The Effect of Return Volatility Mature Market on Emerging Market: Econommometry Model Approach-Granger Causality, Vector Autoregression, Autocorrelation Condition Heteroscedasticity/ General Autocorrelation Condition Heteroscedasticity

Yunita Astikawati, Avelius Dominggus Sore

Economic Education, STKIP Persada Khatulistiwa, Jl. Pertamina-Sengkuang, Sintang, Indonesian.

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Abstract: The mature market dominates and affects the economic conditions in the emerging market. One of the influences occurs in stock trading in the capital market. Therefore, it is necessary to do analysis to prove that there is an influence of volatility return on the mature stock index on the emerging stock index. The mature market index used are NYA, NASDAQ, FTSE100, HANGSENG, SSEC, and STI. The indices of emerging markets are the IDX, SENSEX, SET, JSE, and TSEC. This analysis conducted by using the data from 2014-2018. Data analysis used an econometry approach that is granger causality, VAR, and ARCH/GARCH. The analysis which has done showed some results. First, the results of the analysis showed a reciprocal relationship between the indices in the mature market and emerging market. Secondly, regional factors have an impact on each of these indices that can be seen from the reciprocal relationship between mature and emerging index residing within the same area. Thirdly, the return volatility index mature market simultaneously does not affect on the return volatility index emerging market. Therefore, it is needed further analysis to predict the emerging market influence on the mature market in a shorter time.

1 INTRODUCTION

Investments can be made by anyone and everywhere. Investments can be said to be one of the factors related to economic development. This economic development can also be classified into three categories: they are strong, developing, and weak economies. In general, countries that have strong economies often dominate the developing and weak countries in various fields. One of that is the economy. The developed country, which has progressed in the field of economics, can create safe investments and profitable. This leads to many prospective investors who are more interested in investing in developed countries. On the other hand, developing and weak countries also have their own appeal to potential investors. Developing and weak countries generally provide a high return rate for investors. High returns are also associated with a high level of risk. Returns can be obtained in various ways, one of them through a stock trading transaction. Stock trading transactions can be made intraday. This

transaction can be a transaction to buy and sell shares of the company.

Companies that perform well are more in demand by investors because they produce attractive returns. Return generated from stock trading also generally be influenced by various factors; one of them is the economic condition. When the economic condition of a country is good, then the resulting return also increases. Conversely, if the economic condition of the country is not good or in other words, experienced a crisis, then the resulting return will decrease. The crisis in a certain country can also affect the condition of other countries. One of them is the Venezuelan economic crisis that impacted other countries through the trade route.

American and Chinese trade war also provide stimulation for other countries, especially developing countries such as Indonesia. These two incidents have an impact on Indonesia. It is seen from the weakening of the rupiah exchange rate. The rupiah exchange rate is an indirect effect of retaliatory concern made by Americans against China. Overheating also has a role in elevated inflation. The Increase in inflation makes

investing more at risk. This risk is called systematic risk. The systematic risk of increasing inflation is followed by decreasing the exchange rate and interest rate (Adisetiawan And Ahmadi, 2107). This condition causes investors to transfer their investments to other places that are considered safe. This is due to the number of hot money in Indonesia. In addition to the crisis, the economic policy also impacts the investment return. Especially if the economic policy is made by developed countries, then it will impact on investment returns not only in developed countries but also in developing and weak countries. This impact can be both positive and negative. This impact can be perceived directly and indirectly to investors. This is due to the strong influence of the developed countries to global economic development. It is also proposed by Triyono and Rubiyanto (2017), which states there are mature country capital market relations represented by the Americans that have an emerging influence of Indonesia. Therefore, it is needed to analysis to prove the strong economic influence on developing economies through trading in stock indices. The indices of shares are used, representing developed countries or mature markets and emerging markets. This analysis proves that the adverse effects of the economy not only originate in developing countries but also come from developed countries. This analysis is different because in this study, using more stock index in developed and developing countries with a fairly long period of time. In addition, the selected index already represents developed and developing economic forms and represents the general conditions of the region or continent. Therefore, this research can prove the contagion effect theory.

2 LITERATURE REVIEW

Capital market is a place where prospective investors can meet to execute transactions. Capital market based on the forms is divided into three, namely weak form, semi-strong, and Stong. This market form has an integral relationship with one another. There are a few terms that can explain the chain effect of the phenomenon transmission in the economic field. Those terms are:

2.1 Domino Effect

Domino effect is a chain reaction that due to changes in the economic field that causes changes in areas that

have similar characteristics. These changes are propagating and continuously.

2.2 Ripple Effect

The ripple effect is like a wave that propagated into a wider area. This can be modeled after a phenomenon that occurs in a country that is transmitted to neighboring countries.

2.3 Contagion Effect Theory

The contagion effect is a result of a financial crisis that occurs in a country and affects other countries (Trihadmini, 2011). This infectious effect has occurred several times in this decade. Generally, countries will be influenced when there is an extraordinary phenomenon such as the economic crisis, changing state status such as the exit of certain countries in areas such as Brexit, which occurred in 2016. Contagion effects are defined in three types (Hsien, 2012), i.e., basic, limited, and very limited. The contagion effect of this basic type generally occurs when there is good and bad information. This impact will affect the economy between countries as there will be shocks. However, this shock is not necessarily caused by a crisis but can be caused by other information such as an increase in interest rate. The contagion effect that is limited meant that changes or shocks that occur in a country would be related to other countries. The other countries will get positive and negative impacts. These impacts generally occur beyond some fundamental channels. Contagion effects that are very limited meant that the impact which is gotten by the other countries is limited only when the shocks occur and does not affect the normal economic conditions.

2.4 Factors That Cause Contagion Affect

The contagion effect is not only limited to the consequences of financial turmoil that occur but can also be caused by attitudes and fundamentals. Investor behavior triggers volatility that has an impact on diversification and hedging decisions (Alikhanov, 2013). The contagion effect caused by fundamental factors divided into three types: they are common causes, trade channels, and devaluative competition, as well as financial channels.

The contagion effect caused by common causes recently occurred when the Fed announced the increase in the interest rate of the treasury bond becomes 3.13%. It triggers capital flow from different

countries to the State of America. This is, of course, causing the movement or shifting of the flow of funds from one country to another, thereby triggering economic turmoil for other countries. Economic turmoil is also felt by the country in the region of Asia, especially Indonesia. The exchange rate of Indonesian currency has decreased against the dollar (depreciation). This change also affects the movement of stocks in the country due to the number of hot money coming out of the country.

Second types of Contagion Effect, i.e., Trading channels and competition devaluative This Contagion Effect is a little unique because this impact is caused by local turmoil in a country but has a large impact on the other countries. This generally occurs as a result of trade relations between countries with turbulent countries. The volatility is a depressive currency. A depreciation currency provides greater value for trade transactions. But on the other hand, it gives the opportunity for the Exportir to get the benefit because foreign countries will assume that the export value is cheaper.

The last types of Contagion Effect, i.e., Financial link, which occurs through the trading path made between countries. The trading path carries a variety of information flows and assets. When a country is experiencing a crisis, it has a lot of impact on other countries that have a direct trade relationship with the country (Cheung et al., 2012) This financial problem is not a major problem in the economy but what triggers financial problems is the attitude of investors. Therefore, this effect of transmission cannot be separated from the problem of investor behavior.

2.5 Contagion Effect Caused by Investor Behaviour

Cognitive, emotions and investor attitudes are the main factors of a contagion effect (Beisswingert et al., 2016). When an investor makes a decision to invest or revoke his or her investment in a particular country, it will have an impact on countries that have a close relationship with the country. This impact can be decreased investment interest that can be seen from declining currency value, the stock trading value decreases, occurrence of crisis, and others. Investor behavior that triggers the effect of transmission is caused by three aspects, they are 1) liquidity problems, incentives, information asymmetry, and coordination issues, 2) multiple equilibria, 3) Regulatory changes about the international financial system.

2.6 Types of Contagion

The contagion effect based on its type is divided into two, namely spillovers and financial crises.

2.6.1 Spillovers

Spillover is an impact of which countries can not stand alone in conducting economic activities or better known as interdependence. When the state is experiencing dependencies on the other countries, then it is likely to be influenced in the economic phenomenon is greater. The impact of the phenomenon can be channeled through a financial pathway that correlates with a trading route and a real link.

2.6.2 Financial Crisis

The financial crisis is a situation where a country is decreasing financial asset decline. The impact of the contagion effect on the crisis period is generally more perceived by the emerging market (Celik, 2012).In addition, the problem of low-quality audits can also trigger a contagion effect. This contagion effect is actually due to changes in behavioral investors rather than fundamental economic problems (Jere And Paul, 2013). It is caused that sometimes investors overreaction to a piece of information so that the decision is made into irrational.

Investors can invest directly in a company through the purchase of shares. Investors get benefits during the purchase of a stock sale transaction. The profit is called return stock. Based on the type of return, it is divided into two, namely expected return and realized a return. Return shares do not loose relation with stock volatility. The higher the volatility, the greater the likelihood that investors will gain and loss. Return can be calculated by using the following formula (Jogiyanto, 2009).

$$Rm = \frac{p_t - p_{t-1}}{p_{t-1}}$$

(1)

Description:
Rm: return market
Pt: stock price now
Pt-1: the share price of the previous period

3 METHODOLOGY

This research aims to provide empirical evidence on the interconnectedness of mature and emerging

markets. The subjects of research in this study are all the stocks that are included in the stock index, such as NYSE, NASDAQ, FTSE 100, SSEC, HANG SENG, Kopsi, STI, SENSEX, IDX, JSE, Stock Exchange Thailand, and TSEC Taiwan. This research will be conducted by using daily data from 2014-2018. This research used a quantitative approach. Research data obtained from secondary data, which is data from other subjects (Sekaran And Bougie, 2013). Secondary data is obtained from the website: investing, yahoo finance, Bloomberg, and capital market websites in each country. Data analysis used an econometric approach, and they are granger causality, VAR, and ARCH/GARCH. The GARCH was originally developed by Engle in 1982 as ARCH. Autoregressive Conditional Heteroscedasticity (ARCH) was redeveloped by Bollersev in 1986, and now we know it as Generalized ARCH. GARCH is relatively accurate for analyzing time-series data. Based on the type, GARCH is divided into several types, namely EGARCH, AGARCH, FIGARCH, and SWARCH. GARCH is formulated as follows (Winarno, 2011):

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

(2)

Description:
$\Sigma \_ T \char94 2$: Conditional variant
ω : On average
$\varepsilon \_ (T-1) \char94 2$: Volatility of the previous year
$\Sigma \_ (T-1) \char94 2$: variant of the previous period

GARCH is used to calculate return volatility in the mature index and emerging market. As it is known that the ARCH model has many types, therefore, before making a conclusion, it is worth determining the best model with attention to the R2 value and sees the coefficient of AIC and SIC.

4 RESULTS AND DISCUSSION

This analysis was done in several phases. The first stage of data would be tested using causality granger tests. In the second model selection analysis, the selection of this model depends on the results of the analysis of the causality granger. If the results of the causality granger indicate a simultaneous relationship, then the data would be tested using a vector autoregression model. If there is no simultaneous relationship, then the data will be tested using the regression model. After analysis of the data, regression will be analyzed using ARCH/GARCH.

4.1 Granger Causality

The entire variable is not the normal distribution of JB's probability value of 0.00000 smaller than the standard deviation of 5%. The results of the Correlation Test showed that the data did not contain multicollinearity problems. The data experiences a multicollinearity problem if the correlation value is more than 0,8 (Gujarati And Porter, 2009). Further analysis was the causality granger test. This test was done to see the reciprocal relationship between the market index. Analysis results of causality granger can be concluded as follows:

Table 1: Variables mutually affect simultaneously according to the causality Granger test

X	Y	FORM
FTSE	NYA	SIMULTANEOUS
HANGSENG	SSEC	SIMULTANEOUS
KOSPI	NYA	SIMULTANEOUS
KOSPI	STI	SIMULTANEOUS
KOSPI	TSEC	SIMULTANEOUS
NASDAQ	SSEC	SIMULTANEOUS
NYA	STI	SIMULTANEOUS
NYA	SET	SIMULTANEOUS
SET	TSEC	SIMULTANEOUS
NASDAQ	FTSE	SIMULTANEOUS

Source: data processed eviews 7, 2019.

The results of the analysis above showed that the relationship between a mature market and an emerging market is not always direct. Moreover, not all of the mature market indexes can affect the emerging market.
VAR analysis for all variables affecting the above can be resumed as follows:

Table 2: Summary of VAR test results with vector error correction estimates

X	Y	R-Squares
FTSE	NYA	0,442229
HANGSENG	SSEC	0,457461
KOSPI	NYA	0,451845
KOSPI	STI	0,416653
KOSPI	TSEC	0,423754
NASDAQ	SSEC	0,484539
NYA	STI	0,417251

NYA	SET	0,417135
SET	TSEC	0,396980
NASDAQ	FTSE	0,528429

4.2 Data Stationary Analysis

A stationary data test has done to see if each data was stationary at a specific lag. The stationary test can be done using a test of unit root test. The test root unit results are presented as follows:

Roots of Characteristic Polynomial
Endogenous variables: FTSE HANGSENG IHSG JSE KOSPI NASDAQ NYA SENSEX SET SSEC STI TSEC
Exogenous variables: C
Lag specification: 1 2
Date: 08/01/19   Time: 20:37

Root	Modulus
-0.231244 - 0.403114i	0.464731
-0.231244 + 0.403114i	0.464731
-0.335029 + 0.293437i	0.445365
-0.335029 - 0.293437i	0.445365
0.013674 - 0.430347i	0.430565
0.013674 + 0.430347i	0.430565
0.172637 + 0.392257i	0.428566
0.172637 - 0.392257i	0.428566
0.297139 + 0.186774i	0.350964
0.297139 - 0.186774i	0.350964
-0.265798 + 0.185789i	0.324294
-0.265798 - 0.185789i	0.324294
-0.303985	0.303985
-0.007448 + 0.287453i	0.287549
-0.007448 - 0.287453i	0.287549
0.067636 - 0.251268i	0.260212
0.067636 + 0.251268i	0.260212
-0.134741 + 0.208202i	0.247998
-0.134741 - 0.208202i	0.247998
0.189189 - 0.074995i	0.203510
0.189189 + 0.074995i	0.203510
-0.182813	0.182813
-0.044866 + 0.098981i	0.108674
-0.044866 - 0.098981i	0.108674

No root lies outside the unit circle.
VAR satisfies the stability condition.

The above analysis used Lag 1st and obtained the results of modulus value that there was no one greater than 1. Return index stocks of mature markets and emerging markets affect one another just in 1 period. It can also be concluded that all data is stable or stationary.

4.3 Modelling Analysis

The modeling analysis would be conducted to determine whether a mature market and emerging market index would be analyzed using regression or other models. The first phase of data would be analyzed using the least-squares regression model. The analysis results are as follows:

4.3.1 NYA, NASDAQ, FTSE, HANGSENG, SSEC, STI, KOSPI on the IDX

The result of regression Penggujian can be seen as follows:

Dependent Variable: IHSG
Method: Least Squares
Date: 08/02/19   Time: 09:12
Sample: 1 870
Included observations: 869

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000804	0.001203	-0.667956	0.5043
NYA	-0.010759	0.167589	-0.064201	0.9488
NASDAQ	0.124303	0.116095	1.070703	0.2846
FTSE	0.118572	0.161193	0.735590	0.4622
HANGSENG	0.008941	0.154570	0.057846	0.9539
SSEC	0.028738	0.083012	0.346190	0.7293
STI	0.076751	0.160001	0.479691	0.6316
KOSPI	0.233211	0.173711	1.342523	0.1798

R-squared	0.014246	Mean dependent var		-0.000691
Adjusted R-squared	0.006232	S.D. dependent var		0.035528
S.E. of regression	0.035418	Akaike info criterion		-3.834056
Sum squared resid	1.080040	Schwarz criterion		-3.790168
Log-likelihood	1673.897	Hannan-Quinn criter.		-3.817263
F-statistic	1.777619	Durbin-Watson stat		1.081409
Prob(F-statistic)	0.088439			

Regression results indicate that all of the variables are not significant. The value of Durbin Watson (DW) 1.081409 was smaller than the dl value that was 1.867606, so it can be concluded that data contains an autocorrelation problem. The autocorrelation problem generally occurs when data was time series. The tests of heteroscedasticity test: Breusch Pagan Godfrey is presented as follows:

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.222001	Prob. F(7,861)	0.9803
Obs*R-squared	1.565619	Prob. Chi-Square(7)	0.9800
Scaled explained SS	575.4494	Prob. Chi-Square(7)	0.0000

The results showed the value of OBS*R-squares probability 0.9800 was much larger than the standard error of 5%, so that can be concluded that data was free of the problem of heteroscedasticity. Based on the results of the above analysis, it can be concluded that the best model for the mature return market to the emerging market, which is represented by the IDX is the regression model.

4.3.2 NYA, NASDAQ, FTSE, HANGSENG, SSEC, STI, KOSPI against JSE

The first phase of the regression test would be carried out and subsequently make an analysis model decision whether to keep using regression or other models such as ARCH/GARCH. Regression results are presented as follows:

Dependent Variable: JSE
Method: Least Squares
Date: 08/02/19 Time: 09:16
Sample: 1 870
Included observations: 870

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012090	0.010616	1.138848	0.2551
NYA	0.855876	1.479076	0.578656	0.5630
NASDAQ	-0.255257	1.024463	-0.249161	0.8033
FTSE	0.501080	1.422389	0.352281	0.7247
HANGSENG	0.744040	1.364085	0.545450	0.5856
SSEC	-0.460075	0.732635	-0.627973	0.5302
STI	-0.965260	1.412069	-0.683579	0.4944
KOSPI	-1.718689	1.532958	-1.121158	0.2625

R-squared	0.003253	Mean dependent var	0.011894
Adjusted R-squared	-0.004841	S.D. dependent var	0.311829
S.E. of regression	0.312583	Akaike info criterion	0.521260
Sum squared resid	84.22443	Schwarz criterion	0.565108
Log-likelihood	-218.7480	Hannan-Quinn criter.	0.538037
F-statistic	0.401884	Durbin-Watson stat	2.201840

Prob(F-statistic)   0.901422

The results of the analysis showed simultaneous all of the variables are not significant. The value of DW 2.201840 was greater than 4dl value, which was 2.132394, so it was decided that occur autocorrelation problem. The results of heteroskedasticity analysis using the HETEROSKEDASTICIT test: Breusch Pagan Godfrey acquired Obs*R-Squares value probability 0.9885 and greater than the standard error of 5%. It was concluded that data does not contain a heteroscedasticity problem. Therefore data analysis could use regression.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.330644	Prob. F(7,862)	0.9402
Obs*R-squared	2.329732	Prob. Chi-Square(7)	0.9394
Scaled explained SS	913.9632	Prob. Chi-Square(7)	0.0000

4.3.3 NYA, NASDAQ, FTSE, HANGSENG, SSEC, STI, KOSPI against SET

The result of the causality granger analysis above shows that NYA and SET have simultaneous and unidirectional relationships. Therefore NYA and SET are tested using VAR. NASDAQ, FTSE, HANGSENG, SSEC, STI, KOSPI have no simultaneous connection to SET would be tested using the regression model. The results of the regression analysis are as follows:

Dependent Variable: SET
Method: Least Squares
Date: 08/02/19 Time: 09:23
Sample: 1 870
Included observations: 870

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000291	0.000261	1.115233	0.2651
NASDAQ	0.011768	0.025196	0.467037	0.6406
FTSE	0.143512	0.029918	4.796775	0.0000
HANGSENG	0.142436	0.033553	4.245141	0.0000
SSEC	-0.017029	0.018013	-0.945388	0.3447
STI	0.158738	0.034668	4.578809	0.0000
KOSPI	0.121329	0.037515	3.234156	0.0013

R-squared	0.254501	Mean dependent var	0.000338
Adjusted R-squared	0.249318	S.D. dependent var	0.008875
S.E. of regression	0.007690	Akaike info criterion	-6.889908
Sum squared resid	0.051028	Schwarz criterion	-6.851541
Log-likelihood	3004.110	Hannan-Quinn criter.	-6.875228
F-statistic	49.10228	Durbin-Watson stat	2.146134
Prob(F-statistic)	0.000000		

The results of the above regression can be concluded that both return index mature market does not affect the return index of the emerging market. However, partially FTSE, HANGSENG, STI, and KOSPI positively affect to the SET. Further, the data would be tested using the test of heteroskedasticit test: breach pagan godfre. The test results can be seen as follows:

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.636463	Prob. F(6,863)	0.7011
Obs*R-squared	3.832794	Prob. Chi-Square(6)	0.6993
Scaled explained SS	11.46290	Prob. Chi-Square(6)	0.0751

The probability value was 0.6993 or greater than 0.05, so it can be concluded that data did not contain problems heteroskedasticity. It was concluded that the exact model was a regression.

4.3.4 NYA, NASDAQ, FTSE, HANGSENG, SSEC, STI, KOSPI against TSEC

Analysis results of the causality granger showed that KOSPI and TSEC have a simultaneous relationship, then the data would be tested using VAR. NYA, NASDAQ, TFSE, SSEC, STI, HANGSENG would be tested using the regression model. Regression test results can be seen as follows:

Dependent Variable: TSEC
Method: Least Squares
Date: 08/02/19   Time: 09:28
Sample: 1 870
Included observations: 870

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.27E-05	0.000234	0.054197	0.9568
NYA	0.029506	0.032395	0.910806	0.3627
NASDAQ	0.168801	0.022331	7.559020	0.0000
FTSE	0.169464	0.031292	5.415526	0.0000
HANGSENG	0.335148	0.027147	12.34585	0.0000
SSEC	-0.028502	0.015999	-1.781542	0.0752
STI	0.081432	0.031070	2.620929	0.0089

R-squared	0.497959	Mean dependent var	0.000181
Adjusted R-squared	0.494468	S.D. dependent var	0.009679
S.E. of regression	0.006882	Akaike info criterion	-7.111776
Sum squared resid	0.040874	Schwarz criterion	-7.073408
Log-likelihood	3100.622	Hannan-Quinn criter.	-7.097095
F-statistic	142.6637	Durbin-Watson stat	2.164091
Prob(F-statistic)	0.000000		

Regression results indicate that jointly return mature markets do not affect the return emerging market. But partially NASDAQ, FTSE, HANGSENG, STI significantly positive effect on TSEC. The results of the analysis also showed that the data had been autocorrelation because the value of DW 2.164091 was greater than 4dl, which was 2.132394.

Heteroskedasticity Test: White

F-statistic	18.86131	Prob. F(27,842)	0.0000
Obs*R-squared	327.8819	Prob. Chi-Square(27)	0.0000
Scaled explained SS	686.2510	Prob. Chi-Square(27)	0.0000

The test results of the heteroscedasticity test: breusch pagan godfre. It appeared that data had a heteroscedasticity problem. It was intended that the value of obs*R-squares Probability was smaller than 0.05. Therefore the data would be tested using ARCH/GARCH.

ARCH/GARCH analysis would be done with the principle of trial and error. This is because data should be tested using many ARCH/GARCH models to determine the best model. Based on the results of trial and error was known that there was no simultaneous influence between the return index mature market to the return index emerging market. But partially NASDAQ, FTSE, and HANGSENG were significantly positive against TSEC. It can be seen as follows:

Dependent Variable: TSEC
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 08/02/19 Time: 09:40
Sample: 1 870
Included observations: 870
Convergence achieved after 25 iterations
Bollerslev-Wooldridge robust standard errors & covariance
Presample variance: backcast (parameter = 0.7)
GARCH = C(9) + C(10)*RESID(-1)^2 + C(11)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.101095	0.156149	0.647428	0.5174
C	-0.000565	0.000975	-0.579237	0.5624
NYA	0.013580	0.052494	0.258700	0.7959
NASDAQ	0.166521	0.026651	6.248133	0.0000
FTSE	0.154400	0.037784	4.086350	0.0000
HANGSENG	0.338273	0.031439	10.75978	0.0000
SSEC	-0.009648	0.020967	-0.460155	0.6454
STI	0.070778	0.044035	1.607335	0.1080

	Variance Equation			
C	3.79E-06	1.33E-06	2.848742	0.0044
RESID(-1)^2	0.133114	0.046114	2.886623	0.0039
GARCH(-1)	0.792194	0.056478	14.02665	0.0000

R-squared	0.496811	Mean dependent var	0.000181
Adjusted R-squared	0.492725	S.D. dependent var	0.009679
S.E. of regression	0.006894	Akaike info criterion	-7.190470
Sum squared resid	0.040968	Schwarz criterion	-7.130179
Log-likelihood	3138.855	Hannan-Quinn criter.	-7.167401
Durbin-Watson stat	2.154210		

4.3.5 NYA, NASDAQ, FTSE, HANGSENG, SSEC, STI, KOSPI against SENSEX

The results of the causality granger test showed that there is no reciprocal link between the return market variables on the SENSEX. Therefore the first stage would be carried out regression tests. The regression test results are as follows:

Dependent Variable: SENSEX
Method: Least Squares
Date: 08/02/19 Time: 09:51
Sample: 1 870
Included observations: 870

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000586	0.000278	2.103643	0.0357
NYA	0.095234	0.038791	2.455039	0.0143
NASDAQ	0.078287	0.026868	2.913767	0.0037
FTSE	0.157247	0.037304	4.215235	0.0000
HANGSENG	0.195162	0.035775	5.455225	0.0000
SSEC	-0.053183	0.019214	-2.767852	0.0058
STI	0.032565	0.037034	0.879345	0.3795
KOSPI	0.167667	0.040204	4.170393	0.0000

R-squared	0.310601	Mean dependent var	0.000688
Adjusted R-squared	0.305003	S.D. dependent var	0.009834
S.E. of regression	0.008198	Akaike info criterion	-6.760706
Sum squared resid	0.057932	Schwarz criterion	-6.716858
Log-likelihood	2948.907	Hannan-Quinn criter.	-6.743929
F-statistic	55.48071	Durbin-Watson stat	2.014021
Prob(F-statistic)	0.000000		

Test results of heteroscedasticity test: breusch pagan godfre could be seen that the data have heteroscedasticity problem because obs*R-squares probability 0.0155 was smaller than 0.05. Further, data would be tested using ARCH/GARCH.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.499172	Prob. F(7,862)	0.0152
Obs*R-squared	17.30535	Prob. Chi-Square(7)	0.0155
Scaled explained SS	39.52839	Prob. Chi-Square(7)	0.0000

ARCH/GARCH analysis results can be seen as follows:

Dependent Variable: SENSEX
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 08/02/19   Time: 09:58
Sample: 1 870
Included observations: 870
Convergence achieved after 29 iterations
Bollerslev-Wooldridge robust standard errors & covariance
Presample variance: backcast (parameter = 0.7)
GARCH = C(10) + C(11)*RESID(-1)^2 +
C(12)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.116339	0.292554	0.397666	0.6909
C	-0.000249	0.002309	-0.107796	0.9142
NYA	0.107584	0.047788	2.251302	0.0244
NASDAQ	0.086600	0.042781	2.024259	0.0429
FTSE	0.154962	0.045433	3.410787	0.0006
HANGSENG	0.203045	0.037782	5.374085	0.0000
SSEC	-0.067711	0.027824	-2.433544	0.0150
STI	0.007846	0.065144	0.120437	0.9041
KOSPI	0.176170	0.045295	3.889381	0.0001

Variance Equation				
C	3.57E-06	2.63E-06	1.353285	0.1760
RESID(-1)^2	0.037982	0.020765	1.829186	0.0674
GARCH(-1)	0.909533	0.050917	17.86313	0.0000

R-squared	0.309544	Mean dependent var	0.000688
Adjusted R-squared	0.303129	S.D. dependent var	0.009834
S.E. of regression	0.008209	Akaike info criterion	-6.777017
Sum squared resid	0.058021	Schwarz criterion	-6.711245
Log-likelihood	2960.002	Hannan-Quinn criter.	-6.751851
Durbin-Watson stat	2.014881		

The results of the analysis showed that simultaneously return the mature index market does not affect the return index emerging market represented by SENSEX. The data do not have autocorrelation problems because the value of DW 2.014881 was between DU 1.915896 and 4-DU 2.084104.

4.4 Discussion

The effect of return index market mature overall proved do not affect the return index market of the emerging markets simultaneously. But after some analysis, it can be known that the countries in the same area have a reciprocal relationship. Although the country has different market characteristics and forms. The examples are HANGSENG, SSEC, KOSPI, STI, TSEC, SET, which are located within the Asian region, have a reciprocal relationship.   In addition, reciprocal relations also occur among the return index of mature markets such as FTSE, NYA NASDAQ, SSEC, HANGSENG, and KOSPI. Reciprocal relations also occur between the return index emerging market like SET, and TSEC. The results of this analysis differ from the results, which are stated by Adisetiawan and Ahmadi in 2018, who stated that the Thai capital market has a reciprocal relationship with the Indonesian capital market. It is an overview that an incident that occurs in the mature market capital market does not directly affect emerging capital markets. This is because emerging economies can take this opportunity to convince investors to invest their funds in developing countries. Of course, it is accompanied by macroeconomic policies that are able to provide a sense of security for investors. Developing countries can cooperate with domestic companies to increase economic growth by increasing exports. Increased exports will certainly increase the profitability level of the company and state. Profitability, which increases, will certainly appeal to investor attention and also increase investor confidence.

5 CONCLUSION

This analysis has been concluded that there is no effect on the mature market return index on the emerging market return index. But there is a reciprocal relationship between the return index in the mature market. Likewise, in emerging markets, there is a reciprocal relationship. In addition, the area factor also has a big influence on the reciprocal relationship between the index in both the mature market and the emerging market.

6 SUGGESTION

Further research can perform the same analysis with shorter time periods. Subsequent studies can also

analyze the emerging market's influence on mature markets. This is because, generally, crisis and economic problems begin in the country that is in the emerging market.

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