

## IN SEARCH OF STOCK MARKET PROXY TO CALCULATE SYSTEMATIC RISK (BETA) OF STOCKS IN INDONESIA STOCK EXCHANGE

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### ABSTRACT

*The calculation of beta stock in Indonesia is still debatable to this day. Though many researchers who have used sophisticated methods mathematically, the assumptions applied in developing the methods are impossible to happen in the real world, such as the ability of stock market return the day after (lead) affects the market return today. This study was conducted to assess the stock price index in Indonesia Stock Exchange that can be used as a proxy of stock market in Indonesia. The results of this study showed that there was a gap between beta stocks counted with JCI return as a market proxy with beta stocks counted with index returns of LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100. This study has also found that the beta counted by using KOMPAS-100 return produced the smallest standard error of the estimate (SEE) that it was more applicable compared to the other stock index returns.*

**Keywords:** Beta, LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100

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### I. INTRODUCTION

Investment decisions are always associated with the problem of using funds. Based on the time dimension, investment can be divided into short-term investments and long-term investments. Those investments have in common on their profit rate expected by considering the amount of risk that can be guaranteed by the investor in making an investment decision.

Almost all investment instruments have risks. On financial management, particularly related to capital markets, these risks are generally represented by the coefficient of variance or standard deviation as a tool to measure the total risk. In modern portfolio theory, the risk of securities (securities/effect such as stock) may comprise of two types. They are systematic risk and unsystematic risk. The investors who tend to dislike the risk will pay more attention to

systematic risk than unsystematic risk. It is because the systematic risk cannot be eliminated through diversification of stock (Husnan, 2005).

The size of the systematic risk is often called  $\beta$  (beta). Beta is a coefficient that indicates the return sensitivity of stock towards the change of a stock market return. Husnan (2005) stated that the higher the beta stock number, the higher the sensitivity level of individual stock return towards the change in market returns. Stocks with beta value that are higher than one are the stocks that are sensitive to the change in stock market. Meanwhile, stocks with beta value lower than one are the stocks that tend to be insensitive to the change in stock market.

In the past few decades (approximately in 2000s to 2016) there are still considerable debates related to systematic risk of stock (beta). Some of considerable debates are



about what stock index is appropriate to be used as stock market proxy to calculate beta stocks, for example Hartono and Suriyanto (1999) stated that beta which is calculated by using JCI return as stock market proxy is a bias beta due to a thin market. Meanwhile, Sartono and Zulaihati (1998) stated that JCI as a representative of the market has many weaknesses because it does not quite reflect the actual market condition while LQ45 index reflects the market condition better, hence, LQ45 return is seen to represent the market return better. However, a different thing was revealed by Harsono (1999) who strongly suggested that the movement of LQ45 index cannot represent the Indonesian stock market as a whole. Abroad, the same thing has indeed also occurred as it is claimed by Basu and Rizzuto (1995) that S&P 500 index is less feasible in representing the movement of the stock market in the United States.

Hartono and Suriyanto (1999) reckoned that because the beta stocks calculated using JCI return are the biased ones then treatment and correction are appropriate to conduct to overcome these bias beta. It was then followed by many other researchers such as Sembiring and Rahmah (2013, 2014); Septiani and Supadmi (2014); Soetjiono, Murhadi, and Ernawati (2013), Arfinto (2006). There are several methods of correcting these beta and some of those employ methods with lags and leads. Lags method is still reasonable to do because the return of each stock in the real world can be affected by market stock return in the previous day. Nevertheless, leads method tends to be incomprehensible because in the real world, the stock return is unlikely to be affected by the stock market return in the following days. Therefore, theoretically and mathematically, the assumption of lags method can be done, but, it is very contradictory with the reality in stock market in general. The case above is the idea

on this research. Instead of doing beta correction by using the method that its assumption is contradictory, it is better to find an alternative of stock price index that the return can become a proxy return in Indonesian stock market.

This study was conducted to assess the potential of using stock price index return in Indonesia Stock Exchange such as JCI, LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100 as a proxy return of stock market in calculating beta stock. To get accuracy in calculating beta, the daily closing of stock price index data were used. The period of research is January 3, 2013 until April 11, 2016. In this research, the index which produces a minimum average of standard error of estimate will be concluded as proxy of stock market.

## **II. LITERATURE REVIEW**

### **Return and Risk**

Return is the result obtained from investment. Husnan (2005) reckons that return can be in the forms of a realized return that has happened or expected return that has not happened yet but it is expected in the future. Realized return is the return that already happened which is calculated based on historical data. Realized return is crucial for it is used as one of measuring performances of a company. This historic return is useful as the basic of determining the expected return and the risk in the future. Furthermore, Husnan (2005) has differentiated stock revenue into two namely the dividend revenue and capital gain that represents the excess of purchasing price.

Meanwhile, regarding to the risk, modern portfolio theory requires that if the risks borne by stockholders increase then the stocks will obtain great stock returns. Thus, it can be said that there is a positive relationship



between risks and stock returns (Fabozzi, Gupta, & Markowitz, 2002). Regarding to the stock risk, Arfinto (2006) stated that in the concept of stock risk, total risk is acknowledged, it consists of diversifiable risk/non-systematic risk and non-diversifiable risk/systematic risk. The risk of diversifiable stock is usually associated with specific factors of a company, an issuer of a stock. This risk can be minimized through diversification by establishing stock portfolio. Conversely, non-diversifiable stock risk is related to factors which may influence all stocks listed on a stock market. This risk is so called market risk. Market risk is often measured by using beta stocks.

### **Beta**

Beta is the most commonly instrument used to measure the volatility of stock return or portfolio return to market return (Arfinto, 2006). Hartono (1998) stated that to figure out beta of a securities or a portfolio is an essential thing in analyzing the securities or portfolio. Beta of a securities can be calculated using historical data by applying regression technique. This regression technique in estimating the beta of a securities can be done by using securities's return as a dependent variable and market return as an independent variable. This technique is often called Single Index Model.

Single index model is based on the observation that the price of a securities fluctuates in line with the market price index. In particular, it can be observed that most stocks tend to increase in price when the stock price index increases. Conversely, when the stock price index decreases, most stocks will also decrease, it suggests that returns of securities may correlate with the availability of common response of a securities and return of a market index (Hartono, 1998). The implementation of single index model

requires an assessment of beta for stocks that will be included in portfolio. Beta indicates the slope of regression line and  $\alpha$  indicates intercept with Rit axis. The bigger of beta will make the line steeper and vice versa. This line is then called Security Market Line (SML).

### **Previous Studies**

Basu and Rizzuto (1995) conducted a research on the feasibility of a stock price index to use as a representative of the stock market movements. In their research, Basu and Rizzuto (1995) used S&P 500 index. The result of this study showed that S&P 500 index was less feasible to represent the stock market movement in the United States. In Australian stock market, McKenzie, Brooks, and Faff (2000) conducted a study on the use of local and international stock price indexes to estimate beta stocks in Australian Stock Exchange and found that the beta predicted using the local stock price index (here was the All Ordinaries) was in fact able to produce a smaller level of error in the prediction compared to the international stock price index that involved cross-country stocks formed by Morgan Stanley.

In Indonesia, there is often a presumption that Jakarta Composite Index (JCI) cannot be used as a market representative. For instance, Hartono and Surianto (1999) stated that beta stock calculated using JCI return is a biased beta. As a result, many researchers are reluctant to use JCI to calculate stock market return and replace it with LQ45 index. LQ45 index is considered to be better in representing the stock market conditions. However, it is argued by Harsono (1999) who stated that LQ45 index is not good enough to depict the overall stock market. In fact, there were quite a lot researchers who have been trying to carry out treatments on JCI return to make it unbiased, among them were Sembiring and Rahmah

(2013, 2014); Septiani and Supadmi (2014); Soetjiono et al. (2013), Arfinto (2006). Even though the researchers have used a sophisticated method from the side of mathematic, the assumptions used to develop that model is unlikely to happen in the real world, like the ability of stock market return in the days after (lead) affects the market return today. Based on those descriptions related to the previous studies done, a study, which is able to conclude that the stock price index in Indonesian Stock Exchange that can be used as stock market proxy in Indonesia, needs to be carried out.

### III. METHOD

Population in this research was all stocks listed in Indonesian Stock Exchange until April 11, 2016. There were 522 companies which listed their stocks in Indonesian Stock Exchange up to the period. Meanwhile, the period used for this research was January 3, 2013 until April 11, 2016, 798 days of observation. Not all members of population used in this study, hence, a sampling was done. The sampling was done by using purposive sampling with the following requirements: (1) Consistently included in the calculation of LQ45 index in Indonesia Stock Exchange during the research period. This was done to ensure that the stock used was active during the research period. There were 27 stocks which met the criteria; (2) Did not perform any corporate action that changed the nominal of stock such as stock split and reverse stock split during the research period. From 27 companies whose stocks met the first criteria, there was one company listed which performed stock split which was PT Telekomunikasi Indonesia (Persero), Tbk. There was no company recorded performing reverse stock split during the research period.

Based on those two criteria above, 26 Enterprises found suits all the criteria and were appropriate to be used as research samples.

Data used in this research were secondary data, i.e. the list of stocks classified in LQ45 Index during January 2013 until June 2016 period; data of listed companies that performed stock split and reverse stock split during January 2013 until June 2016 period; data of stock price daily closing and daily closing of stock price index for JCI, LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100 during January 2013 until June 2016 period (798 days of observation). Data of stocks list calculated in LQ45 Index during January 2013 until June 2013 period; data of listed companies that performed stock split and reverse stock split during the research period were retrieved from the official website of Indonesia Stock Exchange ([www.idx.co.id](http://www.idx.co.id)), while data of stock price daily closing and daily closing of stock price index for JCI, LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100 during January 2013 until June 2016 were obtained via [www.google.com/finance](http://www.google.com/finance).

The analysis technique employed in this research was regression analysis technique and independent sample t-test. Regression analysis technique was done to calculate beta stock score. The regression model used is as follows:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + u_{jt}$$

$R_{jt}$  : Return of stock j in period to t (in one time of observation)

$\alpha_j$  : constants

$\beta_j$  : coefficient of beta stock j

$R_{mt}$  : market *return* in period t that is represented by *returns* of JCI, LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100

$u_{jt}$  : residual



Independent sample t-test was also used to test the existence of differences among beta stocks counted using price indices examined in this research. Meanwhile, standard error of estimate for each Stock Price Index in calculating beta was used to conclude the best stock price index (produces a minimum error level). Normally, the smallest standard error of estimate is the best one.

#### **IV. RESULT AND DISCUSSION**

##### **Descriptive Statistics of Beta Stock Calculated Using Stock Indices in Indonesia Stock Exchange**

Based on the descriptive analysis done as illustrated in Table 1, it is found that beta calculated using JCI return as the stock market proxy return in Indonesia Stock Exchange had the highest average score (1.267) than the beta stock calculated using other stock index returns as the market return proxy. Meanwhile, beta calculated using Sri-Kehati Index return as proxy return had the smallest average level (0.945) compared to beta stock calculated using other stock index returns as the market return proxy. Likewise, the same results also happened to the distribution of beta stock data calculated with those two stock index returns. Standard deviation of beta calculated using JCI return as stock market return proxy in Indonesia Stock Exchange was the highest (0.299), whereas, standard deviation of beta calculated using Sri-Kehati return as stock market return proxy in Indonesia Stock Exchange was the smallest one (0.945). On the contrary, the coefficient value of beta variation calculated with Sri-Kehati return as the stock market return proxy in Indonesia Stock Exchange was the highest (0.242) and the coefficient value of beta variation counted using JCI return and KOMPAS-100 return as the stock market

return proxy in Indonesia Stock Exchange was the smallest with each was valued at 0.236 (Table 1).

##### **Descriptive Statistics of Standard Error of the Estimate (SEE)**

Based on the descriptive analysis done as shown in Table 2, it is found that the value of SEE market model calculated using Sri-Kehati return as the stock market return proxy in Indonesia Stock Exchange had the highest average score (0.033) than the value of SEE market model calculated using other stock index returns as the market return proxy. Meanwhile, the score of SEE market model calculated using JCI return, LQ-45 index, IDX-30 and Kompas-100 as the market return proxy produced a relatively small average (0.020) compared to the SEE market model calculated using other stock index return as the market return proxy.

The same results were also found on the distribution of SEE market model calculated using those stock index returns. Standard deviation of SEE market model calculated using JCI return, LQ-45, IDX-30 and KOMPAS-100 as the stock market return proxy in Indonesia Stock Exchange was relatively small with each scaled at 0.005, whereas, the standard deviation of SEE market model calculated using Sri-Kehati return as the stock market proxy return in Indonesia Stock Exchange was the largest (0.047) and the coefficient score of SEE market model variation calculated using Sri-Kehati return as the stock market return proxy in Indonesia Stock Exchange was the highest (1.438) and the coefficient value of SEE market model variation calculated using JCI return was the smallest with 0.237 of score (Table 2).



**Table 1. Descriptive Statistics of Beta Stock Calculated Using Stocks Indices in Indonesia Stock Exchange**

Indices	N	Range	Minimum	Maximum	Mean	Std. Deviation	Coefficient of Variation
Bisnis-27	26	0.903	0.504	1.407	0.951	0.240	0.252
IDX-30	26	0.934	0.497	1.431	0.948	0.245	0.258
JCI	26	1.122	0.735	1.857	1.267	0.299	0.236
Kompas-100	26	0.947	0.599	1.546	1.050	0.247	0.236
LQ-45	26	0.925	0.548	1.473	0.996	0.237	0.238
Sri-Kehati	26	0.830	0.515	1.345	0.945	0.229	0.242

Source: www.idx.co.id and www.google.com/finance, processed.

**Table 2. Descriptive Statistics of Standard Error of the Estimate**

Index	N	Range	Minimum	Maximum	Mean	Std. Deviation	Coefficient of Variation
Bisnis-27	26	0.097	0.013	0.110	0.024	0.018	0.758
IDX-30	26	0.018	0.011	0.029	0.020	0.005	0.249
JCI	26	0.017	0.012	0.029	0.020	0.005	0.237
Kompas-100	26	0.017	0.011	0.029	0.020	0.005	0.241
LQ-45	26	0.018	0.011	0.029	0.020	0.005	0.245
Sri-Kehati	26	0.231	0.013	0.244	0.033	0.047	1.438

Source: www.idx.co.id and www.google.com/finance, processed.

### The Result of Independent t-Test of Beta

**Table 3. The Result of Independent t-Test of Beta Stock**

	t	Sig
JCI - Bisnis-27	21.949	0.000
JCI - IDX-30	18.715	0.000
JCI - KOMPAS-100	20.837	0.000
JCI - LQ-45	20.638	0.000
JCI - Sri-KEHATI	17.278	0.000

Source: www.idx.co.id and www.google.com/finance, processed.

### The Result of t-Test of Standard Error of the Estimate

Different with the average result of independent t-test of beta stock, stocks which were counted using stock indices return in Indonesia Stock Exchange found the significance differences between the averages of beta stock calculated using stock indices

return in Indonesia Stock Exchange. The result of independent t-test of most SEE obtained using market model and calculated using stock indices in Indonesia Stock Exchange tended to not showing the significance differences between the average of SEE calculated using JCI return as the market return proxy with the average of SEE calculated using other stock indices (Bisnis-27, IDX-30, LQ-45 and Sri-Kehati) in Indonesia Stock Exchange as the market return proxy. It can be seen from the insignificant t score counted. However, the independent t-test between SEE obtained using market model and calculated using JCI return and KOMPAS-100 return as the market return proxy showed the availability of significant differences as indicated from the significant t value at 5% of significance level.

In general, it can be stated that although there was a significant difference



between the average of beta stock calculated using stock price indices listed in Indonesia Stock Exchange, in reality, almost all market models which were calculated using stock price indices listed in Indonesia Stock Exchange as market return proxy did not produce any different average of SEE except KOMPAS-100 index. From the SEE comparison of each market model as shown in Table 5, it can be seen that SEE market model obtained using KOMPAS-100 return index was the smallest one than using market model calculated using other stock price indices return especially KOMPAS-100 and LQ-45 indices.

**Table 4. The Result of Independent t-Test of Standard Error of the Estimate**

	t	Sig
JCI - Bisnis-27	-1.022	0.316
JCI - IDX-30	-0.378	0.708
JCI - KOMPAS-100	2.223	0.035
JCI - LQ-45	0.347	0.732
JCI - Sri-KEHATI	-1.370	0.183

Source: www.idx.co.id and www.google.com/finance, processed.

**Table 5. The Comparison of Standard Error of the Estimate**

No.	Indeks	Rata-Rata SEE
1	JCI	0.020054615
2	Bisnis-27	0.023917308
3	IDX-30	0.020079615
4	LQ-45	0.020038846
5	Sri-KEHATI	0.032521154
6	Kompas-100	0.020004231

Source: www.idx.co.id and www.google.com/finance, processed.

This finding has also implied that the assumption of Indonesian researchers (e.g. Sartono and Zulaihati (1998)) who claimed that LQ45 index reflects the stock market better than LQ45 return is considered to be

more representative for the market return is not empirically proven. The result of this study also indirectly supports similar findings conducted in international capital market such as Basu and Rizzuto (1995) which suggested that the investors should be careful in choosing the stock price index as a proxy of a stock market by concluding that S&P 500 index is less feasible in representing the movement of the stock market in the United States.

## V. CONCLUSION AND IMPLICATIONS

This research found that there is a difference between beta stocks calculated using JCI return as market return proxy with beta stocks calculated using LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100 returns. On the contrary, this research found that there is no difference between standard error of the estimate (SEE) of beta stocks calculation done using JCI return and LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27 and IDX-30 returns. However, this research also found that there is a difference of standard error of the estimate (SEE) of beta stocks calculation done using JCI and KOMPAS-100 returns.

The results of this research are different with most of Indonesian researchers' assumptions who claimed that LQ-45 index return is better in representing stock market return in Indonesia Stock Exchange to calculate beta stock than JCI return. The result of this research in fact proves that beta stocks counted using LQ-45 index return and JCI return produce no different results of standard error of the estimate (SEE).

Regarding to proxy return of stock market in Indonesia Stock Exchange which has the smallest standard error of the estimate (SEE), this research reveals that beta calculated using KOMPAS-100 return produces the smallest standard error of the estimate (SEE)

that it is more appropriate to be used than the other stock indices.

The availability of difference results between beta stock calculated using JCI return as market return proxy with beta stock calculated using LQ-45, SRI-KEHATI, PEFINDO-25, BISNIS-27, IDX-30 and KOMPAS-100 returns as market return proxy raise an implication that the investors especially those from investment managers should be careful in using the return of a stock index as market return proxy in Indonesia Stock Exchange. The investment managers can use KOMPAS-100 index return as market return proxy in Indonesia Stock Exchange for it tends to produce the smallest standard error of the estimate (SEE) than the other index returns listed in Indonesia Stock Exchange.

This research has not distinguished the research period based on stock movement fraction in Indonesia Stock Exchange. The research period used in this research consists of three regimes of price change fractions determined by Indonesia Stock Exchange. The period of before January 6, 2014, the changing of stock price in Indonesia Stock Exchange consists of five fractions of price movement which are below Rp. 200 then the stock moves with Rp. 1 of fraction, Rp. 200 up to below Rp. 500 then the stock moves with Rp. 5 of fraction, Rp. 500 up to below Rp. 2000 then the stock moves with Rp. 10 of fraction, Rp.

2000 up to below Rp. 5000 then the stock moves with Rp. 25 of fraction, and the price above Rp. 5000 then the stock will move with Rp. 50 of fraction. The period of after January 6, 2014 until Mei 2, 2016, the changing of stock price in Indonesia Stock Exchange consists of three fractions of price movement which are below Rp. 500 then the stock will move with Rp. 1 of fraction, Rp. 500 up to below Rp. 5000 then the stock moves with Rp. 5 of fraction, and above Rp. 5000 will move with Rp. 25 of fraction. The period of after Mei 2, 2016, the changing of stock price in Indonesia Stock Exchange consists of five fractions of price movement which are the price below Rp. 200 then the stock moves with Rp. 1 of fraction, Rp. 200 up to below Rp. 500 then the stock will move with Rp. 2 of fraction, Rp. 500 up to below Rp. 2.000 then the stock will move with Rp. 5 of fraction, Rp. 2000 up to below Rp. 5000 then the stock moves with Rp. 10 of fraction, and the price above Rp. 2000 up to under Rp. 5000 moves with Rp. 25 of fraction. The existence of those difference results of this price fraction regime will raise an impact in calculating stock return, thus, it is suggested for future researches in conducted the same field to distinguish beta calculations under the three price fraction regimes that were and are still ongoing in Indonesia Stock Exchange.

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