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Research paper

Optimal Portfolio Construction using Single Index Model: A Comparative Study of Largest Market Capitalization and Most Active Trading Volume Stocks

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Abstract

The increasing growth of Jakarta stock index enhanced by increasing trends in trading volume and market capitalization. This study aimed to construct portfolio of largest market capitalization portfolio and most-active trading volume portfolio with 1 year and 6-months holding period and compare the return and risk performance of each portfolios. Single index model was conducted to construct the optimum portfolio by using daily return of stocks listed in Jakarta Stock Exchange during the year of 2016.The result showed that the most active trading volume portfolio comprised more stocks than the largest market capitalization portfolio. The optimal portfolios also showed that each group of stocks has different sector orientation in terms of sector weights. Property and real estate sector has the maximum proportion of the largest market capitalization portfolio, while mining sector has the maximum proportion in the most-active trading volume optimum portfolio. The 6-months formation period of portfolio period showed that most active stocks portfolios has higher cumulative return that the largest market capitalization portfolios inwhich both portfolios has higher cumulative return than the Jakarta Composite Index return. Largest market capitalization portfolio was better performed in 6-months formation period, while most active trading volume portfolio in one-year period.

Keywords: optimum portfolio, single index model, market capitalization, trading volume.

1. Introduction

Jakarta Composite Index had reached to its highest point at 5.296,71 in 2016 with 6,74% growth for the past 6 years. This growth was enhanced by trading volume which had a positive growth of 8,26% and market capitalization with a rising growth of 10,22%. These facts showed that the increasing trend in Jakarta's stock market index was supported by the increasing growth in market capitalization and trading volume.

The purpose of this study is to construct an optimal portfolio from two groups of stocks consisted of: (1)the largest market capitalization stocks and (2) the most active trading volume stocks and compare the return and risk of two optimal portfolio constructed to find which portfolio performed better. Single index model was conducted in this study to construct optimal portfolios.

2. Materials and Methods

Many studies had been conducted in constructing optimal portfolio. [9]studied the optimal portfolio construction of LQ 45 stock in Jakarta Stock Exchange for period 2009 until 2013 by comparing the Markowitz Model and Single Index Model. It found that Single Index Model was more efficient in which has given the greater expected return and the least risk. Their study found the expected return of portfolio was 0,596% and standard deviation of 0,0264% based on single index model. [11]conducting a study of constructing optimal portfolio of LQ 45 stocks of Listed Companies in Jakarta Stock Exchange using Single Index Model. It was found that out of 22 companies, there are 14 companies that has a positive return that were included to the optimal portfolio, and the return and standard deviation of portfolio were 3,32% and 0,22% respectively. Juniarti and Wiharno (2016) study was constructing optimum portofolio of LQ 45 stocks in Jakarta Stocks Exchange by using single index model. It is found that out of 28 companies, 12 companies were selected to be the optimum portfolio and there was a significant difference in trading frequency between the return of optimum portofolio stocks and the return of stocks which were not included in optimum portfolio. The return and standard deviation of portfolio were 1,9159% and 6,1733% respectively. [12]found that out of 45 companies of LQ45 Index, 12 companies were included in optimum portofolio. [10]used single index model to construct optimum portfolio from Kompas 100 stock index in the periode of 2010-2014 and concluded that there were 12 selected stock out of 46 companies that were included in optimaum portfolio. The return of portfolio was 3,05% and the risk was 0,123%. [6]use Sharpe single index model to construct optimal portfolio and concluded that out of 50 stocks, 24 stock were chosen form the inclusion of optimal portfolio and the maximum proportion of stocks in the portfolio is banking sector. Sen and [7] using single index model to construct optimal portfolio of 30 stocks in BSE index for period of 2010-2013, found that 4 securities to be included in optimal portfolio, and there was a significant difference of total risk of optimal portfolio calculated under the mechanism of single index model and Markowitz model respectively. [8] constructed optimal portfolio by using single index model of 164 companies in Dhaka Stock Exchange for the

period of 2007 to 2012 and selected 33 stocks for the optimum portfolio, giving the return of 6,48% and standard deviation of 11,79%.

For the purpose of constructing portfolio, we use secondary data of daily stock price of stocks listed in Indonesia Stock Exchange. This study used daily stock prices from January to December 2016. Two portfolios were constructed in this study. Stocks for the first portfolio were selected from companies listed in fifty largest market capitalization in 2016, and for the secondportfolio, stocks areselected fromcompanies listed in fifty most active companies by trading volume for the same year as reffered to the Indonesia Stock Exchange Quarterly Statistics book (2016).Single index model was used in this study to construct the optimum portfolio. Single index model simplify the of describing the sources of security risk which consists of systematic risk and firms-specific risk components. The set of estimates needed for the Single Index Model are: (1) n estimaes of extre-market expected excess returns, α_i, (2) n estimates of the sensitivity coefficients, β_i, (3) n estimates of the specific variances, σ^2 (e_i), (4) 1 estimates for the market risk premium $E(R_M)$, and (5) 1 estimates for the variance of the common macroeconomic factor σ_M^2. The excess rate of return of a security as suggested by Sharpe is [1]:

$$R_i = \alpha_i + \beta_i R_M + e_i \quad (1)$$

Security analysis were conducted before constructing an optimal portfolio which included the following steps:

1. Calculating daily return of individual stocksand the market by using the following formula.
$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}} \quad (2)$$
2. Calculating standard deviation of individual stocks and the market using the following formula.
$$\sigma_i = \sqrt{\frac{\sum_{t-1}^{n} (R_{it} - \bar{R}_i)^2}{n-1}} \quad (3)$$
3. Calculating beta of individual stock using the following formula.
$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2} \quad (4)$$
4. Calculating alpha of individual stock using the following formula.
$$\alpha_i = E(R_i) - \beta_i E(R_m) \quad (5)$$
5. Calculating variance residual error for individual stock using the following formula.
$$\sigma_{ei}^2 = \sigma_i^2 - \beta_i^2 \sigma_m^2 \quad (6)$$
6. Calculating excess return to beta of individual stock using the following formula.

$$ERB_i = \frac{E(R_i) - R_f}{\beta_i} \quad (7)$$

7. Calculating C_i value of each stock by using the following formula.
$$C_i = \frac{\sigma_m^2 \sum_{j=1}^{n} \frac{E(R_j) - R_f}{\sigma_{ej}^2}}{1 + \sigma_m^2 \sum_{j=1}^{n} \frac{\beta_j^2}{\sigma_{ej}^2}} \quad (8)$$

In determining which stocks were included in the optimum portfolio, rules are as follow ([3]: (1) find the excess return to beta ratio (Eq. 7) for each stock under consideration, and rank from the highest to lowest, (2) the optimum portfolio consists of investing in all stocks for which $(\bar{R}_i - R_f)/\beta_i)$ is greater than a particular cut-off point C*. After stocks were determined in the optimum portfolio, proportions of each stock in optimum portfolio were calculated by using the following formula.

$$w_i = \frac{z_i}{\sum_{j=1}^{k} Z_i} \quad (9)$$

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2} (ERB_i - C^*) \quad (10)$$

After constructing the optimal portfolio, we calculated the following parameters:

1. Portfolio beta using the following formula.

$$\beta_p = \sum_{i=1}^{n} w_i . \beta_i \quad (11)$$

2. Portfolio alphausing the following formula.

$$\alpha_p = \sum_{i=1}^{n} w_i . \alpha_i \quad (12)$$

3. Portofolio standard deviation using the following formula.

$$\sigma_p = \sqrt{\beta_p^2 \sigma_M^2 + \left(\sum_{i=1}^{n} w_i \sigma_{ei}\right)^2} \quad (13)$$

4. Portofolio return using the following formula.
$$E(R_p) = \alpha_p + \beta_p . E(R_M) \quad (14)$$
5. Sharpe ratio using the formula.
$$S_p = \frac{E(r_p) - r_f}{\sigma_p} \quad (15)$$

Sharpe ratio measures the performance of portfolio. The higher the value of this ratio, the better the performance of a portfolio [4].

3. Results

This study conducted two portfolio construction. The first portfolio were using 50 companies listed in the largest market capitalization. Out of 50 companies in the largest market capitalization stocks, 37 were selected to be the optimal portfolio by excluding stocks with negative returns. [2] suggested a specific cut off point to exclude securities that have: (i) a positive beta (β_i) and a value of excess return to beta ratio (Eq. 7) less than the cut-off point; and (ii) a negative beta (β_i) and a value of excess return to beta ratio (Eq. 7) greater than the cut-off point.[5] conducted the optimum portfolio construction in Indian capital market using single Sharpe index, had excluded negative return and negative beta in determining stocks which were included in the optimal portfolio.[9]excludedstockswithnegativereturns in constructing optimum portfolioof LQ 45 stocksusingsingleindex model. The same criteria was applied to the second group of stocks which consisted of 50 most active trading volume stocks, and 32 companies were selected from the most active trading volume stocks.

The result of calculating Eq. 2, through Eq. 8derived a cut-off point to select the optimal portfolio for the largest market capitalization portfolio. Based on the cut-off point calculation, there are 12 stocks selected in the optimal portfolio out of 37 largest market capitalization stocks and 19 stocks selected in the optimal portfolio out of 32 most active trading volume stocks. The list of companies stocks in each portfolio are presented in Table 2 dan Table 3.

By using Eq. 9 and Eq.10, we had the selected stocks that were included in the optimal portfolio. The result of optimum portfolio as described in Table 4 showed that the most active trading volume portfolio comprised more stocks than the largest market capitalization portfolio.The optimal portfolios also showed that each portfolio has different sector orientation in terms of sector weights.The biggest proportion of the most active trading volume portfolio is 47,42% are represented by 4 sectors: cement, mining, property and real estate, and toll road, airport, harbor and allied products with the number of stocks amounting 4 stocks. While in the largest market capitalization portfolio, property and real estate sector has the biggest proportion that amounting to 40,76% of the portfolio inwhich it comprised only one number of stocks.

This study also constructedportfolio of 6 months formation period. The first portfolio formation period startedat 5 January 2016. The next portfolio started at the next date after the previous portfolio formation period. We obtained66 portfolios ateach group of stocks as presented in Table 6. It showed that different date of portfolio formation would give different optimal portfolio in terms of numbers of stocks, stocks included in portfolio, weights of stocks, returns, and risks.

Table 5 showed the return andrisk of each portfolios. Based on the calculation of one year portfolio formation period, the most active trading volume portfolio had greater return than the largest market capitalization portfolio, but also had greater risk based on its standar deviation. The portfolio performance measured by Sharpe ratio, showed that largest market capitalization portfolio had better performance. The return and risk of both portfolioshad the same pattern on each portfolio formation period in which return and standard

deviation of most active trading volume portfolio were greater than the largest market capitalization portfolio.On average, the most active trading volume portfolio had greater return and standard deviation than the largest market capitalization portfolio. Average return of most active trading volume portfolio was 0,7623% compared to the largest market capitalization portfolio which had the average return of 0,5163%. The standard deviation of most active trading volume portfolio was 1,6449%, compared to the largest market capitalization portfolio which had the average standard deviation of 0,9686%.

Table 1: Stock Market Indicators Growth Period 2011-2016

	2011	2012	2013	2014	2015	2016	Growth
Jakarta Composite Index	3,821.99	4,316.67	4,274.18	5,226.95	4,593.01	5,296.71	6.74%
Trading Volume	1,308,477.94	1,134,062.47	1,391,968.66	1,327,015.65	1,459,101.78	1,946,284.30	8.26%
Market Capitalization	3537.29	4126.99	4219.02	5228.04	4872.70	5753.61	10.22%

Source: Financial Service Authority Statistics, 2017

Table2: Selected Companies of The Largest Market Capitalization

No.	Stocks	E(Ri)	SD i	C*	No.	Stocks	E(Ri)	SD i	C*
1	Metropolitan Kentjana	0.18%	0.84%	0.0001	20	Astra International	0.18%	2.82%	0.0016
2	Chandra Asri Petrochemical	0.76%	2.46%	0.0004	21	Bank Central Asia	0.07%	0.99%	0.0015
3	Semen Baturaja (Persero)	1.02%	4.37%	0.0009	22	Telekomunikasi Indonesia (Persero)	0.11%	1.76%	0.0013
4	Bank OCBC NISP	0.29%	4.42%	0.0009	23	GudangGaram	0.09%	2.01%	0.0013
5	BPD Jawa Barat danBanten	0.69%	3.85%	0.0012	24	Bank Danamon Indonesia	0.10%	2.67%	0.0013
6	Aneka Tambang (Persero)	0.49%	2.96%	0.0015	25	Kalbe Farma	0.09%	2.14%	0.0012
7	Adaro Energy	0.56%	3.46%	0.0017	26	Bank Mandiri (Persero)	0.11%	1.95%	0.0012
8	Multi Bintang Indonesia	0.15%	1.93%	0.0018	27	Charoen Pokphand Indonesia	0.10%	2.48%	0.0011
9	Sinar Mas Multiartha	0.42%	7.72%	0.0018	28	PakuwonJati	0.08%	2.44%	0.0011
10	Tambang Batubara BA (Persero)	0.49%	3.39%	0.0019	29	Bank Negara Indonesia (Persero)	0.07%	1.78%	0.0010
11	Bank Maybank Indonesia	0.35%	4.24%	0.0020	30	Unilever Indonesia	0.04%	1.56%	0.0010
12	Indosat	0.09%	1.81%	**0.0020**	31	Astra Agro Lestari	0.03%	2.63%	0.0010
13	Vale Indonesia	0.30%	3.34%	0.0020	32	Media Nusantara Citra	0.04%	3.05%	0.0010
14	SumberAlfariaTrijaya	0.06%	2.32%	0.0020	33	Perusahaan Gas Negara (Persero)	0.04%	2.64%	0.0009
15	WaskitaKarya (Persero)	0.20%	1.93%	0.0019	34	PP (Persero)	0.02%	2.05%	0.0009
16	Bank CIMB Niaga	0.20%	3.26%	0.0019	35	Bank Rakyat Indonesia (Persero)	0.02%	1.85%	0.0009
17	Indofood SuksesMakmur	0.23%	3.61%	0.0019	36	ElangMahkotaTeknologi	0.02%	2.42%	0.0009
18	MitraKeluargaKaryasehat	0.08%	2.28%	0.0019	37	BumiSerpongDamai	0.01%	2.11%	0.0008
19	United Tractors	0.14%	2.35%	0.0018					

Table 5: Portfolios' Characteristics

	Largest Market Capitalization Portfolio		*Most Active Trading Volume Portfolio*	
Portfolio formation period	1 year	6 months	1 year	6 months
Return	0.4609%	0.5163%	0.6287%	0.7263%
Standard deviation	0.9202%	0.9686%	1.3774%	1.6449%
Beta portfolio	0,4880	0,5578	0,7346	0,9861

	Largest Market Capitalization Portfolio		*Most Active Trading Volume Portfolio*	
Alpha portfolio	0,0042	0,0047	0,0057	0,0066
Sharpe ratio	0,4831	0,5153	0.4446	0.4355

Table 3: Selected Companies of The Most Active Trading Volume

No.	Stocks	E(Ri)	SD i	C*	No.	Stocks	E(Ri)	SD i	C*
1	Bumi Resources	0.85%	5.76%	0,0000	17	Elnusa	0.30%	3.75%	0,0018
2	Trada Maritime	0.53%	5.00%	0,0000	18	WaskitaBeton Precast	0.20%	1.93%	0,0019
3	MNC Land	0.11%	4.19%	0,0000	19	Sentul City	0.23%	2.84%	**0,0019**
4	Delta DuniaMakmur	1.09%	5.65%	0,0003	20	Central Proteina Prima	0.06%	3.50%	0,0019
5	Eagle High Plantation	0.37%	4.39%	0,0003	21	SitaraPropertindo	0.09%	1.46%	0,0019
6	PP Properti	0.94%	4.63%	0,0006	22	KawasanIndustriJababeka	0.09%	1.41%	0,0018
7	BPD Banten	0.35%	8.24%	0,0006	23	Puradelta Lestari	0.07%	2.13%	0,0018
8	Semen Baturaja	1.02%	4.37%	0,0011	24	Bank Central Asia	0.07%	0.99%	0,0016
9	SMR Utama	0.27%	4.11%	0,0011	25	Astra International	0.18%	2.82%	0,0015
10	Benakat Integra	0.23%	4.41%	0,0011	26	Telekomunikasi Indonesia	0.11%	1.76%	0,0014
11	Aneka Tambang	0.49%	2.96%	0,0014	27	Kalbe Farma	0.09%	2.14%	0,0013
12	Adaro Energy	0.56%	3.46%	0,0016	28	DarmaHenwa	0.00%	0.94%	0,0013
13	Nusantara Infrastructure	0.24%	1.98%	0,0018	29	PakuwonJati	0.08%	2.44%	0,0013
14	Bumi Resources Minerals	0.22%	4.82%	0,0018	30	AlamSutera Realty	0.05%	2.45%	0,0012
15	Express TrasindoUtama	0.33%	5.36%	0,0018	31	Perusahaan Gas Negara	0.04%	2.64%	0,0012
16	ExploitasiEnergi Indonesia	0.11%	4.66%	0,0018	32	Panin Financial	0.01%	2.59%	0,0012

Table4: Optimal Portfolios of 1-year Formation Period

Portfolio Weight (%)	Largest Market Cap. Portfolio				Most Active Trading Volume Portfolio		
	% Portfolio	# of Stocks	Sectors		% Portfolio	# of Stocks	Sectors
>0 - 5	10,93%	6	*Mining, Food and Beverages, Bank, Investment Fund, Telecommunication*		20,40%	11	*Plantation, Mining, Transportation, Tourism, Restaurant & Hotel, Investment Company, Bank, Building Construction, Wholesale, Property & Real Estate*
>5 - 10	26,82%	4	*Cement, Bank, Mining*		32,17%	4	*Mining, Transportation*
>10 - 15	0,00%	-	-		47,42%	4	*Cement, Mining, Property & Real Estate, Toll road, airport, harbor & allied product*
>15 - 20	21,48%	1	*Chemicals*		-	-	
> 20	40,76%	1	*Property & Real Est.*		-	-	
Total		12				19	

Table 6: 6-Months Formation Period Portfolios

Port.	Port. Formation Date	Jakarta Composite Index		Largest Market Cap				Most Active				Port.	Port. Formation Date	Jakarta Composite Index		Largest Market Cap				Most Active			
		Return	Cum. Return	Return	Cum. Return	# of Stocks	Share ratio	Return	Cum. Return	# of Stocks	Share ratio			Return	Cum. Return	Return	Cum. Return	# of Stocks	Share ratio	Return	Cum. Return	# of Stocks	Share ratio
1	05-Jan	0.10%	0,10%	0.45%	0,45%	15	0.50	0.63%	0,63%	15	0.43	34	22-Feb	0.05%	3,16%	0.52%	17,80%	12	0.50	0.75%	26,89%	15	0.45
2	06-Jan	0.10%	0,21%	0.44%	0,89%	16	0.51	0.65%	1,28%	15	0.43	35	23-Feb	0.05%	3,21%	0.51%	18,39%	13	0.49	0.73%	27,81%	13	0.42
3	07-Jan	0.09%	0,29%	0.44%	1,33%	16	0.50	0.65%	1,94%	14	0.42	36	24-Feb	0.06%	3,27%	0.51%	19,00%	13	0.51	0.22%	28,09%	15	0.12
4	08-Jan	0.11%	0,40%	0.45%	1,78%	16	0.51	0.67%	2,62%	15	0.44	37	25-Feb	0.06%	3,34%	0.52%	19,62%	13	0.52	0.73%	29,03%	14	0.42
5	11-Jan	0.11%	0,51%	0.45%	2,24%	15	0.51	0.66%	3,30%	15	0.44	38	26-Feb	0.06%	3,40%	0.53%	20,25%	13	0.52	0.78%	30,03%	14	0.42
6	12-Jan	0.11%	0,62%	0.44%	2,69%	16	0.51	0.66%	3,99%	14	0.43	39	29 Feb	0.05%	3,46%	0.52%	20,88%	12	0.51	0.77%	31,03%	15	0.42
7	13-Jan	0.10%	0,72%	0.44%	3,14%	15	0.50	0.68%	4,69%	14	0.44	40	01-Mar	0.05%	3,51%	0.54%	21,54%	13	0.52	0.78%	32,06%	14	0.44
8	14-Jan	0.10%	0,82%	0.45%	3,61%	16	0.51	0.70%	5,43%	14	0.45	41	02-Mar	0.05%	3,56%	0.54%	22,19%	13	0.52	0.81%	33,12%	15	0.44
9	15-Jan	0.10%	0,92%	0.41%	4,03%	16	0.53	0.72%	6,19%	14	0.46	42	03-Mar	0.03%	3,60%	0.55%	22,86%	12	0.51	0.82%	34,22%	13	0.43
1	18-	0.10	1,02	0.	4,4	16	0.	0.	6,9	15	0.	4	04-	0.03	3,63	0.	23,	13	0.	0.	35,	12	0.

0	Jan	%	%	41 %	6%		54	73 %	6%		47	3	Mar	%	%	54 %	53 %		51	85 %	36 %		44
1 1	19-Jan	0.10 %	1,13 %	0.46 %	4,94%	16	0.53	0.74 %	7,75%	15	0.47	44	07-Mar	0.03 %	3,67 %	0.56 %	24,21 %	12	0.52	0.82 %	36,47 %	11	0.43
1 2	20-Jan	0.10 %	1,23 %	0.47 %	5,44%	16	0.52	0.74 %	8,54%	14	0.46	45	08-Mar	0.04 %	3,71 %	0.54 %	24,89 %	13	0.51	0.76 %	37,51 %	12	0.42
1 3	21-Jan	0.11 %	1,34 %	0.49 %	5,95%	16	0.54	0.74 %	9,35%	15	0.49	46	10-Mar	0.04 %	3,75 %	0.54 %	25,56 %	13	0.50	0.76 %	38,56 %	11	0.41
1 4	22-Jan	**0.12 %**	1,46 %	0.50 %	6,48%	16	0.54	0.74 %	10,15 %	15	0.49	47	11-Mar	0.05 %	3,80 %	0.53 %	26,22 %	13	0.50	0.74 %	39,58 %	14	0.41
1 5	25-Jan	0.11 %	1,58 %	0.50 %	7,01%	17	0.54	0.72 %	10,94 %	16	0.48	48	14-Mar	0.05 %	3,85 %	0.53 %	26,89 %	13	0.50	0.78 %	40,67 %	13	0.42
1 6	26-Jan	0.10 %	1,68 %	0.51 %	7,55%	17	**0.54**	0.74 %	11,76 %	16	0.49	49	15-Mar	0.05 %	3,90 %	0.53 %	27,56 %	12	0.51	0.73 %	41,69 %	13	0.41
1 7	27-Jan	0.10 %	1,79 %	0.51 %	8,10%	16	0.54	0.74 %	12,59 %	15	0.49	50	16-Mar	0.05 %	3,95 %	0.54 %	28,25 %	12	0.51	0.74 %	42,75 %	12	0.41
1 8	28-Jan	0.10 %	1,88 %	0.50 %	8,64%	16	0.53	0.73 %	13,41 %	17	0.48	51	17-Mar	0.05 %	4,00 %	0.54 %	28,94 %	12	0.51	0.76 %	43,83 %	12	0.41
1 9	29-Jan	0.09 %	1,98 %	0.50 %	9,18%	17	0.53	0.72 %	14,23 %	16	0.48	52	18-Mar	0.05 %	4,06 %	0.54 %	29,63 %	12	0.50	0.75 %	44,91 %	11	0.40
2 0	01-Feb	0.09 %	2,07 %	0.50 %	9,73%	16	0.53	0.72 %	15,06 %	15	0.48	53	21-Mar	0.05 %	4,11 %	0.54 %	30,33 %	12	0.51	0.74 %	45,99 %	11	0.41
2 1	02-Feb	0.09 %	2,16 %	0.48 %	10,26 %	14	0.51	0.72 %	15,88 %	15	0.48	54	22-Mar	0.05 %	4,16 %	0.54 %	31,03 %	12	0.50	0.74 %	47,06 %	11	0.40
2 2	03-Feb	0.10 %	2,26 %	0.51 %	10,82 %	16	0.53	**0.95 %**	16,98 %	9	0.37	55	23-Mar	0.05 %	4,21 %	0.54 %	31,74 %	12	0.50	0.74 %	48,16 %	11	0.40
2 3	04-Feb	0.09 %	2,36 %	0.50 %	11,37 %	16	0.53	0.61 %	17,70 %	15	0.47	56	24-Mar	0.05 %	4,26 %	0.54 %	32,45 %	12	0.50	0.74 %	49,25 %	11	0.39
2 4	05-Feb	0.09 %	2,45 %	0.48 %	11,91 %	16	0.52	0.53 %	18,33 %	15	0.47	57	28-Mar	0.05 %	4,31 %	0.55 %	33,17 %	12	0.51	0.77 %	50,40 %	11	0.41
2 5	09-Feb	0.07 %	2,52 %	0.49 %	12,45 %	16	0.52	0.61 %	19,05 %	15	0.46	58	29-Mar	0.05 %	4,36 %	0.56 %	33,91 %	11	0.52	0.76 %	51,53 %	12	0.40
2 6	10-Feb	0.07 %	2,59 %	0.50 %	13,02 %	15	0.53	0.71 %	19,90 %	14	0.46	59	30-Mar	0.05 %	4,41 %	0.55 %	34,66 %	10	0.52	0.74 %	52,66 %	11	0.41
2 7	11-Feb	0.07 %	2,66 %	0.52 %	13,60 %	15	0.52	0.71 %	20,75 %	14	0.44	60	31-Mar	0.04 %	4,45 %	0.55 %	35,39 %	10	0.52	0.75 %	53,80 %	10	0.40
2 8	12-Feb	0.07 %	2,73 %	0.52 %	14,19 %	14	0.52	0.73 %	21,63 %	13	**0.68**	61	01-Apr	0.03 %	4,47 %	0.55 %	36,13 %	10	0.51	0.76 %	54,97 %	10	0.42
2 9	15-Feb	0.08 %	2,81 %	0.52 %	14,78 %	15	0.53	0.70 %	22,49 %	13	0.45	62	04-Apr	**0.02 %**	4,50 %	0.55 %	36,89 %	10	0.52	0.74 %	56,12 %	11	0.41
3 0	16-Feb	0.08 %	2,90 %	0.52 %	15,38 %	16	0.53	0.70 %	23,34 %	13	0.45	63	05-Apr	0.03 %	4,53 %	**0.78 %**	37,95 %	10	0.42	0.74 %	57,27 %	11	0.41
3 1	17-Feb	0.08 %	2,97 %	0.52 %	15,98 %	16	0.52	0.71 %	24,22 %	13	0.43	64	06-Apr	0.04 %	4,58 %	0.56 %	38,73 %	10	0.52	0.80 %	58,53 %	12	0.45
3 2	18-Feb	0.08 %	3,05 %	0.53 %	16,59 %	15	0.53	0.73 %	25,13 %	13	0.43	65	07-Apr	0.05 %	4,63 %	0.56 %	39,50 %	10	0.52	0.87 %	59,90 %	10	0.43
3 3	19-Feb	0.05 %	3,11 %	0.51 %	17,19 %	14	0.51	0.65 %	25,95 %	13	0.39	66	08-Apr	0.05 %	4,68 %	0.57 %	40,29 %	11	0.52	0.82 %	61,22 %	13	0.44

5. Discussion

The result of optimum portfolio construction showed that different sector were dominated in each portfolio. The optimum portfolio of the largest market capitalization has the majority weightsof property and real estate sector amounting to 40,76% consisting of 1 stocks. Chemical sector is the second majority in the portfolio with the proportion of 21,48% consisting of 1 stock. Cement, bank, and mining sectors has the proportion ranging around 5% - 10% amounting to 26,82% which consist of 4 stocks. The least portfolio weights had the range of weights around 0% - 5% amounting to 10,69% consist of 6 stocks in mining, food and beverages, bank, investment fund and telecommunication sectors. Whereas in the most active trading volume portfolio, the majority weights are in the range of above 10% to 15% amounting to 47,42% which consist of 4 stocks in the cement, mining, property

& real estate, and toll road, airport, harbor & allied products sectors. The second majority weights is in the range of 5% - 10% amounting to 32,17% which consist of 4 stocks in mining and transportation sectors. The least weights is in the rangeof 0% - 5% amounting to 20,40% which consist of 11 stocks in the sector of Plantation, Mining, Transportation, Tourism, Restaurant & Hotel, Investment Company, Bank, Building Construction, Wholesale, Property & Real Estate.

volume portfolio, whereas most active trading volume portfolio hada greater return. All of the portfolio return are greater than market index return of 0,07%. Based on Sharpe ratio, the performance of largest market capitalization portofolio were better than most-active trading volume portfolio, both in one year and six-months formation period.Largest market capitalization portfolio performed better in six-months formation period, while most active trading volume portfolio performed better in one-year formation period.

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