely proportional voting rights in various important decisions in the company, among others in terms of electing the Board of Directors, priority rights in the purchase of new shares the company issues, as well as rights to assets owned by the company (in accordance with the portion of shares owned by investors) if in the future the company experiences liquidation. In addition to these privileges, shareholders will get income from the company in the form of dividends, dividends distributed normally in cash and referred to as cash dividend.

Bonds. Bonds are one of the securities offered by the Indonesia Stock Exchange in the form of medium / long term debt instruments, bonds are also used as proof of debt. The
bonds contain promises of bond issuers to provide interest payments and repay principal debts to bond buyers at maturity. The value of a bond is in the form of maturity, market value and intrinsic value of the bond. Bonds can be distinguished according to their issuers, consisting of Government Bonds and Corporate Bonds.

**Mutual funds**, is an effect that explains or indicates that the owner entrusts a sum of money to a mutual fund company or Investment Manager, which will later be used as investment capital both in the capital market and in the money market.

**Investment** is a commitment to a number of funds or resources made at this time and has the goal of obtaining a number of benefits in the future (Tandelilin, 2010; Ramli, 2016a; Ramli, 2016b; Mariam & Ramli, 2017; Mariam & Ramli, 2019; Ramli, 2016b; Puteri & Ramli, 2017). Investment is an activity undertaken to delay consumption today for consumption in the future, with the expectation that future values are higher than today's values (Ramli, 2017a; Ramli, 2017b; Gumanti, 2011; Ramli, 2018a; Ramli, 2018b). People who make investments are referred to as investors (Mariam, 2016; Ramli, 2019). Investment is a delay in current consumption and is used in efficient production for a certain period of time (Takaya, Ramli and Lukito, 2019; Jogiyanto, 2014; Ramli, 2010; Ramli, 2012a; Ramli, 2012b).

**The rate of return**, according to Hanafi and Halim (2012), the rate of return of shares is also referred to as stock income where it is caused by changes in the value of the period t stock price with t-1 so that the higher the change in stock prices the higher the rate of return of shares produced.

**Risk**

**Market risk** is a part of risk where the part cannot be eliminated by diversification. This is measured by the beta coefficient. Diversified risks are also known as company specific risks, part of the total security risk associated with random events that does not affect the overall market. This risk can be eliminated by proper diversification (Brigham and Houston (2013).
Information:
\( \sigma \): Standard deviation (SD)
\( R_i \): Realized return of \( i \) stock \( i \)
\( E(R_i) \): Average realized stock return \( i \)
\( n \): Total realized stock return \( i \)

**Portfolio Management**, Herwin Surajman Purba (2017), said that portfolio management has to do with the combination of investments from assets available in the capital market. The formation of a portfolio considers the expected rate of return and the level of risk measured. Each investor will consciously form a portfolio that provides a rate of return as expected with a small level of risk, so that it will greatly depend on the objectives of the investment that each investor wants to achieve.

**Optimal portfolio of the Markowitz method**
The Markowitz method calculates the optimal risk, which is the smallest risk (minimum variance portfolio) or MPV. The optimal measurement concept used is the smallest risk with the expected rate of return that follows it. The method of calculating optimal risk is in accordance with the preferences of investors, both investors who like risk (risk takers) and investors who do not like risk (risk averse). The optimal measurement concept used is a portfolio that provides the highest expected rate of return with the same risk or a portfolio that provides the smallest risk with the same expected rate of return which is an efficiency portfolio. Form a portfolio with this model will provide benefits because every investor will get all the information provided by the market. When conducting research using the Markowitz period model that is used only one period, and the calculation is based on the expected rate of return and portfolio risk. Markowitz diversification maintains returns and reduces risk.
Optimal portfolio of single index models

The concept of the single index model is proof that the prices of shares in the securities market will increase in line with the improvement of market conditions (Husnan, 2005: 103) and vice versa when market conditions decline, the prices of individual shares also decline. The single index model is based on the observation that the price of a security fluctuates in the direction of the market price index (Jogiyanto, 2014: 339). Stocks tend to go up if the price index goes up, on the contrary if the price index goes down then most stock prices decline. It can be said that the rate of return of securities is correlated because there is a general reaction to changes in market value. With this basis, returns on securities and returns on common market indices can be written as relationships:

$$\alpha_i = E(R_i) - \beta_i \cdot E(R_m)$$

Where:

$\alpha_i$: Alpha stock $i$

$E(R_i)$: Expected stock return

$\beta_i$: Beta stock $i$

$E(R_m)$: Expected market return

Conceptual Framework

This study designs data in arranging portfolios using the Single Index Method and the Markowitz Method. The scheme of this research process is as follows:
Formulation of The Problem
Based on the conceptual framework above, the problem statement is formulated as follows:
1. What is the process of establishing an optimal BPJS Health portfolio with investment obligations on SBN when calculated using the Markowitz Model method?
2. What is the process of establishing an optimal BPJS Health portfolio with investment obligations on SBN when calculated using the Single Index Model method?
3. How is the comparison of expected return and risk formed in BPJS Optimal portfolio analysis using the Single Index Model and Markowitz Model?
4. What is the proportion of each portfolio forming instrument that is optimal with the Single Index Model and the Markowitz Model?

Hypothesis Formulation
Based on the conceptual framework and the formulation of the problem above, in this study the following hypothesis is proposed:
H1: The level of risk and return obtained when using the single index model method is positive.

H2: The level of risk and return that is obtained when using the Markowitz model method is positive.

H3: The most efficient optimal portfolio composition calculation is to use the Single Index Model.

RESEARCH METHODS

Research Design
This research was conducted in order to compare two optimal portfolio calculation methods that produce better returns and risks. The research conducted also aims to find out how a good portfolio composition when the OJK regulations are implemented.

The data used in this study is quantitative data, that is data stated in numbers that indicate the value of a quantity or variable represented. The data is a time series data that illustrates changes from time to time.

Population and Sample Determination
The population in this study is the daily return index of capital market instruments whose data is available at www.infovesta.com with the research year 1 January 2016 - 31 December 2017. Sugiyono (2013) believes that the sample is a component of the total characteristics possessed by the population. Samples are the actual data sources taken using a method called sampling technique. Sampling is done with certain considerations, not randomly and intentionally, which is commonly called a purposive sampling technique. Sampling criteria set:

| Name of Index                     | Research Time                      | Data Types |
|----------------------------------|------------------------------------|------------|
| Compass Index 100                | 1 January 2016 – 31 December 2017 | Daily      |
| Corporate Bond Index Infovesta   | 1 January 2016 – 31 December 2017 | Daily      |
| Government Securities            | 1 January 2016 – 31 December 2017 | Daily      |
| Infovesta Fixed Income Fund Index| 1 January 2016 – 31 December 2017 | Daily      |
### Data Analysis Method

In analyzing the data of this study using quantitative descriptive analysis using Microsoft Excel software. The selection of software is based on the consideration of the ease and availability of features needed in doing calculations. Analysis is done by calculating the instrument’s rate of return, calculating the average rate of return of the instrument, calculating the instrument standard deviation, calculating the variance and ovarian instruments, calculating the instrument’s correlation, forming an efficient set of portfolio.

#### Markowitz Model

Calculates the return of each index using the formula:

\[
R_t(i) = \frac{P_t(i) - P_{t-1}(i)}{P_{t-1}(i)}
\]

Information:
- \( R_t(i) \): Return of stock realization \( i \)
- \( P_t(i) \): Closing price of shares \( i \) in the \( t \) month
- \( P_{t-1}(i) \): Closing price of stock \( i \) in month \( t - 1 \)

Calculate the Expected Return of each Index using the formula:

\[
E(R_i) = \frac{\sum_{t=1}^{N} R_t}{N}
\]

Calculate the Risk (variance and standard deviation) of each Investment Index. This measure of risk is intended to find out how much the value we get may deviate from the value we expect. We can find the calculation using the formula:
Calculate Covariance between two Indexes in a portfolio. The formula used to calculate covariance is as follows:

\[
\sigma_{ij} = \sum_{i=1}^{n} \left[ (R_{ij} - E(R_{ij})) \cdot (R_{ik} - E(R_{ik})) \right] \]

Calculate the coefficient of correlation between company stock prices. The size of the coefficient:

\[
\rho = \frac{n \sum XY - \sum X \sum Y}{\sqrt{\left[ n \sum X^2 - (\sum X)^2 \right] \left[ n \sum Y^2 - (\sum Y)^2 \right]}}
\]

Correlation will affect portfolio risk. The formula used is: Determining the proportion of funds from portfolio candidates’ shares is done by using the Solver application program in Microsoft Excel. This application will provide the best proportion of funds to produce the maximum return.

Calculate the Expected Return (expected profit level) of the portfolio.

\[
E(R_p) = \sum_{i=1}^{n} X_i E(R_i)
\]

The expected profit from the portfolio can be calculated using the formula:

\[
\sigma^2_p = X_1^2 \sigma_1^2 + X_2^2 \sigma_2^2 + 2 \rho_{12} X_1 \sigma_1 \sigma_2
\]

\[
\sigma_1 = \sqrt{\sigma_1^2}
\]

Calculate the risk (variance and standard deviation) of the portfolio. The variance and standard deviation of a portfolio can be calculated from the following equation:

\[
\sigma_q = \sum_{i=1}^{n} \left[ (R_{ij} - E(R_{ij})) \cdot (R_{ik} - E(R_{ik})) \right] \]

**Single Index Model**

According Jogiyanto (2016), determining the optimal portfolio will be easier if it is based on a number that can determine whether a security can be included in
The Optimal Portfolio.
The figure in question is the ratio between excess return with Beta (excess return to beta ratio) with the ratio calculation as follows:

\[ ERBi = \frac{E(R_i) - R_{BR}}{\beta_i} \]

ERBi: excess return to beta i
E (Ri): expected return based on the Single Index Model for i-securities
RBR: return of risk free assets
\( \beta_i \): Beta securities to-i

The optimal portfolio will contain assets that have high ERB ratios. Assets with low ERB ratios will not be included in a cut-off point which determines the limit of what ERB value is said to be high.

Calculate the Ai and Bi values for each of the I shares as follows:

\[ A_i = \frac{[E(R_i) - R_{BR}] \cdot \beta_i}{\sigma^2_{ei}} \]
\[ B_i = \frac{\beta^2_i}{\sigma^2_{ei}} \]

E (Ri): expected return based on SingleIndexModel for RBR i i security: risk-free asset return
I : Beta securities i
\( \sigma^2_{ei} \): Variant of the i-sec residual error which is also a unique risk or unsystematic risk.

Calculate the value of C1 with the following formula:

\[ C_1 = \frac{\sigma^2 \sum_i j=1 A_j}{1 + \sigma^2 \sum_i j=1 \beta_j} \]

Ci : Cut-off rate
\( \sigma^2 \): Variant of the market index return
\( \beta_j \): Beta stock to-i
The cut-off point value (C *) is the value of C1 where the last ERB value is still greater than the value of Ci.

The indices that make up the optimal portfolio are stocks whose ERB value is greater or equal to the ERB value at point C *. Shares that have a smaller ERB with point C * ERB are excluded from the optimal portfolio formation. After the indices that make up the optimal portfolio can be determined, the next step is to determine the proportion of funds for each stock that makes up the portfolio. Investors can determine the proportion of each of these shares in an optimal portfolio. As for calculating the proportion of each index with Wi:

\[ W_i = \frac{Z_i}{\sum_{j=1}^{K} s_j} \]

Where Z1 is:

\[ Z_1 = \frac{\beta_i}{\sigma_{i}^2} (ERB_i - C^*) \]

Information:

Wi : proportion of securities to-i
K : optimal portfolio size
Bi : beta securities to-i
2ei : variant of i-securities error
ERBi : Excess return to beta securities to-i
C * : cut-off point value which is the biggest Ci.

**RESULTS AND DISCUSSION**

**Form a Portfolio Using the Markowitz Model**

To form a good portfolio, this research uses an opportunity to use Microsoft Excel. The first thing to do is look for Market returns, Market Risks, Individual Returns and also Individual Risks.

**Table 3**

| Information | Expectation Return | Std. Dev | Variance |
|-------------|--------------------|----------|----------|
| IHSG        | 0.070%             | 0.728%   | 0.005%   |

Source: Author Calculation Results
Table 4

| Index                              | Realization of Return | Expectation of Return | Std. Dev | Varian ce |
|------------------------------------|-----------------------|-----------------------|----------|-----------|
| Infovesta Equity Fund Index        | 14.62%                | 0.04%                 | 0.74%    | 0.0054    |
| Infovesta Money Market Fund        | 6.72%                 | 0.02%                 | 0.02%    | 0.0000    |
| Infovesta Fixed Income Fund Index  | 13.55%                | 0.04%                 | 0.17%    | 0.0002    |
| Infovesta Corporate Bond Index     | 13.27%                | 0.04%                 | 0.03%    | 0.0000    |
| Infovesta Government Bond Index    | 15.84%                | 0.04%                 | 0.15%    | 0.0002    |
| Kompas 100                         | 24.71%                | 0.07%                 | 0.88%    | 0.0078    |

Source: the results of the author’s calculation

The concept of expected return (expected return) is a return that has not yet occurred but which is expected to occur in the future, then based on this concept the expected return of 10 negative value instruments is not included in the optimal portfolio selection. To calculate the risk the standard deviation calculation is used so that the results can illustrate the risk per unit. Standard deviation (standard deviation) is a measure of risk by measuring the absolute deviations that have occurred with the expected value. Risk calculation is done by using Microsoft software excel.

The results of circumvention of average risk data per index are for the standard deviation of the equity fund index by 0.74%, the money market mutual funds index by 0.02%, the fixed income mutual funds index by 0.17%, the corporate bond index by 0.03%, the Government Securities index by 0.15% and compass index 100 by 0.88%.

This result explains that the risk level of stock instruments is higher than the risk level of other instrument indexes. The portfolio in KOMPAS 100 shares provides the greatest risk level due to changes in the price of KOMPAS 100 shares higher than the prices of other instruments. In the calculation of the average return and standard deviation can be seen that the compass index 100 has the highest average return with the greatest standard deviation as well, meaning that the stocks included in the Kompas 100 index are greater in terms of providing returns results, in accordance with the theory of risk of return, i.e. high risk high return. The results of these calculations will affect investors, especially for investors with defensive types, where investors will avoid investing in stocks because they have the greatest risk.
The results of data processing to get the average return of each index in both methods, obtained return rates for each stock mutual fund is 14.62%, money market mutual funds 6.72%, fixed income mutual funds 13.55%, corporate bond returns 13.27%, SUN returns 15.84% Compass 100, stock returns 24.71%. In these results it can be seen that the Compass 100 stock index return is greater than that of other indices, meaning that in the period January 1, 2016 to December 31, 2017 overall the stock instruments listed in the Compass 100 index gave higher yields than the other instruments in this study.

**Table 5.**

| No | Information                             | Percentage |
|----|-----------------------------------------|------------|
| 1  | Infovesta Equity Fund Index             | 7.78%      |
| 2  | Infovesta Money Market Fund             | 7.78%      |
| 3  | Infovesta Fixed Income Fund Index       | 7.78%      |
| 4  | Infovesta Corporate Bond Index          | 23.33%     |
| 5  | Infovesta Government Bond Index         | 30.00%     |
| 6  | Kompas 100                              | 23.33%     |
|    | **Total**                               | **100.00%**|

Expected Return 16.33%
Standard Deviation 5.44%
Sharpe Ratio 221.85%

Source: Author Calculation Results

The table shows the composition of the portfolio when calculated using the Markowitz Method with expected return of 16.33% and Standard deviation of 5.44% with the proportion of each fund being a 7.78% Stock Fund, 7.78% Money Market Mutual Funds, Fixed Income Mutual Funds 7.78%, Corporate Bonds 23.33%, Shares 23.33% and Government Bonds as SBN fulfillment are within the minimum ownership limit of 30%. Next calculate the α (Alpha) and β (Beta) of the individual shares. β (Beta) is the unique risk of an individual stock, calculating the slope of realized returns of a stock with realized market return (CSPI) within a certain period. Beta is also used to calculate Excess Return to Beta (ERB). Beta is calculated using the Excel program using the Slope formula. While α (Alpha) is an intercept realized stock return i with realized market return (CSPI) within a certain time period. Alpha is used to calculate the variance error (ei). Alpha is calculated using the Excel program with the intercept formula. Risk-free returns must also be entered to get an ERB value. Risk-free return is the interest rate of Bank Indonesia for the period 2016-2017. From this period the average is made...
monthly to get a risk free return. ERB is used to measure stock premium returns relative to one unit of risk that cannot be diversified measured by Beta. ERB shows the relationship between return and risk which is a determining factor for investment. After counting, obtained.

**Table 6**

| Information          | α         | β     | Var. Recidual or Unsystematic Risk | ERB      | Ci      | C*      | Optimal |
|----------------------|-----------|-------|-----------------------------------|----------|---------|---------|---------|
| Infovesta Equity Fund Index | 0.000     | 0.973 | 0.00104241                        | 0.000    | 0.00008 | 0.0003949 | Not optimal* |
| Infovesta Money Market Fund | 0.000     | 0.000 | 5.08631E-08                       | 0.214    | 0.00001 | 0.0003949 | Optimal |
| Infovesta Fixed Income Fund Index | 0.000    | 0.071 | 3.09865E-06                       | 0.003    | 0.00027 | 0.0003949 | Optimal |
| Infovesta Corporate Bond Index | 0.000    | 0.003 | 1.12279E-07                       | 0.062    | 0.00039 | 0.0003949 | Optimal |
| Infovesta Government Bond Index | 0.000 | 0.060 | 2.51632E-06                       | 0.004    | 0.00035 | 0.0003949 | Optimal |
| Kompas 100            | 0.000     | 1.205 | 0.00155375                        | 0.000    | 0.00014 | 0.0003949 | Optimal |

* excluded from composition Source: Results of author's calculations

Based on calculations using the single index model, it can be seen that there is one index, the Infovesta Equity Fund Index which has a minus value in the calculation of the proportion of funds (Wi), it can be said that the index is not optimal because it has an ERB value <C*. For the calculation of the proportion of initial funds the authors still enter the Infovesta Equity Fund Index so that it remains comparable to the tests conducted on the Markowit method, so that the proportion of funds in each index is 11.7% for each mutual fund index, 11.7% for the corporation bond index, 11.7% for the compass index 100 and 41.7% for the government bond index. Calculation of the weighting or distribution of the proportion of funds using the single index model produces the expected return rate.

**Table 7**

| Information          | Zi | Wi | αp | βp |
|----------------------|----|----|----|----|
| Infovesta Equity Fund Index | 0  | 0  | 0  | 0  |
The next step, the writer tries to recalculate the amount of the proportion of funds when issuing an index that is not optimal, namely the value of \( ER_{B} \geq C^{*} \) (working paper attached), namely the Infovesta Equity Fund Index so that the results obtained are the proportion of funds in the Investment Fund by 12.36%, Mutual Funds Fixed Income 12.36%, Corporate Bonds 12.36%, Shares 12.36% and Government Bonds as SBN fulfillment amounted to 50.54% with risks becoming 0.49%.

Discussion

**H1: The level of risk and return obtained when using the single index model method is positive.**

The return and risk of the optimal portfolio formed using the single Index Model Method produces a return of 18.969% and a risk of 0.497%. The return exceeds the risk free rate (7 days repo), which is 0.354% per month. This indicates that the results of calculating the optimal portfolio formation using the Single Index Model are positive. Then H1 is accepted.

**H2: The level of risk and return that is obtained when using the Markowitz model method is positive.**

The return and risk of the optimal portfolio formed using the Markowitz Model Method yields a return of 16.33% and a risk of 5.44%. The return exceeds the risk free rate (7 days repo), which is 0.354% per month. This indicates that the results of calculating the
optimal portfolio formation using the Markowitz Model are positive. Then H2 is accepted.

H3: The most efficient optimal portfolio composition calculation is to use the Single Index Model.

The results of the calculation of the Single Index Model have a greater return and risk value than the calculation generated by the Markowitz Model method. Then it can be concluded that the calculation using the Single Index Model has the most efficient Optimal Portfolio model. This is supported by the theory which states that an efficient portfolio is a portfolio that can provide the greatest expected return with certain risks and provides the greatest risk with certain expected returns. Single Index calculation gives the highest expected return with the smallest risk. Then H3 is accepted.

CONCLUSION

Based on the calculation of the average return rate for each index, the average daily return is 0.04%, Money Market Mutual Fund Index is 0.02%, Fixed Income Mutual Fund Index is 0.04%, Corporate Bond Index is 0.04%, Bond Index is 0.04% Government (SBN) by 0.04% and the Kompas 100 Stock Index by 0.07%. When viewed from these calculations, the Compass 100 Index has the greatest return.

Based on the calculation of the Standard Deviation, which illustrates the risk rating of each index, the results obtained on the Stock Mutual Fund index are 0.74%, the Money Market Mutual Fund Index is 0.02%, the Fixed Income Mutual Fund Index is 0.17%, the Corporate Bond Index is 0.03%, the Government Bond Index (SBN) is 0.15%, and for the Compass 100 Index 0.88%. The calculation results of this Standard Deviation also give the biggest results on the Compass 100 index, meaning that the stocks contained in the compass 100 index are able to provide a large level of return, with great risk as well, because the nature of risk and return will move in the same direction. Calculation of Optimal Portfolios using the Single Index Model method gives a greater expected return with a small risk level, this is because the indexes that enter into candidate compositions with this method can be seen which indices are not optimal (ERB value < from C value *) so that when calculating the proportion of funds in each index, non-optimal indices can be issued (eliminated) so that the risk will be smaller. Equity Funds
are 12.36%, Fixed Income Funds are 12.36%, Corporate Bonds are 12.36%, Shares are 12.36% and Government Bonds as fulfillment of SBN are 50.54% with risks becoming 0.49%.

Managerial Implications
Based on the results of the study, discussion and conclusions, this study should be used by investors in Non-Bank Financial Institutions in fulfilling Financial Services Authority Regulations on Investment in Government Securities in Non-Bank Financial Institutions, especially BPJS Health. Because in the calculation of this study can show the level of return and risk that will be borne by the Health BPJS in fulfilling the OJK Regulations and can provide an overview of whether the FSA Regulation regarding investment in Government Securities with other requirements can support the investment performance of BPJS Health.

Suggestions for Next Research
Based on the results of the analysis and conclusions of this study, some suggestions that can be considered are as follows:
OJK provisions that require Non-Bank Financial Institutions to invest in SBN instruments can be accepted by the BPJS Health only for other requirements will be very heavy for BPJS Health. Considering the lowest ranked Government Bonds, it will be difficult to provide high returns like bonds with a maximum rating.
For further research, it is recommended to use detailed stock, mutual fund, and bond instrument data so that the optimal portfolio composition obtained already reflects in detail what instruments provide high returns.
Optimal Portfolio calculation method used can compare more than two other methods or methods t and can add assessment indicators namely instrument performance evaluation so that the results are more accurate.

REFERENCES
Ary, T. Gumanti (2011). *Manajemen Investasi - Konsep, Teori dan Aplikasi*. Jakarta: Mitra Wacana Media.
Bangun, Deddy H, Samuel P. D. Anantadjaja, Laura Lahindah. (2012). *Portofolio Optimal*
Menurut Markowitz Model dan Single Index Model : Studi Kasus pada Indeks LQ45. Journal of Management Studies Vol. 01
Brigham, Eugene F dan Houston. (n.d.). Dasar-Dasar Manajemen Keuangan Edisi 11 Buku 2.
Jogiyanto, H. (2014). Teori dan Praktik Portofolio dengan Excel. In J. Hartono, Teori dan Praktik Portofolio dengan Excel. Jakarta: Salemba Empat.
Jogiyanto, H. (2016). Teori Portofolio dan Analisa Investasi (Edisi Kesepuluh). In Teori Portofolio dan Analisa Investasi (Edisi Kesepuluh). Yogyakarta : Fakultas Ekonomika dan Bisnis UGM.

Dalsem, S. V. (n.d.). Markowitz Portfolio Optimization. Retrieved Juni 2018, from Youtube: https://youtube.be/CNIVd b7Yjc
Hanafi, Mahduh dan Abdul Halim. (2012). Analisis Laporan Keuangan. Yogyakarta: (UPP) STIM YKPN.
Husnan, S. (2005). Dasar-dasar teori portofolio & Analisis Sekuritas . Yogyakarta : Unit Penerbit dan Percetakan AMP YKPN .

Imran, B. & Abdul Haeba Ramli (2019). Kepuasan Pasien, Citra Rumah Sakit dan Kepercayaan Pasien di Provinsi Sulawesi Barat . Prosiding Seminar Nasional Pakar ke 2 Tahun 2019. 2.48.1-7.

Mariam, S (2016). Kepentingan Kebijakan Pembuatan Peraturan Daerah Provinsi Daerah Khusus Ibukota (DKI) Jakarta No. 4 Tahun 2007 (Pengendalian, Pemeliharaan dan Peredaran Unggas) dan Implikasinya Terhadap Usaha Pendistribusian Unggas di DKI Jakarta. REFÓRMASI ADMINISTRASI Volume 3, No. 1, (Maret 2016). Jurnal Ilmiah Untuk Mewujudkan Masyarakat Madani. 107-125.

Markowitz, Harry Max. (1959). Portfolio Selection: Efficient Diversification Of Investment. The John Wiley and Son, Inc.

Martin, Sirucek dan Lukas Kren. (2012). Application of Markowitz Portfolio Theory By Building Optimal Portfolio on The US Stock Market. Munich Personal RePEc Archive.

Purba, H. S. (2017). Analisa Dampak Peraturan Otoritas Jasa Keuangan Nomor 1/POJK.05/2016 Terhadap Manajemen Portofolio Lembaga Keuangan Non Bank. Universitas Gadjah Mada

Putri, SS., & Ramli, AH (2017). Deteminan Kinerja Karyawan pada PT. Kinden Indonesia di Jakarta. Prosiding Seminar Nasional Cendekiawan ke-3 tahun 2017. Lembaga Penelitian Universitas Trisakti, hal. 239-243.
Ramli, AH. (2010). Analisis Strategi Pemasaran PT. Sandoz Indonesia Cabang Makassar terhadap penjualan Produk di Makassar. Jurnal Ilmiah Aktualita 2, KPN-Bung Kopertis IX Sulawesi, Makassar, 203-216.

Ramli, AH. (2012a). Strategi Pemasaran pada Industri Farmasi. Pustaka Timur, Yogyakarta.

Ramli, AH. (2012b). Dampak Fasilitas Pendukung Fisik di Rumah Sakit Stella Maris Terhadap Citra Rumah Sakit Stella Maris di makassar. Progresif Journal 5 (02), 1-22.

Ramli, AH. (2013). Dampak Sistem Penyampaian Jasa Terhadap Citra Rumah Sakit Swasta Tipe C Di Makassar. Media Riset Bisnis & Manajemen 13 (2), 147-168.

Ramli, AH. & Sjahruddin, H (2015). Building Patient Loyalty in Healthcare Services. International Review of Management and Business Research Vol. 4 Issue.2 (2015), pp. 391-401.

Ramli, AH. (2016a). Patient Service and Satisfaction System. Business And Entrepreneurial (BER) Vol. 15, No. 2 (2016), pp. 189-200.

Ramli, AH. (2016b). Patient trust on The Hospital Service Delivery System. Business And Entrepreneurial (BER) Vol. 16, No. 1 (2016), pp. 17-30.

Ramli, AH. (2017a). Patient Satisfaction, Hospital Image and Patient Loyalty in West Sulawesi Province. Business And Entrepreneurial (BER) Vol. 16, No. 2 (2017), pp. 137-150.

Ramli, AH. (2017b). Organizational commitment and Employee Performance at Distributor Company. Business And Entrepreneurial (BER) Vol. 17, No. 1 (2017), pp.17-30.

Ramli, AH. (2018a). Manage Of Job Stress And Measure Employee Performance In Health Services. Business And Entrepreneurial (BER) Vol. 17, No. 2 (2018), pp.145-156.

Ramli, AH. (2018b). Compensation, Job Satisfaction And Employee Performance In Health Services. Business And Entrepreneurial (BER) Vol. 18, No. 1 (2018), pp.85-94.

Ramli, AH. & ET. Maniagasi (2018). Kinerja Karyawan RSUD DOK II Di Jayapura. PROSIDING SEMINAR NASIONAL CENDEKIAWAN, tahun 2018, 805-810.

Ramli, AH. & R Yudhistira (2018). Pengaruh Pengembangan Karir terhadap Kinerja Karyawan melalui Komitmen Organisasi pada PT. Infomedia Solusi Humanika di Jakarta. PROSIDING SEMINAR NASIONAL CENDEKIAWAN, tahun 2018, 811-816.

Ramli, AH. (2019). Person-Organisasi fit dalam rantai distribusi pemasaran. Jurnal Manajemen dan Pemasaran Jasa 12 (Nomor 1, 2019), hal. 77-92.

Takaya, R, Ramli, AH, dan Lukito, N. (2019). The Effect of Advertisement value and Context awareness value on purchase intention through attitude brands and advertising attitude in smartphone advertising. International Journal of Creative Reseach and Studies, Volume-3, Issue-3, March 2019, pp. 106-118.

Tandelilin, E. (n.d.). Portofolio dan Investasi: Teori dan Aplikasi (Edisi Pertama). Yogyakarta: PT
Kanisius. Peraturan Pemerintah Republik Indonesia Nomor 87 Tahun 2013 Tentang Pengelolaan Aset Jaminan Sosial Kesehatan.

Undang-undang Republik Indonesia Nomor 8 Tahun 1995 Tentang Pasar Modal
Peraturan OJK Nomor 1/POJK.05/2016 Tentang Investasi SBN untuk LK Non Bank
Undang-undang Nomor 40 Tahun 2014 Tentang Sistem Jaminan Sosial Kesehatan

www.bi.go.id
www.infovesta.com
Bloomberg
