COINTEGRATION AND CAUSALITY OF GLOBAL AND REGIONAL STOCK INDEX ON INDONESIAN STOCK EXCHANGE (IDX) IN INDONESIA

[1]Fadila Hani, [2]Masyhuri Hamidi
[1]Master's Student, Department Masters of Management Faculty of Economic, Andalas University, Padang City, West Sumatera, Indonesia. Email: [1]fadilahani.srm@gmail.com
[2]Lecturer, Department Masters of Management Faculty of Economic, Andalas University, Padang City, West Sumatera, Indonesia. Email: [2]hamidi.masyhuri@gmail.com

Abstract: *This study aims to analyze the integration and relationship of global and regional indexes to the IDX. The indices used in this study were DJIA, FTSE 100, Nikkei 225, KOSPI, Hangseng, and STI. This research was conducted using time series data starting from January 2009 to December 2018. The data used consisted of 120 months observation. The results of the study using the Johansen Cointegration Test were obtained because there is a long-term balance between global and regional indices on the IDX. The VECM model is used to correct the short-term balance towards the long term, and is obtained by the DJIA, Nikkei 100, and Hangseng having a short-term equilibrium with the IDX. While FTSE 100, KOSPI, and STI do not have short-term equilibrium. DJIA, FTSE 100, Nikkei 225, KOSPI, Hangseng, STI and IDX do not have a two-way relationship or not, which are interrelated, and the interrelated relations between DJIA to IDX, IDX to FTSE 100, IDX to KOSPI, and IDX to STI.*

Keywords: *DJIA, FTSE 100, Nikkei 225, KOSPI, Hangseng, STI, IDX, Cointegration, VECM, Granger Causality.*

1. INTRODUCTION:

Economic globalization encourages countries around the world into one market forces increasingly integrated with unimpeded territorial boundaries of the country. Economic globalization requires the elimination of all restrictions and impediments to the flow of capital, goods and services. A country's borders will be blurred (border less) and the linkages between national economies with the international economy will be more closely. Economic globalization opens market opportunities of products from domestic to international markets competitively and also opened up opportunities influx of global products into the domestic market.

The paradigm of international finance in the era of globalization shaping a new paradigm in which national finance a small part of international finance. Currently the stock market has been increasingly integrated globally. The capital market plays an important role in the economy of a country where the value of the stock price index can be the key to the main economic indicators. The movement of the index is strongly influenced by investor expectations on fundamentals in the country and globally. Similarly, the Indonesian capital market is an integral part of the activities of global stock markets.

The major changes as a result of financial globalization is the occurrence of cross-border financial flows and payments, the amount of international risk-sharing through a financial instrument that is more diverse, increasing cross-border ownership of assets, as well as rising profile in international financial markets, both in terms of market players involved and their institutions , Thus, the process of financial globalization will bring a more integrated capital market implications of a country with global capital markets (Salim, 2017).

Naturally, Chien et. al (2015), said the level of integration of stock markets in the various countries to be important for investors and policy makers (government). For investors, the stock market affects the level of integration of international portfolio diversification opportunities for the integration provides an opportunity for investors to allocate capital more efficiently. For policy makers in this case the government, regional integration can help broaden the investor base and a wide range of financial products, thereby strengthening the domestic capital market to compete globally. Relative to reduce the possibility of asymmetric shocks Umutlu et al., (2010); Chien et al., (2015) stated that integrated financial markets also help financial stability, while, Beine et al., (2010); Narayan et al (2011); Chien et al (2015),

In this study, the variables used are the global stock index consisting of the DJIA and FTSE 100, and the regional stock index consisting of the Nikkei 225, KOSPI, Hang Seng and STI, the dependent variable is the CSPI.

2. LITERATURE REVIEW:

Efficient Market Hypothesis Theory

According to Halim (2014), the capital market is said to be efficient if the stock price changes are not predictable or random. Stock prices move randomly is a consequence of the reaction of a rational investor, which is competing for

the new information before other investors find this information for making decisions to buy or sell shares in the stock market.According to Bodie (2014), Fama (1970) in his study discusses some empirical evidence to support the theory of random walks and pioneered the emergence of the theory Efficiency Market hypothesis. Theory of Market Efficiency hypothesis becomes a theory that is quite popular and widely used as the basis of research on the recent market anomalies. In his research, an efficient market is the market where the daily price fluctuations between the lowest price and the highest price was very very thin. Comparison between stock prices in the stock market and intrinsic value reflects the degree of market efficiency.

Modern Portfolio Theory

Mnurut Fetriana (2016) theory underlying the research main international stock market integration is applying modern portfolio theory investors to diversify assets in a variety of world stocks. Modern portfolio theory with the concept of portfolio risk was first introduced by Markowitz (1952). In order to lower the risk of a portfolio, investors need to diversify. While Salim (2017) states in the context of international investment, investors can diversify in different types of assets or securities in various capital markets of the world. By doing international diversification, investors can hope to achieve a combination of risk and return better.

Contagion Effect

Kibtiyah, et al. (2016); Trihadmini (2011) states the contagion effect is a phenomenon that gives the contagious effect which occurs in a country, triggering a financial or economic crisis in other countries. Contagion theory also states that there is no single country in a region can escape from the contagious effects. In Manurung, Pardede, and Sitorus (2014) states that a country's economic conditions will affect the condition perekonomian other countries. A country's economy is no longer determined only by the state but rather a factor in economic conditions of other countries. For example, during the crisis of 2008, which according to World Bank studies due to their economic integration between countries, causing contagion effect on other countries. In a broad sense, contagion is a shock transmission between countries. If a country is in shock, the shock can be transfer to other countries in the vicinity (Adisetiawan, 2018).

The integration between the Capital Market

(Ghouse and Khan, 2017) said that global financial integration began in the mid-1980s, as a result of risk and return of movement between the financial markets observed at the time. The growing economic integration of financial markets across continents to be important since the last three decades. The main factor behind the observed globalization is the rapid growth in technology, capital flows easily, and financial relations between economy. While (Adisetiawan 2018) states that the integration of capital markets in the world characterized by increasingly high correlation between stock returns between the stock market, where a high correlation due to the bias of decreasing the portfolio selection are getting lost because of diversification benefits.

3. RESEARCH METHODOLOGY:

The purpose of this study was to determine the existence of cointegration and causality between global and regional indices against JCI. The sample used is, the DJIA representing the US stock market, the FTSE 100 which represents the UK stock market, the Nikkei 225 representing the Japanese stock market, the KOSPI representing the stock markets of South Korea, the Hang Seng which represents Hong Kong shares, and STI representing the stock exchange of Singapore , The data used is secondary data monthly stock index in January 2009 until December 2018 were obtained from www.yahoofinance.com, The data analysis was done in several steps, which are described as follows:

Unit Root Test

Unit root test used to prove to prove each of the variables have a stable pattern or not. In this study unit root tests using methods Kwiatkowski Phillips Schmidt Shin (KPSS).

Determination of Optimal Lag

Test with VECM models requires knowing the optimal lag length. Optimal lag test is very important in VECM approach. Lag serves to explain how long the effect of a variable to another variable. In addition, the optimal lag test will eliminate the problem of autocorrelation in the VECM system.

Cointegration test

Cointegration test is used to obtain a long-term relationship between the variables in the modeling. In this study, cointegration test used is the Johansen Cointegration Test. Cointegration relationship can be seen from the value of Max Eigen Trace Statistic and Statistic compared with the critical value 1-10 percent confidence level.

Vector Error Correction Model (VECM)

Vector Error Correction Model (VECM) is an analytical model that can be used to determine the short-term behavior of a variable to the long-term due to a permanent shock (Ajija, 2011). In addition VECM models can also be used for finding a solution to the problem of variable time series (time series) are not stationary (non-stationary) and spurious regression (spurious regression) or correlation lancing (spurious correlation) in the econometric analysis.

Granger Causality Test

Causality test was first proposed by Engel and Granger. Granger causality test is useful to look at the causal relationship between the two variables. By doing the granger causality test, we will be able to determine the relationship between two variables, whether have the unidirectional relationship (only one influence), or both of these variables have the two-way relationship (between variables interact with each other variables).

4. ANALYSIS:

Description Statistics

Here is a table that explains the statistical description of dependent and independent variables include the number of observational studies, on average, the lowest value, highest value, and standard deviation. Data taken from the years 2009-2018.

Table 1. Description Statistics Level Data

variable	Obs	Mean	Min	Max	Std. dev
Nikkei 225	120	14610.83	7568.42	24120.04	4866.10
DJIA	120	15897.54	7062.93	26458.31	4863.45
Hangseng	120	22848.37	12811.57	32887.27	3475.34
JCI	120	4433.66	1285.48	6605.63	1214.51
FTSE 100	120	6242.51	3625.83	7748.80	894.00
STI	120	3021.67	1533.40	3615.28	366.54
KOSPI	120	1970.92	1018.81	2568.54	280.62

Source: Yahoo Finance Monthly Index, prepared by Eviews 9 and Ms. Excel

Unit Root Test

Here is the result of the unit root test of the variables in the study.

Table 2
Test Results roots Unit (Unit Roots Test) By Philips Schmidt Kwiatkowski approach Shin (KPSS)

variables	The value of t-statistics and Critical Values				Information
	t-statistic	*C-Value* 1%	*C-Value* 5%	*C-Value* 10%	
JCI	39.98993	0.739000	0.463000	0.347000	Stationary (Level)
DJIA	35.80772	0.739000	0.463000	0.347000	Stationary (Level)
FTSE 100	76.49120	0.739000	0.463000	0.347000	Stationary (Level)
Nikkei 225	32.89155	0.739000	0.463000	0.347000	Stationary (Level)
KOSPI	76.93763	0.739000	0.463000	0.347000	Stationary (Level)
Hangseng	72.01927	0.739000	0.463000	0.347000	Stationary (Level)
STI	90.30555	0.739000	0.463000	0.347000	Stationary (Level)

Source: Summarized from the processed Eviews 9

From Table 4.2 above it can be seen that the test results on the level on all variables have been stationary. It can be seen from the t-statistic value that is greater than the critical value (1%, 5% and 10%). The data will then be used in this study, where the condition to do cointegration test is data to be stationary. This data is already stationary at the current level.

Optimal Lag Test

In determining the optimal lag lag figures using the criteria of the most widely asterisk (*), we select / define the criteria that have a final prediction error correction (FPE) or the number of AIC, SIC, HQ is the smallest among the various lag submitted. Results of the determination of lag length are listed in Table 4.3 below.

Table 3
Long Lag Test Results (Lag Length Criteria)

lag	LogL	LR	FPE	AIC	SC	HQ
0	-6061.486	NA	2.72e + 38	108.3658	108.5357	108.4348
1	-5357.389	1307.608	2.27e + 33	96.66766	98.02691 *	97.21915 *
2	-5303.318	93.65861	2.09e + 33 *	96.57711 *	99.12570	97.61115
3	-5254.465	78.51286 *	2.15e + 33	96.57974	100.3177	98.09634
4	-5214.334	59.48068	2.64e + 33	96.73811	101.6654	98.73726
5	-5169.556	60.77010	3.09e + 33	96.81350	102.9301	99.29521
6	-5132.725	45.38097	4.35e + 33	97.03080	104.3368	99.99507
7	-5086.373	51.31822	5.48e + 33	97.07809	105.5734	100.5249
8	-5023.085	62.15785	5.50e + 33	96.82295	106.5076	100.7523

* Indicates a lag order selected by the criterion
LR: LR modified sequential statistical test (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Length Lag Test Criteria, processed using Eviews 9

Based on the above results, it is based on criteria, lag 1 and 2 was selected as the optimum lag, the next test results using the Lag 1 or 2 so that all information can be included in the research model.

Cointegration test

Eviews following output results for Johansen cointegration test that uses the assumption of a linear deterministic (intercept and trend). Johansen Cointegration test with the proviso that if the trace statistics or statistical max-eigen value greater than the critical value at the level of $\alpha = 5\%$ and $\alpha = 1\%$, then the test results are cointegration equation which means it has a long-term balance.

Table 4
Johansen Cointegration Test Based on Trace Statistic

Unrestricted Cointegration Rank Test (Trace)

hypothesized		**Trace**	**0:05**	
No. of CE (s)	**eigenvalue**	**statistics**	**critical Value**	**Prob. ****
none *	0.440989	183.1978	125.6154	0.0000
At most 1 *	0.339565	115.1522	95.75366	0.0012
At most 2	0.223964	66.61405	69.81889	0.0877
At most 3	0.158936	36.94796	47.85613	0.3500
At most 4	0.075469	16.69673	29.79707	0.6624
At most 5	0.052922	7.515838	15.49471	0.5185
At most 6	0.009816	1.154119	3.841466	0.2827

Trace test indicates 2 cointegrating eqn (s) at the 0:05 level
* Denotes rejection of the hypothesis at the 0:05 level
** MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

hypothesized		**Max-Eigen**	**0:05**	
No. of CE (s)	**eigenvalue**	**statistics**	**critical Value**	**Prob. ****
none *	0.440989	68.04561	46.23142	0.0001
At most 1 *	0.339565	48.53815	40.07757	0.0045
At most 2	0.223964	29.66609	33.87687	0.1467
At most 3	0.158936	20.25123	27.58434	0.3240

At most 4	0.075469	9.180889	21.13162	0.8176
At most 5	0.052922	6.361719	14.26460	0.5672
At most 6	0.009816	1.154119	3.841466	0.2827

Max-eigenvalue test indicates 2 cointegrating eqn (s) at the 0:05 level
* Denotes rejection of the hypothesis at the 0:05 level
** MacKinnon-Haug-Michelis (1999) p-values

Source: Johansen Cointegration Test Output Eviews 9

VECM Estimation

To view a variable has a short-term equilibrium towards the long term, it can be seen from the estimated value of the variable VECM where the probability should be smaller than the alpha value of 0.05. While the long-term relationship can be seen from a comparison of the value of t-statistic estimation of the value of the t-table. If the value of t-statistic greater than t-table, it can be said that there is a long-term relationship between variables. Their short and long term relationship showed that the independent variables affect the dependent variable.

Table 5
VECM Estimation Results

variables	Coefficient	t-statistic	Std. Deviation
JCI (-)	1.00000		
DJIA (-)	-0.190866	-5.91574	0.03226
FTSE 100 (-)	0.014389	0.09977	0.14422
Nikkei 225 (-)	-0.041652	-2.20147	0.01892
KOSPI (-)	-1.748892	-5.08746	0.34377
Hang Seng (-)	0.255626	10.86480	0.02353
STI (-)	-1.872334	-7.53160	0.24860
C	2384.693		

Source: Summarized from VECM Estimation of Long-Term Output Eviews 9

Test Kusalitas Granger

In this study, granger causality test aims to see the direction of the relationship between the DJIA, FTSE 100, Nikkei 225, KOSPI, Hang Seng and STI against JCI. With knowable granger causality test one variable with other variables related to reciprocal or related only unidirectional. Here in Table 4.8 show variable granger causality test results DJIA, FTSE 100, Nikkei 225, KOSPI, Hang Seng and STI against JCI.

Table 6
Granger Causality Test Results

Null Hypothesis:	Obs	F-Statistic	Prob.
DJIA does not Granger Cause JCI	118	2.52280	0.0847
JCI does not Granger Cause DJIA		0.26121	0.7706
FTSE_100 does not Granger Cause JCI	118	0.43290	0.6497
JCI does not Granger Cause FTSE_100		3.51131	0.0332
NIKKEI_225 does not Granger Cause JCI	118	0.15454	0.8570
JCI does not Granger Cause NIKKEI_225		2.21383	0.1140
KOSPI Composite Index does not Granger Cause	118	0.77296	0.4641
JCI does not Granger Cause KOSPI		16.1853	7.E-07
HANGSENG does not Granger Cause JCI	118	1.08634	0.3409
JCI does not Granger Cause HANGSENG		1.30846	0.2743
STI does not Granger Cause JCI	118	2.06597	0.1315
JCI does not Granger Cause STI		19.1287	7.E-08

Source: Processed Data Eviews 9

5. CONCLUSION:

Based on the goals and results of the research, it can be concluded as follows: (1) There is a cointegration between the DJIA, FTSE 100, Nikkei 225, KOSPI, Hang Seng and STI against JCI by using Johansen Cointegration Test. (2) There is a significant relationship to the DJIA, FTSE 100, Nikkei 225, KOSPI, Hang Seng and STI against JCI by using VECM models in the short term balance towards the long term. (3) The VECM models are short-term relationship on the DJIA, Nikkei 225 and Hang Seng. (4) Through the Granger causality test did not reveal any two-way relationship, but there is a relationship in one direction on the DJIA to JCI, JCI to the FTSE 100, the JCI to KOSPI, and JCI to STI.

Based on the research that has been presented, it can be given suggestions as follows: (1) For further research, is expected to use the daily data of stock price index, so the relationship of indices become more pronounced in the short term and long term. (2) This study only examined the stock price index relationships globally and regionally, while other factors are affecting the JCI is not included in this study. It is expected that further research into account other factors beyond the factors that have been used in this study.

REFERENCES:

1. Adisetiawan, R. (2018). Causality Global Macroeconomic and on the Indonesian Capital Market. Journal of Economics Business. Vol 2 No. 1.
2. Beine, M., Cosma, A., Vermeulen, R., (2010). The Dark Side of Global Integration: Increasing Tail Dependence. A. Bank financ 34 (1), 184-192.
3. Bodie, Zvi., Kane, Alex., And Marcus, Alan J. (2014). Portfolio Management and Investment. Global Edition, Salemba Four. Jakarta.
4. Chien Mei-Se., Lee, Chien-Chiang., Hu Te-Chung, and Hu Ting-Hui (2015). Dynamic Asian Stock Market Convergen: Evidence for Dynamic Cointegration Analysis among China and the ASEAN-5. Economic Modeling, 51, 84-98. Elsevier.
5. Fetriana, Sandra (2016). Cointegration Analysis and Public Sharia Stock Index in Indonesia. Scientific Repository IPB.
6. Ghouse, Ghulam and Khan, Saud Ahmed (2017). Dynamic Tracing Linkages and Spillover Effect Between Leading Pakistani and Foreign Stock Markets. Reviews of Financial Economics. Elsevier.
7. Halim, Abdul (2014). Investment Analysis and Applications: In Asset Finance and Real Assets. Salemba Four. Jakarta.
8. Ikrima, Tara Ninta., And Muharram, Harjum (2014).Co-Integration And Contagion Effect Between Stock Market Sharia in Indonesia, Malaysia, Europe, and America currently occurrence Greek crisis. *Journal of Management Dynamics: 121-136.*
9. Kibtiyah, Mariyatul., Goddess, Andrieta Shintia., And Gustyana, Tika Trikartika (2016). Stock Market Volatility Spillover Analysis Indonesia and China. Scientific magazine UNIKOM. Vol.15, No.1.
10. Manurung, A., Pardede, J and Sitorus, R. (2014). "Between interrealtionship Dynamic Macroeconomic Indicators, Global Stock Market, Commodities Prices and Jakarta Composite Index". Journal of Accounting and Management. Volume 25, Page: 67-77.
11. Salim, July Fahmi (2017). Variable Effect Analysis of Monetary and ASEAN Regional Stock Prices on Stock Price Index (CSPI) in Indonesia. Research Gate.
12. Trihadmini, Nuning. (2011). Contagion and Spillover Effect of Global Financial Markets as the Early Warning System. Finance and Banking Journal. Vol. 13 No. June 1st. 47-61
13. Umutlu, M., Akdeniz, L., Altay-Salih A., (2010). The Degree of Financial liberalization and Aggregated Stock-Return Volatility in Emerging Markets. J. Banks. Financ. 34 (3), 509-521.