

Stock Market Proxy Testing in Beta Calculation in the COVID-19 Pandemic Period on the Indonesia Stock Exchange

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Abstract

This study was conducted to assess the stock price index on the Indonesia Stock Exchange (IDX) which can be used as a proxy for the stock market in Indonesia. The indexes used to search for stock market proxies in Indonesia are JCI, IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI, and PEFINDO25. The period in this study is from June 2018 to October 2021 obtained through *bloomberg.com*. Based on the results of the Paired Sample t-Test, the JCI returns before and during the Covid-19 pandemic did not show a difference in stock beta. Then, the results of the Standard Error Estimate (SEE) test show that JCI returns have the smallest deviation rate in the period when Covid-19 occurred and in the entire period. The results showed that the JCI return can be used as a proxy for the stock market in Indonesia compared to the returns of other stock indexes.

Keywords : Beta; Covid-19; Index; JCI; Return

JEL Classification : G10, G12

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1. INTRODUCTION

Investments in the capital market have two different time dimensions, which are divided into short-term and long-term investments. Investors invest with the hope of getting a return on an asset that has been purchased. The return expected by investors can be referred to as the total return obtained from the sum of capital gains and dividends (Mardhiyah, 2017). In addition to investing, investors also consider the magnitude of the risk on their investment in making investment decisions (Chabachib, 2020; Hollstein, 2020; Robiyanto & Pangestuti, 2020)

According to modern portfolio theory, almost all investment instruments have systematic risk and unsystematic risk (Jogiyanto Hartono, 2015; Solekha & Winarto, 2020). Investors tend to dislike systematic risk because diversifying cannot minimize this risk. Systematic risk can be calculated using the beta coefficient (β). Beta (β) is a coefficient that indicates the sensitivity of stock returns to changes in market returns (Ferson & Harvey, 1991; Frensidy, 2016; Frensidy, Utama, & Prijadi, 2017), even in the highly volatile market, and beta factor still appears to be the most important single factor, driving the capital

allocation decisions (Hollstein, 2020). Beta is an important factor in Capital Asset Pricing Model (CAPM), and beta used in CAPM is beta as it is, not bull (upside) beta or bear (downside) beta as studied by Bharwaj and Brooks (1993); Fletcher (2000); Gupta (2020) and Robiyanto and Pangestuti (2020). Therefore, investors will look for ways to allocate their capital to various types of stock indices that can provide optimal levels of profit with minimal risk. The problem that will arise is that many stock indices listed on the Indonesia Stock Exchange (IDX) can be used as stock representatives to measure risk and return. Investors tend to look for the best stock candidates to choose from because they are assumed to provide welfare to investors (Ekantari & Widanaputra, 2015; Robiyanto, 2018).

One of the systematic risks that occurred in 2020, was the global financial crisis due to the Covid-19 pandemic. This pandemic has had an impact on a decline in trade, such as a decline in exports and imports, flight bans, and the massive implementation of lockdowns, hampering the global economy. This impact was also felt by the Indonesian economy which was affected. One of how the Indonesian economy is supported by activities in the capital market. In Indonesia, the capital market is represented by the Jakarta Composite Index (JCI) (Robiyanto, Frensidy, Setyawan, & Huruta, 2021; Rovantiane & Robiyanto, 2021). The JCI experienced a very sharp decline due to the increasing number of patients infected with the Covid-19 virus (Firdaus, 2020). This makes investors relinquish their share ownership in the Indonesian capital market to reduce risk (Sumiari & Putri, 2020). However, the JCI slowly increased, indicated by several companies that had a good performance, so many investors took this opportunity as an alternative to reinvest in shares (Robiyanto & Yunitaria, 2022).

Each stock index has a deviation rate that always changes in a certain period and is proven by research by Ekantari and Widanaputra (2015); Pamilangan and Robiyanto (2019); Wijaya and Djajadikerta (2017) stated that the LQ45 stock price index is more worthy of being a representative of the overall stock market index because it has a smaller deviation rate than the Jakarta Composite Index (JCI). However, the research conducted by Prasetyo (2018); Solekha and Winarto (2020); Tendean, Saerang, and Tulung (2019) found that the LQ45 stock price index cannot describe the stock market index as a whole, but the Jakarta Islamic Index (JII) index which has the smallest deviation level so that it can be used to represent stock market movements. This research was further developed by Chabachib (2020) and Iskandar, Martalena, and Julianto (2020), who found that KOMPAS100 is an index that has the smallest deviation rate that can be used to represent the stock market. Chabachib (2020) uses stock price index returns such as JCI, LQ45, SRI-KEHATI, PEFINDO25, BISNIS-27, IDX30, and KOMPAS100 as proxies for calculating stock betas. Meanwhile, currently on the Indonesia Stock Exchange (IDX) there are 40 indices, and some of them are newly introduced indices, so it is necessary to conduct research with the new index.

Based on this, it is important to research for stock index representatives to represent the right stock market in calculating systematic risk. This is different from Chabachib (2020) which only examined conditions before an extraordinary event, namely the Covid-19 pandemic. Moreover, systematic risk calculated by beta is very important. Hollstein (2020) stated the betas of individual stocks are highly relevant for many applications, and the best way to calculate beta is by using daily data.

This research was conducted to examine the potential use of stock index returns on the IDX such as JCI, IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI, and PEFINDO25 as representatives of stock market returns in

calculating stock beta. The data used in this study is stock price data for the daily closing of selected stock indices for the period June 1, 2018, to December 31, 2019, where this period is the period before the Covid-19 pandemic. Furthermore, the period January 1, 2020, to October 31, 2021, is the period when the Covid-19 pandemic occurs, data obtained from Bloomberg. In this study, the index that produces the smallest average standard error of estimation can be concluded as representative of the Indonesian stock market.

2. HYPOTHESES DEVELOPMENT

Investors will face total risk, namely systematic risk, and unsystematic risk. Unsystematic risk is a risk that only affects a particular company or industry arising from the influence of micro factors within the company's industry (Jogiyanto Hartono, 2015; Rovantiane & Robiyanto, 2021; Silvasti, Grobys, & Äijö, 2020). Unsystematic risk can be minimized by diversifying assets. In contrast to unsystematic risk, systematic risk is a market risk as a whole caused by changes in economic conditions, politic, and other macro-economic variables that will affect companies so that it cannot be done through asset diversification (Yuliana & Robiyanto, 2022). Therefore, investors pay more attention to systematic risk to reduce deviations that occur. Systematic risk can be described by the beta coefficient (β) (Chabachib, 2020; Jogiyanto Hartono, 2015; Mulyati, 2017; Pangestuti, Wahyudi, & Robiyanto, 2017; Robiyanto, 2017; Robiyanto, Nugroho, Huruta, Frensidy, & Suyanto, 2021).

Beta is one important factor in CAPM (Ferruz, Gómez-Bezares, & Vargas, 2010; Jogiyanto Hartono, 2015; Zubairi & Farooq, 2011). Beta is a tool for calculating the volatility of a securities or portfolio's return to the overall market return (Robiyanto, Wahyudi, & Pangestuti, 2017; Silvasti et al., 2020). Volatility is a fluctuation in the return of a securities or portfolio over a certain period. Beta is worth 1 if the fluctuation of the securities or portfolio return follows the fluctuation of the market return. Then, a beta that is worth more than 1 can be interpreted that the beta of the stock having a risk greater than the level of market risk. If the beta has a value less than 1, it is said to be a stock that has a lower risk level than market risk (Ferson & Schadt, 1996; Frensidy, 2016; Widodo & Robiyanto, 2018).

Empirical results found by Jogiyanto Hartono and Surianto (1999); Prasetyo (2018); Solekha and Winarto (2020) show that the beta of securities listed on the Indonesia Stock Exchange (IDX) is biased. Until now, many capital market researchers are still arguing that the Jakarta Composite Index (JCI) in the Indonesian capital market is stock market return data that is biased, so it cannot be used to represent the stock market index as a whole. In the Indonesia Stock Exchange (IDX), the index that represents the Indonesian stock market is the Jakarta Composite Index (JCI) up to now. JCI is the main index that is used as an indicator or benchmark for the overall movement of stocks listed on the IDX (Ekantari & Widanaputra, 2015). This stock index aims to measure market sentiment and can be used as a proxy in measuring or modeling risk and return in investing (Iskandar et al., 2020). In this study, the comparison of stock price index returns is used to find the index that has the smallest standard error, so that it can be used as a proxy for the Indonesian stock market index. Because the JCI is the main index that is used as an indicator or benchmark for the overall movement of stocks listed on the IDX, so the hypothesis formulated as follows:

H₁: JCI is the best bets estimator

Covid-19 pandemic also changes financial landscapes (P. G. Hartono & Robiyanto, 2023). Chia, Liew, and Rowland (2020) examined the relationship between stock market returns and macro-economic variables during the Covid-19 pandemic which were assumed to influence the performance of the stock market index in Malaysia. The study compared nine stock price indices on Bursa Malaysia such as KLCI, T100, M70, SC, EMAS, ESH, HSH, ACE and FLED. The index is compared to find the smallest risk which is reflected in the results of the standard deviation as a reference for investors to make decisions in managing their investment portfolios. During the Covid-19 pandemic, it was found that the Kuala Lumpur Composite Index (KLCI), which consists of 30 companies with the largest market capitalization in Malaysia, was able to represent the stock market index on the Malaysian stock exchange as a whole. Then, Wu and Wang (2018) tried to re-examine using modern portfolio theory and conducted a study on the use of stock price indices on the United States (US) stock exchange such as the S&P500 stock price index, CSI 300, GDAXI, Nasdaq, and Dow Jones. The findings show that the S&P500 index is less feasible to represent the stock market index in the United States. This study will calculate betas before Covid-19 pandemic and during Covid-19 pandemic, because financial landscapes change a lot during pandemic (Conlon, Corbet, & McGee, 2020; Nugroho & Robiyanto, 2021; Vukovic, Maiti, & Grigorieva, 2021), so the hypothesis formulated as follows:

H₂: Beta before Covid-19 pandemic is different from beta during Covid-19 pandemic

3. METHOD, DATA, AND ANALYSIS

Sampling

This study uses a population of all shares listed on the Indonesia Stock Exchange (IDX) until October 31, 2021. 739 companies listed their shares on the IDX up to that period. The period that will be used in this research is June 1, 2018, to December 31, 2019, where this period is the period before the Covid-19 pandemic and the period January 1, 2020, to October 31, 2021, is the period when the Covid-19 pandemic occurs. Then, sampling was carried out because not all members of the population in this study could be used.

The sampling method used is using purposive sampling method with criteria, among others; consistently included in the calculation of the LQ45 index on the IDX during the observation period, never took corporate actions such as stock splits or reverse stock splits, and traded actively during the observation period. From the first criterion, as many as 65 stocks have been listed on the LQ45 stock index during the observation period. Then, from the 65 stocks, 30 companies were taken that were consistently in the LQ45 index during the period June 2018 to October 2021. In the second criterion, three companies carried out a stock split, namely PT Unilever Tbk, PT Gudang Garam Tbk, and PT Bank Central Asia. Tbk. Furthermore, no company did a reverse stock split during the observation period. Based on the two criteria above, obtained 27 issuers that deserve to be used as research samples.

Data Collections

The data used in this study is secondary data, namely a list of stocks included in the LQ45 index for the period June 2018 to October 2021; data on issuers conducting stock splits and reverse stock splits for the period June 2018 to October 2021; data on daily closing stock prices and daily closing stock price indices for the JCI, IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI, and PEFINDO25 for the period June 2018 to October 2021, obtained through Bloomberg. Then,

data on issuers who carried out stock splits and reverse stock splits during the period were taken from the official website of the Indonesia Stock Exchange (IDX) via www.idx.co.id.

Table 1. List of Samples

No.	Stock Code	No.	Stock Code	No.	Stock Code	No.	Stock Code
1	ADRO	8	BMRI	15	INCO	22	PTBA
2	AKRA	9	BSDE	16	INDF	23	PTPP
3	ANTM	10	CPIN	17	INTP	24	SMGR
4	ASII	11	CTRA	18	JSMR	25	TLKM
5	BBNI	12	EXCL	19	KLBF	26	UNTR
6	BBRI	13	HMSP	20	MNCN	27	WIKA
7	BBTN	14	ICBP	21	PGAS		

Measurements

This study uses the following model and analytical steps, they are 1) calculating individual stock returns, 2) calculating the return of each stock index, 3) measure the variance and standard deviation and 4) calculating the beta of a stock i . Each step will be explained below with its formula and explanation.

- 1) Calculating individual stock returns
Stock return can be calculated by the formula:

$$R_i = \frac{P_{it} - P_{it-1}}{P_{it-1}}$$

Where:

- R_{it} = stock return i period t
- P_{it} = price of stock i day to t
- P_{it-1} = price of stock i -day $t-1$

- 2) Calculating the return if each stock index

$$R_{st} = \frac{Index_{st} - Index_{st-1}}{Index_{st-1}}$$

Where:

- R_{st} = stock index return s period t
- $Index_{st}$ = stock index s period t
- $Index_{st-1}$ = stock index s period $t-1$

- 3) Measure the variance and standard deviation using the formula

$$\sigma^2 Ri = \frac{\sum [R_{it} - E(R_i)]^2}{n - 1}$$

The formula for calculating the standard deviation is as follows

$$\sigma Ri = \sqrt{\frac{\sum [R_{it} - E(R_i)]^2}{n - 1}}$$

Where:

- Ri = stock return variance i
- σRi = stock return standard deviation i

$E(R_i)$ = expected return
 R_{it} = stock return i in period t
 $n - 1$ = stock sample quantity

4) Calculating the beta of a stock i

$$\beta_i = \frac{\delta R_i, R_p}{\sigma^2 R_p}$$

Where:

$\delta R_i, R_p$ = Covariance of stock return i with stock index return

$\sigma^2 R_p$ = Stock index return variance

β_i = stock beta i

The analysis technique used in the sample in this study is regression analysis technique and independent sample t-test. A regression analysis technique was performed to calculate the beta score of the stock. The regression method used is as follows:

$$R_{it} = \alpha + \beta_i R_{st} + u_{i,t}$$

Where:

R_{it} = Stock return i in period t

α = constant

β_i = stock beta i

R_{st} = market returns for period t are represented by returns on JCI, IDX-80, IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI, and PEFINDO25.

$u_{i,t}$ = residual stock i period t

An independent sample t-test was used to calculate the difference between stock betas calculated using the stock price index and standard error estimation (SEE) for each stock price index in calculating beta. This is used to find the best stock price index that can be used as a representative of the Indonesian stock market as a whole by looking at the smallest error rate or standard deviation. The smallest standard error estimation (SEE) of stock price index in calculating beta will considered as the best estimator.

4. RESULTS

This study examines the stock market beta of 9 stock price indices, namely JCI, IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI and PEFINDO25. The population used in this study is all shares listed on the Indonesia Stock Exchange (IDX) until October 30, 2021. The period used in this study is the period before the Covid-19 pandemic, during the Covid-19 pandemic and the overall period. Then, a descriptive statistics of stock beta was carried out which was calculated using the stock index in the IDX. This test is conducted to compare the beta of the stock which is calculated by using the stock index return as a proxy for stock returns. The results of the descriptive statistical test of stock betas calculated using the stock index on the IDX are presented in Table 2.

Table 1. Descriptive Statistics of Stock Beta Calculated Using Stock Index on the Indonesia Stock Exchange

Before Pandemic									
	LQ45	IDX30	SRI KEHA TI	JII	PEFIN DO 25	MNC 36	KOMP AS 100	IDX BUM N 20	JCI
Minimum	0.0217	0.0160	0.0964	0.0534	0.0008	0.0811	0.0170	0.0436	0.0761
Maximum	1.4338	1.4018	1.4011	1.3687	1.3706	1.4828	1.5880	1.2733	1.9513
Range	1.4121	1.3858	1.3047	1.3152	1.3697	1.4018	1.5710	1.2296	1.8752
Mean	1.0619	1.0323	1.0106	1.0004	0.7547	1.0824	1.1456	0.8531	1.4075
Std. Deviation	0.3003	0.2946	0.3007	0.2775	0.2391	0.2972	0.3228	0.2894	0.3864
Coefficient of Variation	0.2828	0.2854	0.2975	0.2774	0.3169	0.2746	0.2817	0.3392	0.2745
During Pandemic									
	LQ45	IDX30	SRI- KEHA TI	JII	PEFIN DO25	MNC 36	KOMP AS100	IDX BUM N 20	JCI
N	27	27	27	27	27	27	27	27	27
Minimum	-0.0860	-0.0916	-0.1025	-0.0239	-0.0745	-0.0953	-0.0795	-0.0881	-0.0787
Maximum	0.9774	0.9536	0.9670	0.9630	1.0380	0.9921	1.0398	0.8607	1.8235
Range	1.0634	1.0452	1.0695	0.9870	1.1125	1.0875	1.1193	0.9488	1.9022
Mean	0.6694	0.6569	0.6583	0.6852	0.6795	0.6933	0.7155	0.5521	1.3702
Std. Deviation	0.2019	0.1978	0.2042	0.1785	0.2150	0.2067	0.2115	0.1881	0.3839
Coefficient of Variation	0.3017	0.3011	0.3102	0.2605	0.3164	0.2982	0.2955	0.3406	0.2802
All Period									
	LQ45	IDX30	SRI KEHA TI	JII	PEFIN DO25	MNC 36	KOMP AS100	IDX BUMN 20	JCI
N	27	27	27	27	27	27	27	27	27
Minimum	-0.0608	-0.0661	-0.0542	-0.0024	-0.0571	-0.0532	-0.0568	-0.0551	-0.0414
Maximum	1.0331	0.9930	1.0022	1.0047	1.1149	1.0634	1.1245	0.9283	1.8141
Range	1.0939	1.0591	1.0564	1.0071	1.1720	1.1166	1.1813	0.9833	1.8555
Mean	0.7606	0.7450	0.7431	0.7710	0.6968	0.7857	0.8157	0.6276	1.3792
Std. Deviation	0.2152	0.2109	0.2157	0.1921	0.2107	0.2172	0.2260	0.2051	0.3718
Coefficient of Variation	0.2830	0.2831	0.2903	0.2492	0.3023	0.2764	0.2771	0.3268	0.2696

Source: Bloomberg, processed.

Based on the descriptive analysis conducted in Table 2 before the Covid-19 pandemic, it is known that the beta calculated using PEFINDO25 returns as a proxy for stock market returns on the IDX has a minimum value of 0.0008, while the maximum beta value is 1.9513 which is calculated by using JCI returns. Then, the beta results calculated using PEFINDO25 returns as a proxy for stock market returns on the IDX have the lowest mean value of 0.7547 compared to stock betas calculated with other stock indices as a proxy for stock returns. Beta calculated using JCI returns as a proxy for stock market returns has the highest mean value of 1.4075. Furthermore, the standard deviation of beta which is calculated using PEFINDO25 returns as a proxy for stock returns on the IDX has the smallest value of 0.2391 and the JCI return which has the largest value is 0.3864. The

coefficient of variation calculated using JCI returns has the lowest value of 0.2745 and IDX BUMN20 returns have the highest value of 0.3392.

Further descriptive analysis in Table 2 during the Covid-19 pandemic found that the beta calculated using MNC36 returns as a proxy for stock market returns on the IDX had a minimum value of -0.0953 and a maximum value of 1.8235 which was calculated using JCI returns. Then, the beta calculated using IDX BUMN20 returns as a proxy for stock market returns on the IDX has the lowest mean value of 0.5521 compared to stock betas calculated with other stock indices as a proxy for stock returns. Then, the beta which is calculated using the JCI return as a proxy for stock market returns has the highest mean value of 1.3702. The standard deviation of beta which is calculated using JII's return as a proxy for stock returns on the IDX has the smallest value of 0.1785 and JCI's return which has the largest value is 0.3839. Just like before the Covid-19 pandemic, the coefficient of variation calculated using JII's return had the lowest value of 0.2605, and IDX BUMN20's return had the highest value of 0.3406.

Table 2. Test of Homogeneity of Variance

	df1	df2	Sig.
Before Pandemic Index	8	234	0.916
During Pandemic Index	8	234	0.100
Combine Period	8	234	0.192

Source: Bloomberg, processed.

Furthermore, Table 2 for the entire period shows that the beta calculated using the LQ45 return has a minimum value of -0.0661 and a maximum value of 1.8141 which is calculated using the JCI return in the combined period. Then, the beta calculated using IDX BUMN20 returns from the two periods as a proxy for stock market returns on the IDX has the lowest mean value of 0.6276 compared to stock betas calculated with other stock indices as a proxy for stock returns.

Table 3. One-Way ANOVA

Before Pandemic					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.215	8	0.902	9.813	0.00
Within Groups	21.507	234	0.092		
Total	28.723	242			
After Pandemic					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.431	8	1.554	29.761	0.00
Within Groups	12.217	234	0.052		
Total	24.648	242			
All Period					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.345	8	1.293	23.411	0.00
Within Groups	12.925	234	0.055		
Total	23.271	242			

Source: Bloomberg, processed.

Then, the beta which is calculated using the JCI return as a proxy for stock market returns has the highest mean value of 1.3792. During these two periods, the beta standard deviation calculated using JII's return as a proxy for stock returns on the IDX had the lowest value of 0.1921, and JCI's return had the highest value of 0.3718. Then, the coefficient of variation calculated using JII's return has the lowest value of 0.2492, and

IDX BUMN20's return has the highest value of 0.3268. Meanwhile, the Homogeneity Test was conducted to determine whether or not the variances of a population group were equal. The results of the Homogeneity Test can be seen in Table 3.

The results of the Homogeneity Test found that the significance value of the betas in the three periods above exceeded the 5% significance level. It can be concluded that the stock betas variance is homogeneous, so it can be compared directly without any modification. Meanwhile, to test whether there is a difference in the beta calculated from the stock price indexes on the IDX, this is done using the One-Way ANOVA test. The results of the One-Way ANOVA analysis for the pre-pandemic, post-pandemic, and combined periods are presented in Table 4.

Based on Table 4, it can be seen that the significance value is 0.00 which is smaller than the 5% significance level, this shows that before the pandemic, after the pandemic, and a combination of the two, each index differs. Next, the paired sample t-test will be conducted. Paired sample t-test is used to see whether there is a difference in the mean between two samples that are paired and related. The results of the paired sample t-test are presented in Table 5 and Table 6.

Table 4. Paired Sample Statistics

	Mean	N	Std. Deviation	Std. Error Mean
BetaJKLQ45_Before	1.062	27	0.301	0.057
BetaJKLQ45_During	0.669	27	0.202	0.038
BetaJKIDX30_Before	1.033	27	0.295	0.057
BetaJKIDX30_During	0.657	27	0.198	0.038
BetaJKSRI_Before	1.011	27	0.301	0.578
BetaJKSRI_During	0.658	27	0.204	0.039
BetaJKJII_Before	1.000	27	0.277	0.053
BetaJKJII_During	0.685	27	0.178	0.343
BetaJKPEF25_Before	0.754	27	0.240	0.460
BetaJKPEF25_During	0.680	27	0.215	0.414
BetaJKMNC36_Before	1.082	27	0.297	0.572
BetaJKMNC36_During	0.670	27	0.207	0.398
BetaJKKM100_Before	1.145	27	0.323	0.621
BetaJKKM100_During	0.715	27	0.211	0.407
BetaIDX BUMN20_Before	0.853	27	0.289	0.056
BetaIDX BUMN20_During	0.552	27	0.188	0.362
BetaJCI_Before	1.407	27	0.386	0.074
BetaJCI_During	1.370	27	0.384	0.073

Source: Bloomberg, processed.

Based on Table 6, the results of the paired sample t-test show that the mean of the betas of the stock index before the Covid-19 pandemic was greater than the mean of the betas index during the Covid-19 pandemic, meaning that the indices were during the Covid-19 pandemic is not more sensitive to the LQ45 stock index. Table 6 the paired sample t-test test below shows that the beta of the LQ45, IDX30, SRI-KEHATI, Jakarta Islamic Index (JII) index, PEFINDO25, MNC36, KOMPAS100 and IDX BUMN20 shows a significant result which has a value of 0.00 is smaller than the 5% significance level, which means that the results prove that there is a difference in the mean beta of each index in the period before and during the Covid-19 pandemic. So, H_2 accepted.

However, the JCI beta showed a significant result of 0.407 greater than the 5% significance level, meaning that there was no difference between the JCI beta before and

during the occurrence of Covid-19. This finding shows that before the Covid-19 pandemic and during the Covid-19 pandemic, the JCI index had the smallest deviation rate compared to other indices. This is because the JCI is an index that can represent all shares listed on the IDX while the shares listed on each index can change within a certain period.

Table 5. Paired Sample t-Test

Index	t	Sig. (2-tailed)	Index	t	Sig. (2-tailed)
BetaJKLQ45_Before BetaJKLQ45_During	11.189	0.00	BetaJKNMNC36_Before BetaJKNMNC36_During	10.766	0.00
BetaJKIDX30_Before BetaJKIDX30_During	10.812	0.00	BetaJKKM100_Before Beta JKKM100_During	10.921	0.00
BetaJKSRI_Before BetaJKSRI_During	9.443	0.00	BetaIDX BUMN20_Before BetaIDX BUMN20_During	9.186	0.00
BetaJKJII_Before BetaJKJII_During	8.573	0.00	BetaJCI_Before Beta JCI_During	0.843	0.407
BetaJKPEF25_Before BetaJKPEF25_During	2.490	0.00			

Source: Bloomberg, processed.

Furthermore, the Standard Error of the Estimate (SEE) test is used to find the value of the standard deviation or the smallest deviation rate from each stock index for the period before the pandemic, during the pandemic, and the overall period. The results of the descriptive statistical test of the Standard Error of the Estimate (SEE) are shown in Table 7.

Based on the descriptive analysis carried out as in Table 7 before the Covid-19 pandemic, it is known that the value of the SEE market model calculated using the IDX BUMN20 return as a proxy for stock market returns on the IDX has a minimum value of 0.0107 and has no difference in the maximum value. Next, IDX BUMN20 returns have the smallest mean value of 0.0207 while the SEE market model value calculated using MNC36 returns produces the largest mean of 0.0211. The standard deviation of the SEE market model calculated using the return of PEFINDO25 has the smallest value of 0.0048, while the standard deviation of the SEE market model calculated using the return of SRI-KEHATI and IDX BUMN20 has the largest standard deviation of 0.0058. Then, the coefficient of variation of the SEE market model calculated using the PEFINDO25 return is the lowest of 0.2091 and the coefficient of variation of the SEE market model calculated using the SRI-KEHATI return has the highest value of 0.2786.

Further testing in Table 7 during the Covid-19 pandemic, it is known that the value of the SEE market model calculated using the JCI return has a minimum value of 0.0163 while the PEFINDO25 return has a maximum value of 0.0396. Next, the SEE market capital value calculated using JCI returns as a proxy for stock market returns on the IDX has the smallest mean value of 0.0240 compared to the SEE market model value calculated using PEFINDO25 returns yielding the largest mean of 0.0289 compared to the SEE model. SEE market is calculated using other stock index returns as a proxy for stock returns. The standard deviation of the SEE market model calculated using the PEFINDO25 return has the smallest value of 0.0047, while the standard deviation of the SEE market model calculated using the JII return has the largest standard deviation value of 0.0051. Furthermore, the coefficient of variation of the SEE market model calculated using PEFINDO25 returns is the smallest of 0.1636 and the coefficient of variation of the SEE market model calculated using JCI returns has the largest value of 0.2045.

Table 6. *Descriptive Statistics of Standard Error of the Estimate (SEE)*

Before Pandemic									
	LQ45	IDX30	SRI- KEHAT I	JII	PEFIND O 25	MNC 36	KOMPA S 100	IDX BUM N 20	JCI
N	27	27	27	27	27	27	27	27	27
Minimum	0.0117	0.0116	0.0110	0.0123	0.0147	0.0117	0.0121	0.0107	0.0123
Maximum	0.0315	0.0315	0.0315	0.0315	0.0315	0.0315	0.0315	0.0315	0.0315
Range	0.0198	0.0199	0.0205	0.0192	0.0168	0.0198	0.0194	0.0208	0.0192
Mean	0.0208	0.0209	0.0210	0.0210	0.0230	0.0211	0.0208	0.0207	0.0208
Std. Deviation	0.0056	0.0057	0.0058	0.0053	0.0048	0.0057	0.0055	0.0058	0.0054
Coefficient of Variation	0.2702	0.2730	0.2786	0.2514	0.2091	0.2700	0.2644	0.2777	0.2607
During Pandemic									
	LQ45	IDX30	SRI- KEHAT I	JII	PEFIND O 25	MNC 36	KOMPA S 100	IDX BUM N 20	JCI
N	27	27	27	27	27	27	27	27	27
Minimum	0.0181	0.0181	0.0181	0.0178	0.0187	0.0181	0.0181	0.0185	0.0163
Maximum	0.0392	0.0392	0.0393	0.0393	0.0396	0.0393	0.0391	0.0395	0.0330
Range	0.0211	0.0211	0.0213	0.0215	0.0208	0.0212	0.0211	0.0210	0.0167
Mean	0.0282	0.0282	0.0283	0.0284	0.0289	0.0283	0.0282	0.0283	0.0240
Std. Deviation	0.0050	0.0050	0.0050	0.0051	0.0047	0.0050	0.0050	0.0049	0.0049
Coefficient of Variation	0.1775	0.1788	0.1782	0.1783	0.1636	0.1774	0.1761	0.1725	0.2045
All Period									
	LQ45	IDX30	SRI- KEHAT I	JII	PEFIND O 25	MNC 36	KOMPA S 100	IDX BUM N 20	JCI
N	27	27	27	27	27	27	27	27	27
Minimum	0.0162	0.0162	0.0163	0.0160	0.0170	0.0162	0.0162	0.0167	0.0150
Maximum	0.0339	0.0340	0.0341	0.0340	0.0347	0.0341	0.0338	0.0340	0.0319
Range	0.0177	0.0178	0.0178	0.0180	0.0177	0.0179	0.0177	0.0172	0.0169
Mean	0.0253	0.0253	0.0254	0.0254	0.0264	0.0254	0.0253	0.0253	0.0226
Std. Deviation	0.0048	0.0049	0.0049	0.0048	0.0045	0.0049	0.0048	0.0047	0.0049
Coefficient of Variation	0.1919	0.1937	0.1941	0.1879	0.1696	0.1920	0.1893	0.1876	0.2178

Source: Bloomberg.com, processed data

Then, in Table 7, after being tested, the minimum and maximum values were the same as during the pandemic, so that for the entire period it was found that the value of the SEE market model calculated using JCI returns had a minimum value of 0.0150 while PEFINDO25's return had a maximum value of 0,0347. Next, the JCI return as a proxy for stock market returns on the IDX has the smallest mean value of 0.0226 compared to the value of the SEE market model which is calculated using PEFINDO25 returns, which produces the largest mean of 0.0264 compared to the SEE market model which is calculated using stock index returns. others as a proxy for stock returns. The standard deviation of the SEE market model calculated using PEFINDO25 returns has the smallest value of 0.0045, while the standard deviation of the SEE market model calculated using returns of IDX30, SRI-KEHATI, MNC36, and JCI has the largest standard deviation value of 0.0049. Furthermore, the coefficient of variation of the SEE market model calculated using PEFINDO25 returns has the smallest value of 0.1696 and the coefficient of variation of the SEE market model calculated using JCI returns has the largest value of 0.2178.

In summary, in before pandemic period, IDXBUMN has the smallest SEE. While during pandemic period and all period, JCI has the smallest SEE. Based on these results, so H_1 accepted. JCI still the best estimator for beta in the IDX.

5. DISCUSSION

Based on the results, this study found that JCI still the best estimator for beta in the IDX. The results of this study are different from the assumptions and findings of most Indonesian researchers (i.e. Chabachib (2020); Ekantari and Widanaputra (2015); Jogiyanto Hartono and Suriyanto (1999); Rovantiane and Robiyanto (2021); Solekha and Winarto (2020); Tendean et al. (2019); Wijaya and Djajadikerta (2017)) who state that the JCI are not better proxy for market in the IDX and JCI should not used to calculate stock beta. The results of this study prove that the stock beta calculated using the JCI return index produces the smallest estimation error rate. This may happen because during Covid-19 pandemic, some big companies (some of them are start-up with unicorn status) listed in the IDX but do not included in prestigious stock indexes such as LQ45, IDX30 et cetera but still included in JCI calculation with big portion (i.e. BUKA during studied period). Also, during studied period, some companies with small market capitalization emerge to became companies with big market capitalization because huge stock price appreciation such as technology stocks and bank stocks. The phenomenon of digital bank become a major driver for this appreciation, while these stock are being neglected to be included to some prestigious indexes.

This study also found that betas before Covid-19 pandemic is differ from betas during Covid-19 pandemic. Betas during Covid-19 pandemic were smaller than before Covid-19 pandemic. This surprising results occur because during Covid-19 pandemic, the IDX imposed asymmetric auto rejection regulation. Stocks depreciation limited to 7% per day by this regulation, while stock appreciation still using normal auto rejection limit. During Covid-19 pandemic especially in early period, almost all stocks going down and under this regulation, stocks could not go anywhere (stalled) if they hit 7% depreciation, while the market still changing. This why the beta become smaller during Covid-19 pandemic period.

6. CONCLUSION, LIMITATIONS, AND SUGGESTIONS

This study found that there was no difference between the Standard Error of Estimate (SEE) stock beta calculations performed using returns IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI, and

PEFINDO25. However, this study found that there were differences in SEE from the calculation of stock betas using JCI returns. The results of this study prove that the stock beta calculated using the JCI return index produces the smallest estimation error rate.

In the search for stock market proxies, in the period before the Covid-19 pandemic, the smallest SEE that could represent the Indonesian stock market was the IDX BUMN20. However, during the period of the Covid-19 pandemic, the smallest SEE that can represent the Indonesian stock market is the JCI return. In the combined period, namely before the pandemic and during the Covid-19 pandemic, the smallest SEE that can represent the Indonesian stock market is the JCI return. From these three results, the IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI and PEFINDO25 indices cannot represent the stock market because they do not show any beta differences calculated using the Paired Sample t-test, while the JCI return can be used as a proxy for the Indonesian stock market because there is no difference between before and after the Covid-19 pandemic and has the smallest deviation rate calculated using the standard error estimation test (SEE).

The limitations of this study are the observation period using market return data and stock index returns for 830 days, the object of research only takes 9 indices out of 40 indices listed on the Indonesia Stock Exchange (IDX) and not all companies can survive on the IDX30, LQ45, IDX BUMN20, Jakarta Islamic Index (JII), KOMPAS100, MNC36, SRI-KEHATI and PEFINDO25. Further researchers can use market return data and stock index returns with a longer time, use stock price index returns other than those used in this study and can use different periods and phenomenon. The results of this study imply that for investing and trading, traders and investors do not need to calculate and compare the beta of each stock index return listed on the Indonesia Stock Exchange (IDX). Investors and traders can use the calculation of the Jakarta Composite Index (JCI) return as a reference in investing and buying and selling shares because the JCI return has the least deviation rate, this is also because the JCI is representative of all indexes on the IDX.

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