

## Portfolio Analysis Using Single Index Model

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*Abstract:* - This paper focused on portfolio analysis that set-up among 10 selected stocks from Kuala Lumpur Stock Exchange (KLSE). Two types of analysis conducted in this paper, which is daily analysis and weekly analysis using single index model. The result shows that entrance of 5 stocks to set-up optimal portfolio for daily analysis and only 2 stocks been selected in the weekly analysis. Among this 2 analysis, weekly analysis provides a higher profit level with lower risk level if compared to daily analysis.

*Key-Words:* - Investment return, Investment risk, Diversification, Portfolio theory, Expected return and risk.

### 1 Introduction

This paper will focus on stock investment through setting up a portfolio with calculated expected profit and risk level. The main objective is to select an optimal portfolio from daily and weekly analysis that will provide an optimal return with certain level of risk among 10 selected stocks in KLSE.

Single index model provide an optimal expected return and risk through formula (1) and (2).

$$\text{Expected return, } \bar{R}_p = \alpha_p + \beta_p \bar{R}_m \quad (1)$$

$$\text{Expected risk, } \sigma_p^2 = \beta_p^2 \sigma_m^2 + \sum_{i=1}^N X_i^2 \sigma_{e_i}^2 \quad (2)$$

$$\text{where: } \beta_p = \sum_{i=1}^N X_i \beta_i$$

$$\alpha_p = \sum_{i=1}^N X_i \alpha_i$$

Throughout this paper, a best combination of stocks in portfolio will be conducted with high profit and low risk level. Besides, the proportion of capital to invest in selected stock will be computed with single index model.

### 2 Theory

#### 2.1 Investment Return

The return of an investment is the money earned from the difference of the investment result as a profit of the investment. The expected return of an individual stock can be written as,

$$\bar{R}_i = \alpha_i + \beta_i \bar{R}_m \quad (3)$$

where:

$\bar{R}_i$  = The expected return to security  $i$

$\alpha_i$  = The component of security  $i$ 's return that is independent of the market's performance – a random variable.

$\beta_i$  = A constant that measure the expected change in  $R_i$  given a change in  $R_m$ .

$\bar{R}_m$  = The rate of return on the market index – a random variable.

#### 2.2 Investment Risk

According to Fisher and Jordan (1994) the investment risk is a risk of holding securities which is generally associated with the possibility that the return will be less than the return that were expected. Risk is also define as a standard deviation around the expected return. More

dispersion or variability about a security expected return meant the security was riskier than the one with less dispersion.

Securities carry differing degree of expected risk leads most investor to the notion of holding more than one security at a time intended to reduce the risk. As the possibility of deviation is higher, the risk is also higher. The risk of a security which is the variance of a security's return can be written as,

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{e_i}^2 \quad (4)$$

where:

$\sigma_i^2$  = Variance of a security's return.

$\sigma_{e_i}^2$  = Variance of a stock movement that is associated with the movement of the market index.

$\sigma_m^2$  = Variance in market index.

### 2.3 Diversification

Diversification is a process of portfolio combination involve a few different investment instrument. Diversification will reduce the expected investment risk. The influence of diversification towards the security's risk as follow:

- i. Diversification can reduce the unsystematic risk. The unsystematic risk is a risk cause by the characteristic of the industry. The unsystematic risk is also known as unique risk.
- ii. Diversification cannot reduce the unsystematic risk but it can flatten risk dispersion. Systematic risk which is known as market risk is due to the overall changes in the market.

Diversification of one's holding is intended to reduce risk in an economy in which every asset's return are subject to some degree of uncertainty. Effort to spread and minimize risk is a form of diversification. A traditional form of diversification have concentrated upon holding a number of security types (stock, bonds) across industry lines (utility, mining, manufacturing groups). The best diversification comes through holding large

number of securities scattered across industries.

### 2.4 Portfolio Theory

In this text portfolio will consist of collection of securities, or portfolio is a group of investment opportunity.

An investor that form a portfolio hope to gain as much return as possible at the lowest risk compare to the investment on only one investment opportunity. The portfolio theory explain the correlation between the expected return and the risk of the portfolio. There a few model used to analyse the portfolio such as the Markowitz model, factor model, and single index model.

### 2.5 Single Index Model

The single index model is also known as the market model. In this model the portfolio risk depend on the sensitivity of the security associated to the changes of the portfolio market return. The portfolio analysis converge on two parameters which is the expected return and the portfolio risk.

Besides this the portfolio analysis also calculate the correction or variance of each pairs of possibility securities that form portfolio. If the total of stocks collected in the portfolio increase, the covariance that is calculated will also increase. This model is a model that analyse the movement of the stocks cause by the market index.

#### 2.5.1 Expected Return And Risk Of An Individual Security

Most of the stocks prices tend to increase when the market goes up and when the market goes down, the stocks prices tend to decrease. This suggested that one reason the security expected return might be correlated is due to the common response to the market changes. A useful measurement of this correlation can be obtained by relating the return on a stock to the return on a stock market index that can be written as:

$$R_i = a_i + \beta_i R_m \quad (5)$$

where:

$R_i$  = The return of security i.

$R_m$  = The return on market index

$\alpha_i$  = The component of security i's return that is independent of the market's performance.

Equation breaks the return on a stock into two component, that part of it is due to the market and another part is independent of the market.  $\beta_i$  measures how sensitive a stock's return is to the return on the market. The term  $\alpha_i$  represents component of return insensitive to (independent) the return on market. Let  $\alpha_i$  denote the expected value of  $a_i$  and let  $e_i$  represent the random element of  $a_i$ . Then,

$$a_i = \alpha_i + e_i \quad (6)$$

where  $e_i$  has an expected value of zero.

The return on a stock equation can be written as,

$$R_i = \alpha_i + \beta_i R_m + e_i \quad (7)$$

where:

$\alpha_i$  = Component of security i's return that is independent of the market's performance.

$e_i$  = Residual.

$R_i$  is dependent variable while  $R_m$  is independent variable. Both  $R_m$  and  $e_i$  are random variable. Each of them have a probability distribution and a mean and standard deviation which is  $\sigma_m$  and  $\sigma_{e_i}$ .

When these components were added together, it will be equal to the total return.

It is convenient to have  $e_i$  uncorrelated with  $R_m$  which mean that,

$$Cov(e_i, R_m) = E[(e_i - 0)(R_m - \bar{R}_m)] = 0. \quad (8)$$

If  $e_i$  is uncorrelated with  $R_m$ , it implies that equation (7) describes the return on any security is independent of the return on the market changes. The estimation of  $\alpha_i$ ,  $\beta_i$  and  $\sigma_{e_i}$  are often obtain from time series regression analysis.

Regression analysis guarantees that  $R_m$  and  $e_i$  will be uncorrelated, at least over the period that the equation has been fit. So  $e_i$  is independent of  $e_j$  for all value of  $i$  and  $j$ , or  $E(e_i e_j) = 0$  is the key assumption in the single index model. This implies that the only reason stocks vary together, systematically is because of a common comovement with the market.

Basic equation:  $R_i = \alpha_i + \beta_i R_m + e_i$  (for all stocks  $i = 1, \dots, N$ )

By construction:  $E(e_i) = 0$  (for all stocks  $i = 1, \dots, N$ )

By assumption:

1. Index unrelated to unique return:

$$E[e_i(R_m - \bar{R}_m)] = 0 \quad (\text{for all stocks } i = 1, \dots, N)$$

2. Securities only related through common response to market:

$$E(e_i e_j) = 0 \quad (\text{for all pairs of stocks } i = 1, \dots, N \text{ and } j = 1, \dots, N \text{ but } i \neq j)$$

By definition:

$$1. \text{ Variance } e_i = E(e_i)^2 = \sigma^2 e_i$$

$$2. \text{ Variance } R_m = \sigma_m^2$$

The expected return, standard deviation and covariance in the single index model are used to represent the jointmovement of securities as the following result:

$$1. \text{ The mean return, } \bar{R}_i = \alpha_i + \beta_i \bar{R}_m$$

$$2. \text{ The variance of a security's return, } \sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{e_i}^2$$

$$3. \text{ The covariance of returns between securities } i \text{ and } j, \sigma_{ij} = \beta_i \beta_j \sigma_m^2$$

The expected return are divided into two component which is the independent component,  $\alpha_i$  (unique part) and a market related part,  $\beta_i \bar{R}_m$ . Likewise, a security's variance has the same two part which is unique risk,  $\sigma_{e_i}^2$  and market related risk. In contrast, the covariance depends only on the market risk. The single model index implied that the only reason securities move together is a common response to the

market movements. The total parameter that should be find is  $3N + 2$ . For the portfolio with 10 stocks, there are 32 parameter that should be find.

### 2.5.2 The Portfolio Expected Return and Risk

Beta on a portfolio,  $\beta_p$  is define as a weighted average of the individual  $\beta_i$ 's on each stock in the portfolio where the weights are the fraction of the portfolio invested in each stock. Then

$$\beta_p = \sum_{i=1}^N X_i \beta_i \quad (9)$$

The Alpha of a portfolio,  $\alpha_p$  is define as

$$\alpha_p = \sum_{i=1}^N X_i \alpha_i \quad (10)$$

Therefore the expected return of a portfolio is written as,

$$\bar{R}_p = \alpha_p + \beta_p \bar{R}_m \quad (11)$$

Given the expected return of any portfolio are,

$$\bar{R}_p = \sum_{i=1}^N X_i \bar{R}_i \quad (12)$$

Then by replace  $\bar{R}_i$  in the equation above

$$\bar{R}_p = \sum_{i=1}^N X_i \alpha_i + \sum_{i=1}^N X_i \beta_i \bar{R}_m \quad (13)$$

Given the variance of a portfolio is written as

$$\sigma_p^2 = \sum_{i=1}^N X_i^2 \sigma_i^2 + \sum_{i=1}^N \sum_{j=1, j \neq i}^N X_i X_j \sigma_{ij} \quad (14)$$

Therefore, by replacing the result above for

$$\begin{aligned} \sigma_p^2 &= \sum_{i=1}^N X_i^2 \beta_i^2 \sigma_m^2 + \\ &\quad \sum_{i=1}^N \sum_{j=1, j \neq i}^N X_i X_j \beta_i \beta_j \sigma_m^2 + \sum_{i=1}^N X_i^2 \sigma_{\epsilon_i}^2 \end{aligned} \quad (15)$$

If the portfolio p is taken to be the market portfolio, then the expected return on p must be  $\bar{R}_m$ . From the equation (11) the only value of  $\beta_p$  and  $\alpha_p$  that

guarantee  $\bar{R}_p = \bar{R}_m$  for any choice of  $\bar{R}_m$  is equal to zero and  $\beta_p$  equal to one. Thus, the Beta on the market is one and stocks are thought of as being more or less risky than the market according to whether their Beta is larger or smaller than 1. In double summation  $i \neq j$ , if  $i = j$  then the terms would be,

$$\sum_{i=1}^N \sum_{j=1, j \neq i}^N X_i X_j \beta_i \beta_j \sigma_m^2 = X_i^2 \beta_i^2 \sigma_m^2. \quad \text{But}$$

this are exactly the terms in the first summation. Thus, the variance on the portfolio can be written as,

$$\sigma_p^2 = \sum_{i=1}^N \sum_{j=1, j \neq i}^N X_i X_j \beta_i \beta_j \sigma_m^2 + \sum_{i=1}^N X_i^2 \sigma_{\epsilon_i}^2. \quad (16)$$

Thus, the risk of the investor's portfolio could be represented as,

$$\sigma_p^2 = \beta_p^2 \sigma_m^2 + \sum_{i=1}^N X_i^2 \sigma_{\epsilon_i}^2 \quad (17)$$

Assume for a moment that an investor forms a portfolio by placing equal amounts of money into each of N stocks. The risk of this portfolio can be written as,

$$\sigma_p^2 = \beta_p^2 \sigma_m^2 + \frac{1}{N} \left( \sum_{i=1}^N \frac{1}{N} \sigma_{\epsilon_i}^2 \right) \quad (18)$$

Because N show the total of stocks in the portfolio, then the larger the N, the value in the second part of equation (18) will be smaller. This part show the residual risk or unsystematic risk, then the larger the total of stocks in the portfolio the contribution of the unsystematic risk will decrease. The other risk will vanished although the total of stocks in the portfolio is getting larger because the risk is correlated to the Beta of the portfolio. When the residual risk is closer to zero, then the portfolio risk will be,

$$\sigma_p = \left[ \beta_p^2 \sigma_m^2 \right]^{1/2} = \beta_p \sigma_m = \sigma_m [X_i \beta_i] \quad (19)$$

Because the value of  $\sigma_m$  is the same for every stock, then the contribution of the stock risk to the portfolio risk consist of

many stock depend on  $\beta_i$ . Total of the individual risk are the same as equation (4). The effect of  $\sigma_{e_i}^2$  to the portfolio risk will reduce when it is closer to Zero by increasing the stock, then the  $\sigma_{e_i}^2$  is known as diversifiable risk or unsystematic risk (risk that can be reduce by diversification).

The effect of  $\beta_i \sigma_m^2$  to the portfolio risk will not change although the total stocks has increase is known as systematic risk or non diversifiable risk. Because  $\sigma_m^2$  is a constant and unsystematic risk cannot vanish by increasing the total stock, then the stock Beta,  $\beta_i$  always been used as a risk measurement for certain stock. The value of  $\sigma_{e_i}^2$  can be calculated by,

$$\sigma_{e_i}^2 = \sigma_i^2 - \beta_i^2 \sigma_m^2 \quad (20)$$

### 3 Data And Methodology

There are 2 types of data collected for the process of analysis in this paper. First, composite index and price of 10 selected stocks was collected daily according to trading day of KLSE. The duration of data is from October 15<sup>th</sup>, 2002 until March 18<sup>th</sup>, 2003, that is 100 trading days in KLSE. Selection of 10 stocks for this paper's analysis was according to the most volume traded in KLSE from March 11<sup>th</sup>, 2003 until March 15<sup>th</sup>, 2003.

Secondly, interest rates was collected that was release by Bank Negara Malaysia at March 18<sup>th</sup>, 2003. The rates is 3% annually.

Data analysis model;

i. Stock's profit:  $R_i = \frac{P_i - P_{i-1}}{P_i}$  and

$$\bar{R}_i = \frac{1}{N} \sum_{i=1}^N R_{it}$$

Market's profit:  $R_m = \frac{IK_t - IK_{t-1}}{IK_{t-1}}$

and  $\bar{R}_m = \frac{1}{N} \sum_{i=1}^N R_{mt}$

ii. Alpha and beta value of each stock:

$$\beta_i = \frac{\sum_{t=1}^N [(R_i - \bar{R}_i)(R_m - \bar{R}_m)]}{\sum_{t=1}^N (R_m - \bar{R}_m)^2} \quad \text{and}$$

$$\alpha_i = \bar{R}_i - \beta_i \bar{R}_m$$

iii. Unsystematic risk (variance):

$$\sigma_m^2 = \frac{1}{N-1} \sum_{i=1}^N (R_{mt} - \bar{R}_m)^2$$

Stock's profitable risk (variance):

$$\sigma_i^2 = \frac{1}{N-1} \sum_{i=1}^N (R_{it} - \bar{R}_i)^2$$

Residual risk (variance):

$$\sigma_{e_i}^2 = \sigma_i^2 - \beta_i^2 \sigma_m^2$$

iv. Excess return to beta ratio (ERB):

$$ERB = \frac{\bar{R}_i - R_f}{\beta_i}$$

v. Cut-off rate ( $C_i$ ):

$$C_i = \frac{\sigma_m^2 \sum (\bar{R}_i - R_f) \beta_i}{1 + \sigma_m^2 \sum \frac{\beta_i^2}{\sigma_{e_i}^2}}$$

vi. Stock selection into portfolio is according to value of ERB and  $C_i$  \*. If the value of ERB >  $C_i$  \*, then the stock selected into portfolio or vice versa.

vii. Capital proportion ( $X_i$ ) for each selected stock in portfolio:

$$X_i = \frac{Z_i}{\sum_{i=1}^N Z_i} \quad \text{where}$$

$$Z_i = \frac{\beta_i}{\sigma_{e_i}^2} \left( \frac{\bar{R}_i - R_f}{\beta_i} - C_i \right)$$

viii. Coefficient variation:  $CV = \frac{\sigma_p}{R_p}$

## 4 Result

### 4.1 Daily Analysis

Table 1. Market and Stock Return, Alpha, Beta and Variance (Daily Analysis)

Stock	$R_i$ ( $\times 10^{-3}$ )	$R_m$ ( $\times 10^{-5}$ )	$Var.I$ ( $\times 10^{-3}$ )	$Var.m$ ( $\times 10^{-5}$ )	$Kov.R_i R_m$ ( $\times 10^{-5}$ )	Beta I	Alpha I ( $\times 10^{-3}$ )	$Var.e_i$ ( $\times 10^{-3}$ )
IOI	0.234	8.3	0.467	7.19	2.712	0.377	0.203	0.457
MAYBANK	0.020	8.3	0.296	7.19	2.719	0.378	-0.011	0.286
AMMB	-1.620	8.3	0.515	7.19	7.023	0.976	-1.701	0.446
BAT	0.510	8.3	0.055	7.19	0.783	0.109	0.501	0.054
SIME	0.465	8.3	0.187	7.19	3.762	0.523	0.422	0.167
COMMERZ	-0.200	8.3	0.341	7.19	6.238	0.867	-0.272	0.287
PBB	-0.420	8.3	0.147	7.19	2.481	0.345	-0.449	0.138
AFFIN	-4.290	8.3	0.415	7.19	1.809	0.251	-4.311	0.410
KEMAS	0.738	8.3	1.514	7.19	11.100	1.541	0.610	1.343
GENTING	1.382	8.3	0.294	7.19	7.032	0.977	1.301	0.225

From table 1, there are 6 stocks provide positive return with highest value recorded by Genting which is 0.001382. On the other hand, the lowest return recorder by Affin with -0.00429. The level of market's return is 0.000083 and market risk level is

0.0000719. For unsystematic risk level, Kemas recorded the highest value of 0.0001343. Here it shows that profit level and risk level is positively correlated but with just a small correlation coefficient value.

Table 2. ERB,  $C_i$ , and Capital Investment Proportion ( $X_i$ )

Stock	ERB	$C_i (\times 10^{-4})$	$ERB > C_i^*$	$Z_i$	$X_i$
IOI	0.000402	0.0882*	>*	0.3216	0.0194
MAYBANK	-0.000160	0.0292	<		
AMMB	-0.001740	-2.184	<		
BAT	0.003928	-1.652	>*	7.8832	0.4752
SIME	0.000732	-0.868	>*	2.2361	0.1348
COMMERZ	-0.000330	-1.161	<		
PBB	-0.001460	-1.748	<		
AFFIN	-0.017380	-2.868	<		
KEMAS	0.000425	-2.344	>*	0.4731	0.0285
GENTING	0.001329	-0.0038	>*	5.6735	0.3421

In table 2, the optimal value of  $C_i$  is 0.0882 and this value will be use as an indicator for stock selection into optimal portfolio. Here, there are 5 counters show their ERB value is greater than  $C_i^*$ . These counter are BAT, Genting, SIME, Kemas and IOI. The largest capital investment proportion will go to BAT with 47.52% and

the smallest proportion is 1.94% by counter IOI. Lastly, table 3 give the value of expected return from this optimal portfolio with daily analysis is 0.08% and at a very low risk level, that is 0.000062. This shows that investment make through this portfolio will provide a higher return, that is 10% higher than market's return (0.008%).

Table 3. Return and Risk Level for Optimal Portfolio (Daily Analysis)

Stock	$R_i$	$R_m = 0.000083$		$Var.m = 0.0000727$			
		$X_i$	Alpha ( $X_i$ )	Beta ( $X_i$ )	$R_i X_i$	Var. $e_i$	$X_i Var.e_i$
BAT	0.00051	0.4752	0.000238	0.05169	0.000242	0.000054	0.000026
GENTING	0.00138	0.3421	0.000445	0.33429	0.000472	0.000225	0.000077
SIME	0.00047	0.1348	0.000057	0.07046	0.000063	0.000167	0.000023
KEMAS	0.00074	0.0285	0.000017	0.04391	0.000021	0.001342	0.000038
IOI	0.00023	0.0194	0.000004	0.00731	0.000004	0.000457	0.000009
		Jumlah	0.000761	0.50766	0.000802	0.002245	0.000173

$$R_p = 0.000761 + 0.50766(0.000083) = 0.0008 = 0.08\%$$

$$Var.p = 0.000062$$

#### 4.2 Weekly Analysis

Data on every Tuesday is used to process the analysis of weekly data. If Tuesday is public holiday, then data on

the next day will choose for replacement. Here, there are 23 data for weekly analysis and result for weekly analysis is shown in table 4.

Table 4. Market and Stock Return, Alpha, Beta and Variance (Weekly Analysis)

Stock	$R_i$ ( $\times 10^{-3}$ )	$R_m$ ( $\times 10^{-4}$ )	$Var.I$ ( $\times 10^{-3}$ )	$Var.m$ ( $\times 10^{-4}$ )	$Kov.R_i R_m$ ( $\times 10^{-4}$ )	Beta I	Alpha I ( $\times 10^{-4}$ )	$Var.e_i$ ( $\times 10^{-3}$ )
IOI	1.419	4.98	2.772	6.011	6.291	1.047	8.986	2.113
MAYBANK	0.007	4.98	1.227	6.011	2.216	0.369	-1.763	1.145
AMMB	-7.251	4.98	2.539	6.011	6.277	1.044	-77.702	1.883
BAT	2.222	4.98	0.099	6.011	-0.648	-0.108	22.758	0.092
SIME	1.794	4.98	0.250	6.011	2.311	0.384	16.027	0.161
COMMERZ	-0.947	4.98	1.483	6.011	5.314	0.884	-13.870	1.013
PBB	-2.066	4.98	0.356	6.011	1.072	0.178	-21.546	0.337
AFFIN	-18.94	4.98	2.264	6.011	-3.543	-0.589	-186.507	2.055
KEMAS	1.994	4.98	4.312	6.011	10.508	1.748	11.246	2.475
GENTING	6.392	4.98	1.749	6.011	7.121	1.185	58.027	0.905

From table 4, the result is almost the same as daily analysis with 6 counters recorded positive return level with highest value is 0.006392 by Genting. The lowest return level also recorded by Affin with -0.01894. On the other hand, the highest unsystematic risk level recorded by Kemas with 0.002475 and the lowest is 0.000092 by BAT. Besides,

market's return for this weekly analysis stood at 0.000498 with risk level at 0.0006011. If comparing relation between return and risk level, this weekly analysis shows a negative value of correlation coefficient. This is good sign that high return obtained with a lower risk level for weekly analysis.

Table 5. ERB,  $C_i$ , and Capital Investment Proportion ( $X_i$ )

Stock	ERB	$C_i(x10^{-3})$	ERB > $C_i$	$Z_i$	$X_i$	$Z_i^*$	$X_i^*$
AFFIN	0.033119	-0.052	>*	9.188165	0.479261		
GENTING	0.004909	1.079*	>*	5.011201	0.261388	5.011201	0.501955
SIME	0.003165	-0.797	>*	4.972173	0.259352	4.972173	0.4980453
KEMAS	0.000811	0.120	<				
IOI	0.000805	0.191	<				
PBB	-0.01482	-1.224	<				
BAT	-0.01525	-2.005	<				
MAYBANK	-0.00155	0.102	<				
COMMERZ	-0.00172	-0.950	<				
AMMB	-0.0075	-1.426	<				

In table 5, the optimal value of  $C_i$  is 0.001079 and there are 3 ERB values greater than 0.001079. Although this 3 countries is going to form the optimal portfolio, but there is one counter provide negative expected return value and this counter should not be chosen. The counter that provide negative expected

return is Affin. This is because the  $\alpha$  and  $\beta$  value of Affin is negative that cause it's expected return become negative. So there are just 2 counters will be selected into optimal portfolio for weekly analysis. These 2 counters are Genting and SIME with capital investment proportion 50.2% and 49.8% respectively.

Table 6. Return and Risk Level for Optimal Portfolio (Weekly Analysis)

Stock	$R_m = 0.000498$		Var m = 0.000601						
	Alpha I	Beta I	$R_i$	$X_i$	Alpha( $X_i$ )	Beta( $X_i$ )	$R_i X_i$	Var. $e_i$	$X_i$ Var. $e_i$
GENTING	0.005803	1.184661	0.006392	0.502	0.002913	0.5947	0.003209	0.000905	0.000454
SIME	0.001603	0.384462	0.001794	0.498	0.000798	0.19146	0.000893	0.000161	0.00008
			Jumlah	0.003711	0.78616	0.004102	0.001066	0.000534	

$$R_p = 0.003711 + 0.78616 (0.000498) = 0.004103 = 0.41\%$$

$$\text{Var. p} = 0.000639$$

Tabel 6, show the expected return for this weekly optimal portfolio is 0.41% at 0.000639 risk level. The expected return for this portfolio is even higher than weekly market's return that is 0.000498. This means that investment through this combination of stock will provide a higher return level and at a lower risk level.

### 4.3 Coefficient Variation

Comparison have made between daily dan weekly analysis to choose the analysis that provide high return and low risk through coefficient variation value.

Daily analysis portfolio:

$$CV = \frac{\sigma_p}{R_p} = \frac{\sqrt{0.000062}}{0.0008} = 9.8425$$

Weekly analysis portfolio:

$$CV = \frac{\sigma_p}{R_p} = \frac{\sqrt{0.000639}}{0.004103} = 6.1610$$

Weekly analysis showed a lower CV value that is 6.1610 while daily analysis is 9.8425. This indicate that portfolio of weekly analysis will be chosen and will provide a higher return with certain risk level if compared to daily analysis.

## 5 Conclusion

Criteria of choosing stock into optimal portfolio not limited to just comparing Excess Return to Beta Ratio (ERB) and Cut-off Rate Optimal ( $C_i^*$ ), but have to consider the value of expected return of each stock.

There are 5 counters forming the optimal portfolio of daily analysis with expected return from this portfolio is 0.08% at 0.000062 risk level. These 5 counters are BAT, Genting, SIME, Kemas and IOI with capital investment proportion 47.52%, 34.21%, 13.48%, 2.85%, and 1.94% respectively.

There are just 2 counters selected into optimal portfolio of weekly analysis with expected return stood at 0.41% with risk level of 0.000639. The 2 counters are Genting and SIME with capital investment proportion 50.2% and 49.8% respectively.

Coefficient variation value for daily analysis is 9.8425 and if compared to weekly analysis (6.1610), it shows that portfolio in weekly analysis provides higher return level with lower risk level. This mean the best portfolio is from weekly analysis that is combination of counter Genting and SIME.

### *References:*

- [1] Elton, E. J., & Gruber, M. J., *Modern Portfolio Theory and Investment Analysis*, Fourth Edition, John Wiley and Sons, New York, 1994.
- [2] Fisher, D. E., & Jordan, R. J., *Security Analysis and Portfolio Management*, Fifth Edition, Prentice Hall, New Jersey, 1994.