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Analysis of Foreign Currency Portfolio in Indonesia

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ABSTRACT

The study entitled Analysis of Foreign Currency Portfolio In Indonesia is a case study of a foreign exchange market portfolio taking a research site at Bank Indonesia. Markowitz was the first to introduce the concept of portfolio risk, which in general risk can be reduced by combining multiple assets into a portfolio or so-called diversification. This research was conducted to analyze the optimal portfolio of foreign exchange investment in order to make investments give maximum return and certain risk that is obtained optimally. Based on the results of the research of the four currencies used as sample analysis, the four currencies can form as optimal portfolio of CHF, CNY, GBP and JYP, while the highest rate of return using portfolio theory is in Chinese Yuan (CNY) by 71%. The expected return of the currency is dominating compared to other foreign currencies.

Keywords: Optimal Portfolio, Foreign Exchange, Markowitz Model, Return, Risk

1. INTRODUCTION

In recent years Indonesia's capital market has become the concern of many parties, especially the business community. This is due to the increasing needs of the people who are no longer in the form of basic needs only. So to meet the increasing needs of each community

wants more income to meet the needs of life. When the income is greater than the needs then the community is to save the excess in several ways including the investment itself.

Investors aiming to enhance their risk-adjusted returns should therefore consider the turnover ratio level in their fund investment decisions [30]. The investment portfolio management process consists of an integrated set of steps to create an appropriate mixture of assets. Since it is highly depending on characteristics of the investor, it is possible to stress three main steps: planning, execution and feedback. The most crucial part of portfolio management is the execution step during which a suitable portfolio is built. The procedure takes into account asset allocation, security analysis and investor requirements [5]. The goal of the Most-Diversified Portfolio is not to be an equilibrium model. It can, however, potentially be transformed into an equilibrium model either by adding additional assumptions or by adding fundamental valuation criteria, such as earnings, sales, and so forth. Such additions would allow the model to accommodate different mispricing's [4]. To obtain the desired portfolio an investor must perform an analysis that gives the maximum return at a certain level of risk [28]. Asset allocation could be defined as the process of sharing the portfolio into number of asset classes [26], that the higher the weight of an asset, the higher should be its expected performance [16]. Investment management emphasizes the importance of diversification through portfolio [6], since many studies indicate that greater profits can be made by diversifying internationally [1]. The optimal investment ratios for a set of stocks and other financial products can be obtained by the conventional portfolio theory based on quantitative data such as returns and risks [22].

Financial market plays a significant role in an economy. Its significant role lies in its function of becoming the center of financing for various deficit units [20]. In international trade / international trade, a valid payment instrument is required, such instrument is called Foreign Currency. The currency devaluation of a country motivates investors to invest because of higher yields [31]. Foreign portfolio inflows are expected to finance the difference between domestic savings and investment, without increasing the foreign currency debt of the country. Portfolio flows are considered as 'hot capital' and move from one country to another with searching the highest returns and better market conditions [10]. Currencies have been historically viewed merely as a medium of exchange, store of value and unit of account. The fixed exchange rate regime ensured that exchange rates of various currency pairs did not fluctuate under normal circumstances. However, when the era of flexible exchange rates started, foreign exchange rates experienced many upward and downward movements, depending on the dictates of market forces. The determination of exchange rates by supply and demand has also opened up an opportunity for investors to gain risky returns or losses from exchange rate movements. In other words, currency assets can now be considered as financial assets, similar to stocks and bonds [23]. In this case money serves as a store of value, then money can be used for investment. Foreign exchange intervention is the practice of monetary authorities buying and selling currency in the foreign exchange market to influence exchange rates [19]. To be used in economic activity, the currency used has a certain price in the currency of another country. In any investment, an analysis of the expected return and the assumed risk constitutes a fundamental step. Investing in financial assets is no exception. Since Markowitz proposed the portfolio selection theory in 1952, this methodology has become the benchmark in portfolio management [9].

This research is conducted to analyze the optimal portfolio of foreign exchange investment in order to make investments that provide minimal risk and return earned optimal.

2. RESULT / EXPERIMENTAL

The data used are closing price data of four currency exchange rates traded in the Foreign Exchange Market in Indonesia obtained from the website www.bi.co.id, namely JYP (Japanese Yen), GBP (British Pound), CHF (Swiss Franc), and CNY (China Yuan). During 1 year of sale (245 business days) in Moneychanger in Indonesia starting from 01 January until 30 December 2015.

2. 1. Return and Risk of Portfolio Assets

2. 1. 1. Return Portfolio

Return can be referred to as the measure of total gain or loss from an investment over a given time period with respect to both changes in market value and cash distributions. Normally, the return is said to be a percentage [24]. The return can be measured as the total gain or loss to the holder over a given period of time. Return R_t of an asset at time t (without dividend) is expressed as follows:

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (1)$$

where P_t is the asset price at time t , which is either positive or zero [5]. In Markowitz Mean-Variance Portfolio Theory the rate of return of assets are random variables [11], [29]. If return R has possible values that are r_1, r_2, \dots, r_n then the chance set $P\{R = r_j\} (j=1, 2, \dots, n)$ is called the opportunity distribution of return R . The set of probabilities satisfies $\sum_{j=1}^n P\{R = r_j\} = 1$ [21]. Furthermore, the expectation of return $E[R]$ represents the expected future rate of return of an asset and is expressed as follows:

$$\mu = E[R] = \sum_{j=1}^n P\{R = r_j\} \quad (2)$$

Total data points r_1, r_2, \dots, r_n in random variables return R is called population. The average value of the count

$$\bar{R} = \frac{1}{n} \sum_{j=1}^n r_j \quad (3)$$

2. 1. 2. Risk Portfolio

Risk can be referred to as the chance of loss. When an asset has greater chances of loss, the asset can be considered as a risky asset [25], in measuring risk, one observation is that

investor's view of risk is asymmetric about the mean [8]. Currency risk, also referred to exchange rate risk, represents the degree or potential to which an investment is likely to be affected by exchange rate movements [7]. The return variance R , expressed by $Var(R)$ is called the standard deviation, and in modern portfolio theory Markowitz is called the fasciitis or investment risks $Var(R) = [(R - \mu)^2]$ [11]. No matter what measure is used the risk of a portfolio depends not only on the risks of every included security, but also on the mutual dependence (interdependence) among the securities, except for cash position, which is assumed to have a risk of 0 [15]. In practice if the population return data consists of n observations, and the return data used is returns on the sample, then σ^2 will be approximated by the return variance R on the sample, i.e.:

$$\sigma^2 = \frac{1}{n-1} \sum_{j=1}^n (r_j - R)^2 \tag{4}$$

Let R_1 and R_2 return from two different assets with the respective expectations μ_1 and μ_2 , the second covariance return is

$$\sigma_{12} = \text{cov}(R_1, R_2) = E[(R_1 - \mu_1)(R_2 - \mu_2)] \tag{5}$$

If the data return used is the return data on the sample, then the covariance (σ_{12}) between R_1 and R_2 , is

$$\sigma_{12} = \frac{1}{n-1} \sum_{j=1}^n (r_{1j} - R_1)(r_{2j} - R_2) \tag{6}$$

where: R_1 and R_2 are the average counts in equation (4) [11].

The return of a portfolio is the weighted average of the return of each asset, so

$$\begin{aligned} R_p &= w_1 R_1 + w_2 R_2 + \dots + w_n R_n \\ &= \sum_{j=1}^n w_j R_j \\ &= (w_1 w_2 \dots w_n) \begin{pmatrix} R_1 \\ R_2 \\ \vdots \\ R_n \end{pmatrix} \\ &= wR \end{aligned} \tag{7}$$

where: w is a vector of portfolio weights and $\sum_i^n w_i = 1$ (The weights can be negative, which means investors can short a security) [21] measure of risk used square root of variance. The variance of a portfolio is expressed

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \sigma_{ij} \tag{8}$$

Furthermore, the covariance of all asset returns can be expressed in terms of matrices and equations (8) to $\sigma_p^2 = w' \Sigma w$ where

$$\Sigma = \begin{pmatrix} \sigma_{11} & \cdots & \cdots & \cdots & \sigma_{1n} \\ \vdots & \ddots & & & \vdots \\ \vdots & & \ddots & & \vdots \\ \vdots & & & \ddots & \vdots \\ \sigma_{ni} & \cdots & \cdots & \cdots & \sigma_{nn} \end{pmatrix}, w = \begin{pmatrix} w_1 \\ \vdots \\ w_n \end{pmatrix} \text{ and } w' = (w_1 w_2 \cdots w_n)$$

2. 2. Optimization Problems (Mean-Variance Analysis)

The mean-variance utility postulates that random variables with the same mean and variance should be equally desirable [18]. Portfolio optimization is the process of allocating capital among a universe of assets to achieve better risk–return trade-off [12]. Robust portfolios resolve the sensitivity issue identified as a concern in implementing Mean–Variance analysis [14]. The understanding of the composition of portfolios based on Mean–Variance optimization [13] is one of the greatest achievements in finance [3].

An Mean-Variance objective function is designed to maximize the buyer's expected profit while minimizing its variance [19]. The Mean-Variance (M-V) optimization problem of the Markowitz portfolio is provided by:

$$\min w' \Sigma w \tag{9}$$

Subject to

$$\begin{aligned} w' e &= 1 \\ w' \mu &\geq R \text{ and} \\ w &\geq 0 \end{aligned}$$

Too

$$\max w' \mu \tag{10}$$

Subject to

$$\begin{aligned} W^e &= 1 \\ W^{\mu} &\geq R \text{ and} \\ w &\geq 0 \end{aligned}$$

For parameter μ . This problem is easily solved using a Lagrange Multiplier (Merton, 1972) [17].

2. 2. 1. Data Description

The data used are closing price data of four currency exchange rates traded in the Foreign Exchange Market in Indonesia obtained from the website www.bi.co.id, namely JYP (Japanese Yen), GBP (British Pound), CHF (Swiss Franc), and CNY (China Yuan). During 1 year of sale (245 business days) in Moneychanger in Indonesia starting from 01 January until 30 December 2015.

A) Swiss Franc Exchange Chart (CHF)

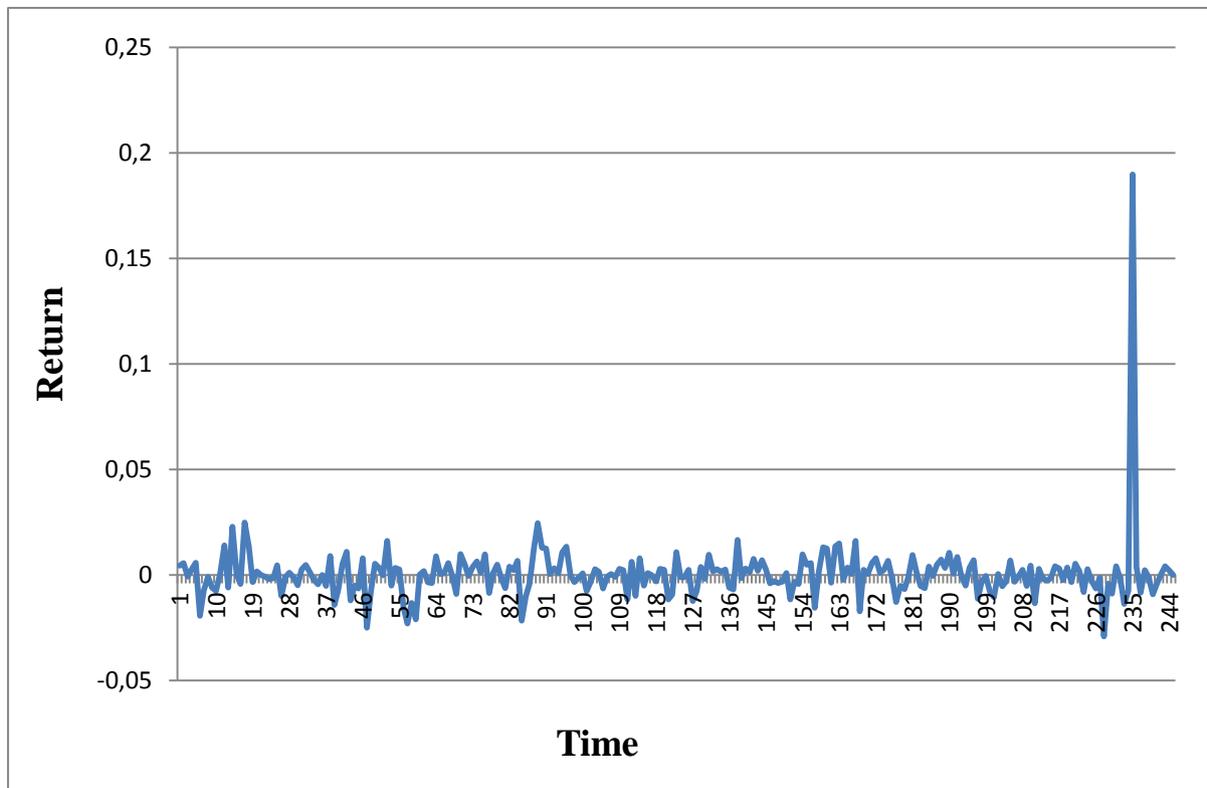


Figure 1. Graph of return of daily exchange closing price from 01 January to 30 December 2015 currency Swiss Franc (CHF)

The exchange rate return chart shows that the return on each exchange rate varies greatly, i.e. on January 19, 2015 the exchange rate return is very high, that is 0.189745866 and on 08 May 2015 get very low return, that is equal to -0.021769757. From the daily closing price of CHF (Swiss French) in the period January 01 to December 30, 2015 the price of the currency ranges from 12573,00 IDR up to 14028,00 IDR and the total exchange rate of 3427510,00 IDR while the average price of the exchange rate is 13989,00 IDR.

B) Exchange Rate Chart Chinese Yuan (CNY)

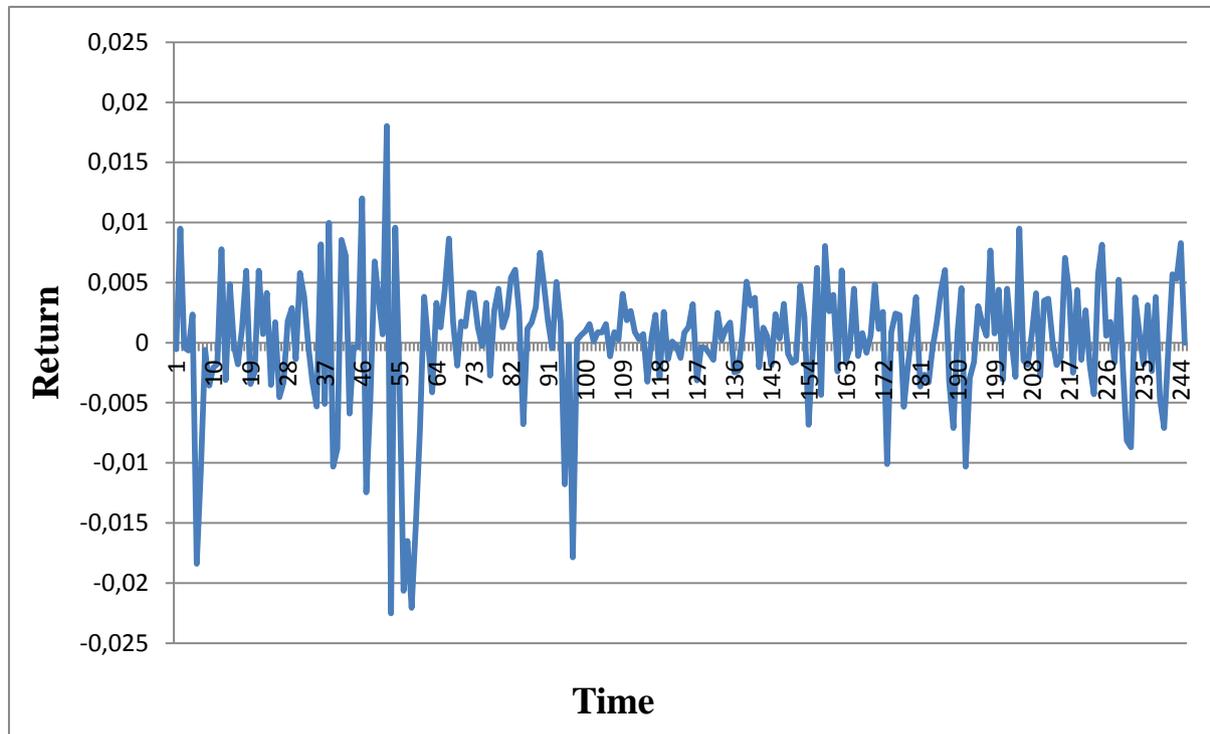


Figure 2. The return graph of the daily exchange rate closing price from 1 January to 30 December 2015 Chinese Yuan (CNY)

The fluctuation is marked by a very noticeable upward movement in the Chinese Yuan (CNY) exchange rate chart on August 11st 2015, which is down from 0.009506327 to -0.17875608. With fluctuations changing over time this exchange rate chart again decreased the return from -0.022071315 on 07 October 2015 to -0.022535734 on October 15, 2015, but on October 16, 2015 this exchange rate again rose to 0, 018027385 although back down on December 22, 2015 at the range of -0.018398012. The exchange rate return chart shows that the return of each exchange rate varies greatly, i.e. there is a very high return and there is a very low return. From the closing price of the Chinese Yuan (CNY) daily exchange rate from 1 January to 30 December 2015 the price of the currency ranges from 2048,00 IDR up to 2135,00 IDR and the total exchange rate of 529349,00 IDR with an average exchange rate of 2160,00 IDR.

C) Graph English Pound Rate (GBP)

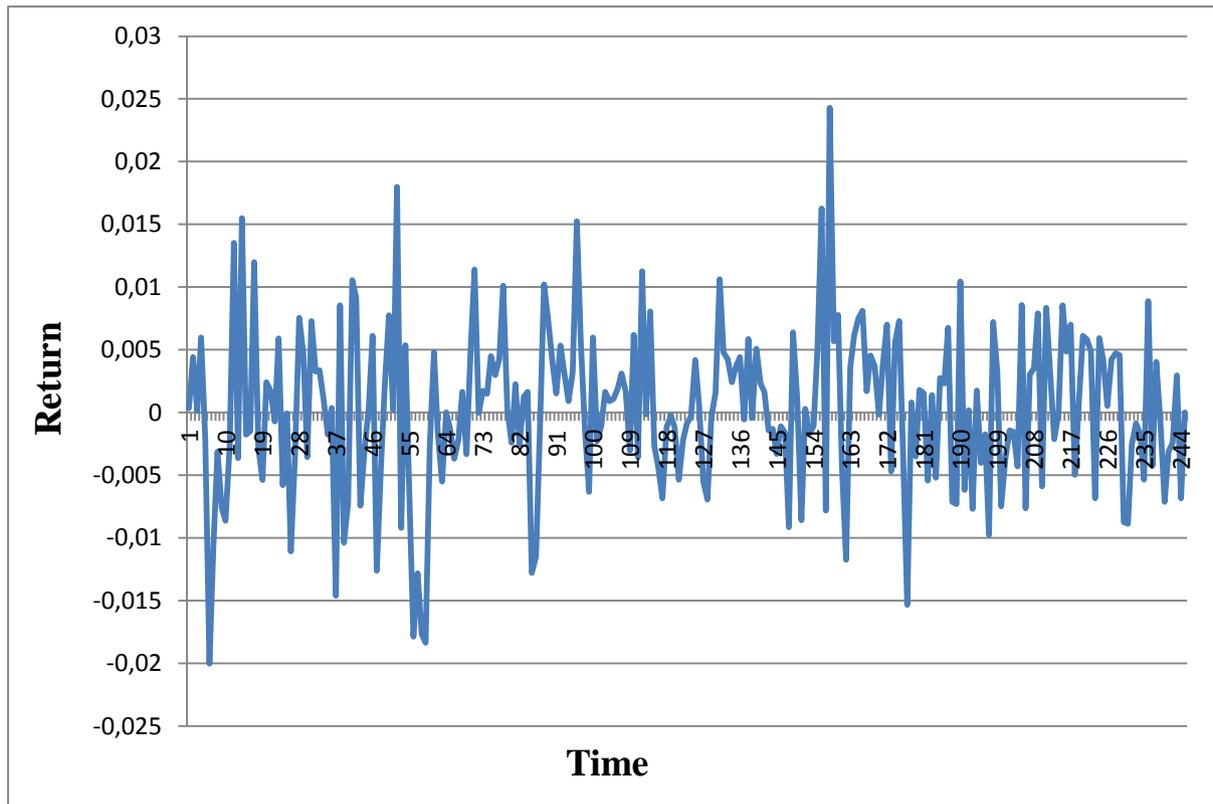


Figure 3. The return graph of the daily exchange rate closing price from 1 January to 30 December 2015 The British Pound Sterling (GBP)

The fluctuation is indicated by the ups and downs of the UK pound chart (GBP) and exchange rate movements ranging between -0.025 and 0.03. Significant changes to the British Pound Sterling Return (GBP) exchange charts have almost the same diversity for 1 period, that is, the exchange rate returns decreased considerably from -0.017884063 on 09 October 2015 to -0.020019917 on December 22 2015. And the exchange rate graph shows the varying increase of the highest exchange rate 0.024291209 on May 1, 2015, then 0.017978821 on October 16, 2015 and on December 10, 2015 by 0.015489344. From the closing price of the British Pound Sterling (GBP) daily exchange rate from 1 January to 30 December 2015 the price of the currency ranges from 19495,00 IDR up to 20557,00 IDR and the total exchange rate of 5041747,00 IDR with the average price of 20578,00 IDR.

D) Japanese Yen Exchange Rate Chart (JPY)

The exchange rate return chart shows that the return of each exchange rate varies from 0.014646707 to -0.009829735 seen that the significant exchange rate returns on August 24, 2015 is 0.024245006 and the exchange rate return decreased on October 09, 2015 by -0.021232438. From the closing price of the Japanese Yen (JYP) daily exchange rate from 1

January to 30 December 2015, the currency price ranges from 10413,00 IDR up to 11512,00 IDR and the total exchange rate of 2725506,00 IDR while the average exchange rate of 11124,00 IDR.

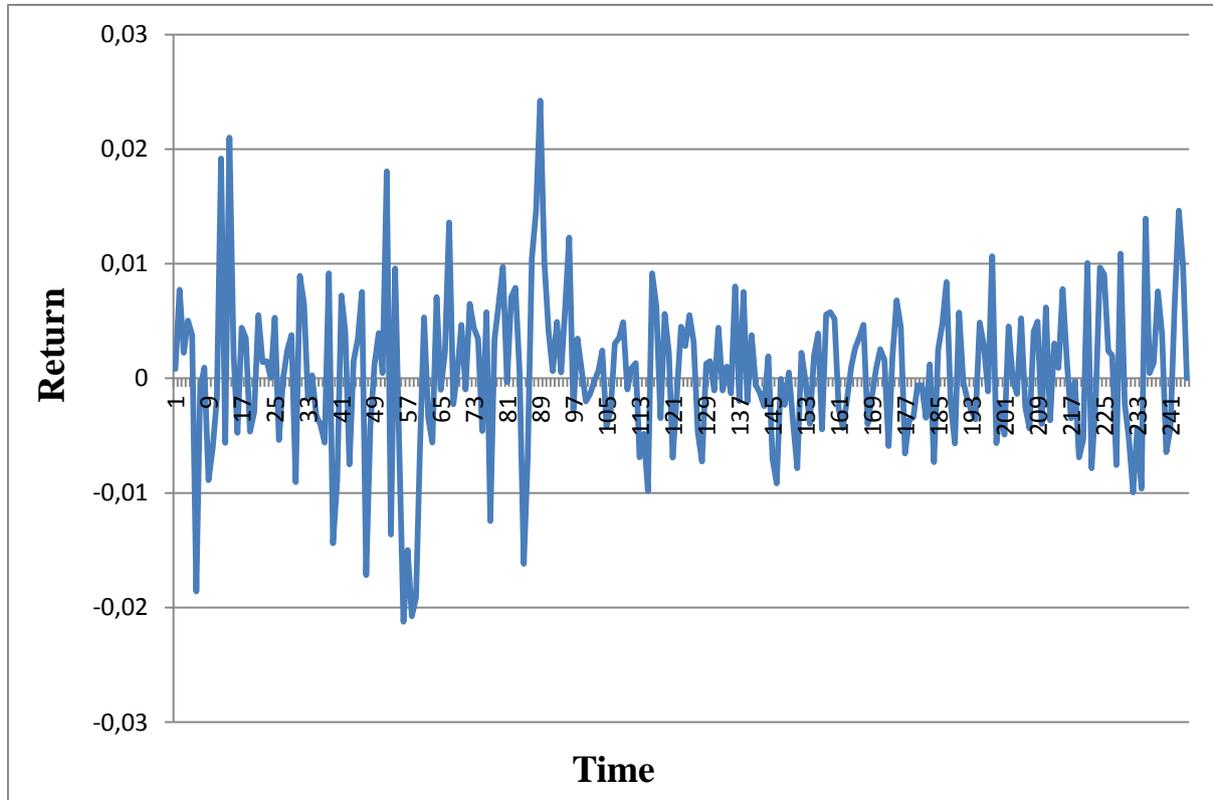


Figure 4. Graph of return of daily exchange rate closing price from 01 January to 30 December 2015 Japanese Yen (JYP)

2. 2. 2. Specifies the parameter values

Using the equations (3) and (8), the average returns (\bar{R}) and variance (σ_p^2) of each exchange rate are as shown in Table 1 below:

Table 1. Result of Calculation of Average Return and Variance (σ_p^2)

Currency	Average returns (\bar{R})	Variance (σ_p^2)
CHF	0.000543105	0.000209439
CNY	0.000182984	0.000028995
GBP	0.000237469	0.0000422439
JYP	0.000431929	0.0000452925

From Table 1 the average return and variance above can be seen the average return that gives the maximum return is the Japanese Yen (JYP) of 0.000431929 and the lowest return is the China Yuan (CNY) of 0.000182984. While the value of variance that provides minimal risk of the currency of the Swiss French (CHF) of 0.000209439 and the biggest risk is the currency Japanese Yen (JYP) of 0.0000452925.

3. CONCLUSIONS

Portfolio is an investment of more than one type of stock or exchange rate, in the formation of this portfolio must be searched which exchange rate gives the maximum return with certain risks. The key of choosing an optimal investment portfolio is how the investor's ability to diversify the investment in measuring the level of risk and the level of profit that will be obtained as a consequence of the decision of the investment portfolio selection. If an investor wants to form a portfolio then investors should really be able to read and examine the development of the capital market and changes in the price of the existing currency appropriately.

This study aims to determine how to choose the type of exchange rate that can provide maximum return with certain risks. Of the four currencies selected on the foreign exchange sales report obtained from Bank Indonesia in 2015 using Model Markowitz. From the results of this study it can be concluded that the most optimal portfolio composition is located in the IDR / CNY exchange rate portfolio invested at 71%, the IDR / GBP exchange rate is invested 25%, the IDR / CHF rate of 2%, and the IDR / JYP exchange rate invested by 1%. The results of this analysis indicate that of the four currencies, all of these currencies can be used as optimal portfolio candidates.

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