Does Naively Selected Perform Portfolio Efficiently? Empirical Evidence from Indonesia Capital Market

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Abstract

The aims of this study are to search and examine the optimum number of assets that perform portfolio efficiently. There are 210 nonfinancial stocks listed in Indonesia Stock Exchange included in the samples during period of analysis 2000 to 2008. Monthly returns data (daily cumulative abnormal returns for each month) are used to eliminate bias of non-synchronous trading in data analysis. This study performs 500 naively selected portfolios using replacement random sampling method for each combination of stocks of portfolios from 2 to 20 stocks. Treynor Index and Jensen Alpha are used to measure the portfolio performance.
Research results show that portfolio with 18 and higher stocks provides practical consistent value of performance and lower standard deviation. However the results of statistical tests comparing performance of portfolios between and within portfolio j and j-(j-k) do not confirm the hypothesis that the higher number of stocks leads better diversified portfolio. This study finds that decreasing value of portfolio performance slower than decreasing level of deviation standard. Parallel to previous studies (Elton ang Gruber, 1977; Statman 1987; Bennet and Sias, 2006; DeMiguel et al. 2009), this study suggests investors to expand the number of stock beyond 20 stocks to attain better diversified portfolio.

Keywords: naively selected diversification, portfolio performance, Treynor Index, Jensen Index

JEL: G110, G120

1. Introduction

Modern portfolio theory aroused in 1950 pioneered by Markowitz (1952, 1959) change the investor's aware of the benefit of diversification. The thinking of not put all your eggs in one basket is helpful for investors in managing and building their investments. Two major research areas concern on diversification. First, literature studies focus on search optimal number of securities in portfolio (Statman 1987; Newbold and Poon, 1993; Schmidt, 2003; Bennet and Sias, 2006; Setiawan 2007) using naïve 1/N diversification rule. However the optimal number of securities to perform well diversified portfolio are varies among studies and across countries from 8 stocks (Newbold and Poon, 1993) to 100 stocks (Tang, 2004).

Second, recent studies concern on developing and building better model of assets allocation (Cheng and Liang, 1999; DeMiguel et al. 2009; Abankwa et al. 2013) compare to naïve 1/N diversification rule. Empirical evidences in this area are mixed. DeMiguel et al. (2009) built 14 selection models and compare these portfolios to naïve 1/N portfolios. They provided evidence that none of 14 portfolios more efficient than naïve 1/N portfolios. While other studies have demonstrated that sophisticated mean-variance models are more efficient than 1/N or naive diversification (Hartzell, et al.1986; Grissom et al., 1987; Malizia and Simons, 1991; Mueller, 1993; Cheng and Liang, 1999; and Abankwa et al., 2013).

Previous studies more concern on Sharpe Index as a measurement proxy of portfolio performance (Chen and Liang, 1999, DeMguel et al., 2009, Tu and Zhou, 2009, and Abankwa et al., 2013). Tang (2004) used 1/N rule found that 20 assets in portfolio could eliminate 95% diversifiable risk. Furthermore, it needs 80 additional stocks (i.e 100 stocks) to eliminate an extra 4% (i.e. 99%) of diversifiable risk. Well diversified portfolio might eliminate diversifiable or unsystematic risk, and leave behind systematic risk. Therefore systematic risk is relevant in assessing portfolio performance rather than unsystematic risk.

The aims of this study are to search and examine the optimum number of assets that perform portfolio efficiently using 1/N diversification. This study uses Treynor Index (Treynor, 1966) and Jensen Index (Jensen, 1968) as portfolio performance measurement, which provides new insight in selecting optimum portfolio. These indexes evaluating portfolio performance that more concern on systematic risk than unsystematic risk.

Remain discussions are divided into four sections. Section 2 outlines the literature review. Section 3 develops research method conducting the data sample, and technique analysis. Section 4 discusses and analyzes research findings. Conclusion and practical implication are presented in the last section.

2. Literature Review

In his seminal paper, Markowitz (1952) proposed that more assets in portfolio will lead lower total risk. The total risk consists of unsystematic risk and systematic risk. If asset returns were not correlated, diversification could eliminate risk (Markowitz, 1959). Newbold and Poon (1993) documented several textbooks, which explicitly state the optimal number of securities in a portfolio ranging from 8 to 20 securities. However, only few empirical researches have been conducted in this area in recent studies. Schmidt (2003) found there is a high marginal diversifiable risk reduction of about 80% when the portfolio size increases to include 15 assets. In contrast, Bennet and Sias (2006) found there is no evidence that investors have ever been able to form well-diversified portfolios regardless of the number of securities held. They found there have always been large diversification gains possible beyond 20 stocks. This consistent with Statman (1987) that found well diversified portfolio of randomly chosen stock must include at least 30 stocks for a borrowing investor and 40 stocks for a lending investor. While Elton and Gruber (1977) provided evidence that total risk of 10 stock portfolios is 156% of the minimum total risk, while 20% higher than minimum total risk requires 28 stocks, 10% higher than minimum total risk requires 60 stocks, and 5% higher than minimum total risk requires 110 stocks.

Setiawan (2007) conducted research in Indonesia in order to search optimal number of stock of well diversified portfolio. He selected samples that actively trading stocks from LQ 45 with period of analysis from 2000 to 2005. This study employed two asset selection models; naïve 1/N diversification rule and cut off method. Three portfolio performance indexes were used in this study: Sharpe Index, Treynor Index, and Jensen Index. He built 780 portfolios for j securities. He found that 15 stocks were met well diversified portfolio for naïve 1/N diversification rule, and 13 stocks are sufficient to build well diversified portfolio for cut off method.

DeMiguel et al. (2009) employed comprehensive study of 14 asset allocation models across seven data empirical datasets. They found evidence that none is consistently better than naïve 1/N diversification rule. In contrast, Cheng and Liang (1999) found that an efficient portfolio outperform naively diversified portfolio when the portfolio formation period is the same as the period used for testing the efficiency difference. While Tu and Zhou (2009) used optimal combination of the 1/N rule with sophisticated strategy that refers to the three-fund rule of Kan and Zhou (2007), found that the combination portfolio outperform 1/N rule. Abankwa et al. (2013) also found that sophisticated optimization strategies do consistently outperform 1/N rule.

This study focuses on searching optimal number of assets in portfolio using naïve 1/N diversification rule. While Setiawan (2007) employed the three indecxes of portfolio performance, this study more concern on two indexes: Treynor Index proposed by Treynor (1966) and Jensen's Alpha proposed by Jensen (1968). The two indexes concern on evaluating the efficiency of portfolio rather than single asset performance. This study expands the scope of the samples not only stocks that including in the LQ45, but for all non financial firms listed in Indonesia Stock Exchange. Thus, this study states the hypothesis that investors require more number of stocks (securities) to attain better diversified portfolio.

3. Research Method

3.1. Sample and Data

Sample of this research are nonfinancial firms that listed in Indonesia Stock Exchange which provide stock price data during period of 2001 to 2008. There are 210 nonfinancial firms that met the sample criteria. Data of capital market, including stock price and Indonesia composite index, are collected from Indonesia Stock Exchange (IDX) and Center of Business and Economic Data Universitas Gadjah Mada. The interest rate data (BI rate and deposit interest rates) are collected from the Central Bank of Indonesia.

3.2. Variables and Instrument Measurements

This study used monthly returns, which are calculated from cumulative daily return for every month from 2001 until 2008. Monthly return is used to anticipate bias due to many thin trading in Indonesian capital market. Individual stock return and composite index return are calculated as follow:

Individual stock return:

$$R_{iT}=\sum_{t=1}^{n} R_{it} \qquad (1a)$$

Where RiT is return for stock i at month t, Rit is return for stock i at day t, and n is number of days in each month.

Market return:

$$R_{MT}=\sum_{t=1}^{n} R_{Mt} \qquad (1b)$$

Where RMT is return for Indonesia composite index at month T, RMt is return for Indonesia composite index at day t, and n is number of days in month T.

The single stock of systematic risk (□j) is calculated based on the regression of single index market model as follows:

RiT = □i + □iRMT + □iT

(2)

Where RiT is return for stock i at month t, RMT is return for Indonesia composite index at month t, □i is intercept for stock i, □i is coefficient of parameter of market return as proxy of systematic risk for stock i, and □iT is residual error i at month t.

Based on equation (4a), this study performed 500 naively selected portfolios using replacement stocks random sampling method for each combination of stocks of portfolios from 2 to 20 stocks. There were total number of 9500 portfolios have been constructed in this study. Portfolio return and its risk can be calculated as follows:

Portfolio return:

$$Rp_{(i,j)} = \left(\sum_{i=1}^{j} \bar{R}_i \right) / N \qquad (3)$$

Where Rpi,j is return for portfolio i with j stocks, $\bar{R}_i$ is average return for stock i, N is number of stocks in portfolio j.

Systematic risk of portfolio or beta portfolio:

$$\beta_{(i,j)} = \left(\sum_{i=1}^{j} \beta_i \right) / N \qquad (4)$$

Where βi,j is beta portfolio i with j stocks, βi is beta for stock i, N is number of stocks in portfolio j.

Two indexes were used in this research to evaluate the portfolio performance; Treynor ratio (TR) and Jensen's Alpha (JA). Treynor ratio (TR) measures portfolio performance through adjusted return relative to the systematic risk (Treynor, 1966). The Treynor ratio can be measured as follow:

$$TRp_{(i,j)} = \left(Rp_{(i,j)} - R_f \right) / \beta_{(p,i,j)} \qquad (5a)$$

Where TRpi,j is Treynor Ratio for portfolio i with j stocks, Rpi,j is return for portfolio i with j stocks, Rf is Risk free rate, and □p,i,j is coefficient of parameter of market return as proxy of systematic risk for portfolio i with j stocks.

Jensen (1968) proposes a tool to evaluate portfolio performance, which the later known as Jensen's Alpha. This tool is useful to evaluate whether a portfolio outperform market indices. The performance has been adjusted by market risk premium. Jensen's Alpha (JA) can be formulated as follow:

$$JAp_{i,j} = Rp_{i,j} - [R_f + (R_M - R_f).\square_{p,i,j}] \qquad (5b)$$

Where JApi,j is Jensen's Alpha for portfolio i with j stocks, Rpi,j is return for portfolio i with j stocks, Rf is risk free rate based on 90 days interest rate for Indonesia Central Bank, RM is market return, and □p,i,j is coefficient of parameter of market return for portfolio i with j stocks.

3.3. Statistical Test Techniques

Analysis of Variance (ANOVA) was used to test differences of portfolio performance index between portfolio j. While Tukey HSD post hoc test multiple comparison was employed to test differences of portfolio performance index within portfolio j and portfolio j-(j-k), j>1 and n=20.

4. Empirical Research Results and Discussion

4.1. Descriptive Statistics

This study builds 19 groups of portfolios that consist of 500 portfolios for each group. There are total 9.500 portfolios. The Table 4.1 presents descriptive statistics for portfolio returns. The table shows that portfolios with lower number of stocks have higher mean return and higher standard deviation. Mean return of portfolio with 14 stocks has similar returns compare to portfolios with higher than 13 stocks, but they have different level of standard deviation. While mean return of portfolio with 18 stocks has similar both in returns and in deviation standard compare to portfolios with higher than 18 stocks.

Table 4.1. Descriptive Statistics of Portfolio Return

Number of Stocks	N	Minimum	Maximum	Mean	Std. Dev.[1]
02	500	-0.019	0.346	0.025	0.047
03	500	-0.011	0.234	0.025	0.039
04	500	-0.007	0.221	0.025	0.035
05	500	-0.005	0.179	0.024	0.031
06	500	-0.004	0.151	0.024	0.028
07	500	-0.004	0.130	0.024	0.026
08	500	-0.003	0.118	0.023	0.024
09	500	-0.002	0.114	0.023	0.023
10	500	-0.002	0.105	0.023	0.022
11	500	0.000	0.096	0.023	0.020
12	500	0.001	0.091	0.022	0.019
13	500	0.000	0.097	0.022	0.018
14	500	0.001	0.091	0.021	0.017
15	500	0.001	0.086	0.021	0.017
16	500	0.002	0.082	0.021	0.016
17	500	-0.001	0.140	0.022	0.019
18	500	0.002	0.076	0.021	0.015
19	500	0.002	0.081	0.021	0.015
20	500	0.004	0.077	0.021	0.015

The Table 4.2 presents descriptive statistics for portfolio beta. Theoretically, market index consist of all securities in the capital market. It means that market beta is equal to 1. Thus portfolio beta equal 1 is practically efficient. The table shows that spread of portfolios beta varies from 0,734 (portfolio with number of 17 stocks) to 0,751 (portfolio with number of 17 stocks). The table shows that the higher number of stock the lower standard deviation that also mean lower spread of portfolio beta. The table shows trend that the higher number of stocks lead the beta toward 1. It consistent with Markowitz (1952; 1959) that the higher number of stocks reduces unsystematic risk.

Table 4.2.Descriptive Statistics of Beta of Portfolio

Number of Stock	N	Minimum	Maximum	Mean	Std. Dev.
02	500	-0.667	2.571	0.743	0.373
03	500	-0.273	2.105	0.744	0.297
04	500	-0.094	1.763	0.739	0.248
05	500	0.021	1.646	0.739	0.242
06	500	0.117	1.617	0.738	0.221
07	500	0.172	1.498	0.737	0.208
08	500	0.219	1.441	0.736	0.196
09	500	0.233	1.411	0.736	0.185
10	500	0.252	1.355	0.736	0.176
11	500	0.306	1.365	0.737	0.169
12	500	0.373	1.273	0.739	0.165
13	500	0.417	1.249	0.742	0.160
14	500	0.409	1.222	0.744	0.156
15	500	0.428	1.180	0.744	0.151
16	500	0.427	1.152	0.745	0.147
17	500	0.343	1.151	0.734	0.151
18	500	0.443	1.130	0.748	0.140
19	500	0.442	1.117	0.749	0.137
20	500	0.456	1.121	0.751	0.134

Table 4.3 shows descriptive statistics of Treynor Ratio in order to measure and evaluate portfolio performance. The table shows that higher number of stocks in portfolios has lower mean Treynor Ratio and lower standard deviation. Portfolios with 18 and higher stocks has similar mean Treynor Ratio, 0.016. However, decreasing value of Treynor Ratio is slower than decreasing level of standard deviation.

Table 4.3.Descriptive Statistics of Treynor Ratio

Number of Stock	N	Minimum	Maximum	Mean	Std. Dev.
02	500	-4.821	2.886	0.008	0.364
03	500	-2.970	1.564	0.021	0.232
04	500	-0.515	1.455	0.032	0.128
05	500	-0.025	1.601	0.035	0.120
06	500	-0.016	0.608	0.027	0.064
07	500	-0.022	0.389	0.024	0.052
08	500	-0.018	0.334	0.023	0.045
09	500	-0.016	0.296	0.022	0.040
10	500	-0.015	0.230	0.021	0.036
11	500	-0.012	0.183	0.020	0.033
12	500	-0.013	0.158	0.018	0.029
13	500	-0.011	0.155	0.018	0.028
14	500	-0.010	0.149	0.017	0.026
15	500	-0.009	0.126	0.017	0.024
16	500	-0.009	0.111	0.017	0.023
17	500	-0.022	0.270	0.017	0.030
18	500	-0.009	0.104	0.016	0.022
19	500	-0.008	0.092	0.016	0.021
20	500	-0.007	0.087	0.016	0.020

Table 4.4 shows descriptive statistics of Jensen's Alpha to evaluate portfolio

performance. The table shows that portfolios with lower number of stocks have higher mean Jensen's Alpha and higher standard deviation. Mean Jensen's Alpha of portfolio with 12 stocks has similar Jensen's Alpha compare to portfolios with higher than 12 stocks, but they have different level of standard deviation. While mean Jensen's Alpha of portfolio with 18 stocks has similar both in Jensen's Alpha and in deviation standard compare to portfolios with higher than 18 stocks. These results are quite similar to descriptive statistics for portfolio return in Table 4.1. The trend of the results also consistent with the Treynor Ratio in Table 4.3 that decreasing value of Jensen Alpha is slower than decreasing level of standard deviation.

Table 4.4.Descriptive Statistics of Jensen Alpha

Number of Stock	N	Minimum	Maximum	Mean	Std. Dev.
02	500	-0.028	0.336	0.015	0.047
03	500	-0.020	0.225	0.015	0.039
04	500	-0.016	0.212	0.015	0.035
05	500	-0.014	0.170	0.015	0.031
06	500	-0.014	0.141	0.014	0.028
07	500	-0.014	0.121	0.014	0.026
08	500	-0.013	0.109	0.014	0.024
09	500	-0.011	0.105	0.014	0.023
10	500	-0.011	0.095	0.013	0.022
11	500	-0.010	0.087	0.013	0.020
12	500	-0.009	0.082	0.012	0.019
13	500	-0.009	0.088	0.012	0.018
14	500	-0.009	0.081	0.012	0.017
15	500	-0.008	0.076	0.012	0.017
16	500	-0.008	0.072	0.012	0.016
17	500	-0.011	0.130	0.012	0.019
18	500	-0.008	0.066	0.012	0.015
19	500	-0.007	0.071	0.012	0.015
20	500	-0.006	0.067	0.012	0.015

4.2. Statistical Test

This subsection presents statistical test using ANOVA for test differentiation between portfolios j and Tukey HSD post hoc test multiple comparisons within portfolios. Table 4.5 summarizes results of ANOVA test differences for portfolio return, beta, Treynor Ratio, and Jensen Alpha. The table shows all variables, except portfolio beta, are marginal significant at 10%.

Table 4.5. ANOVA for test Differences of Variables

Variable	F Ratio	Prob Sig.
Return	1.551	0.064
Beta	0.298	0.998
Treynor Ratio	1.519	0.073
Jensen Alpha	1.552	0.063

Further analysis using Tukey HSD post hoc test multiple comparison analyzes differences of variable within portfolio j and portfolios j-k. The test results do not present in this paper due to page limits. The results show that none of the statistical test has significant differences comparing those variables from portfolio j and portfolio j-k. These results do not confirm the hypothesis that the higher number of stocks leads better diversified portfolio.

The research results show that naively stocks selected in portfolio provide grey area conclusion. There are no optimal securities number in portfolio found in this study, even there are 500 portfolios building for each portfolio with 2 until 20 stocks in these portfolios. These findings contradict to Setiawan (2007) which found that portfolio with 15 securities are optimal for naively securities selected method, and 13 securities are optimal using cut off method.

There are some rational explanations for these results. The sample scope (all non financial firms) used in this study is wider than sample (LQ45) used by Setiawan (2007). Therefore there are many thin trading in the data analysis. Even monthly data are used in this study to reduce the problem, but it is not sufficient the cop the non synchronous trading. The thin trading also leads bias analysis in estimating the beta. During 2001 until 2008, there are substantial difference market trend and fundamental macroeconomic, which led higher market volatility.

5. Conclusion

This study finds that higher number of stocks in portfolios has lower value of portfolio performance and lower standard deviation. Portfolios with 18 and higher stocks have equal value of Treynor Ratio, while portfolio with 12 and higher stock have equal value of Jensen Alpha. Furthermore, decreasing value of Treynor Ratio and Jensen Alpha are slower than decreasing level of its standard deviation. Portfolio with 18 and higher stocks provides lowest standard deviation of Jensen Alpha.

Statistical tests comparing performance of portfolios between and within portfolio j and j- (j-k) do not confirm the hypothesis that the higher number of stocks leads better diversified portfolio. However, this study finds that decreasing value of portfolio performance slower than decreasing level of deviation standard. This study suggests to expanding the number of stock beyond 20 stocks to attain better diversified portfolio. Parallel to previous studies (Elton and Gruber, 1977; Statman 1987; Bennet and Sias, 2006; DeMiguel et al. 2009) who find and suggest that portfolio with more than 20 stocks until 110 stocks to get better diversified portfolio.

This study has some implications for further research: Filter stocks sample which more actively trading in Indonesian Capital Market. This study covers all non financial stocks that provide complete data without regard on thin trading data. Some beta measurement adjustment may be employed to reduce bias beta estimated (Tandelilin, 2010, 2001; Dimson, 1979; Fowler and Rorke, 1983; Fowler et al., 1989; and Scholes and William.1977. Long period of analysis from 2001 to 2008 might provide misleading data interpretation due to market and economic volatilities. Comparison between naively securities selected in portfolio and particular benchmark will provide information that is more useful for market players and potential investors.

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