Jurnal Riset Manajemen dan Bisnis (JRMB) Vol 5, No. 1 (November - Februari 2020) akan dionline kan secara berkala melalui metode online first. Mulai Edisi ini, JRMB sudah berstatus Peringkat 3 (SINTA 3) dan Tim Redaksi melakukan perubahan Layout artikel terutama di bagian cover dan lembar terakhir artikel dengan menambahkan informasi mengenai sumber biaya dan pernyataan conflict of interest.

Published: 2019-11-25

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Jurnal Riset Manajemen dan Bisnis (JRMB) Fakultas Ekonomi UNIAT

JRMB: Jurnal Riset Manajemen dan Bisnis. The academic journal published by the Economic Faculty of Attahiriyah Islamic University. The journal will focus on providing quality research in the areas of Business Management. The goal of the journal is to cover topics that are paramount in HR management, marketing and finance. Accordingly, papers that focus on emerging and interdisciplinary topics are encouraged. The Journal is published three times a year in February, June, and October. The aim of the journal is to disseminate the business management researches done by researchers.

Accredited by the Republic Indonesia Ministry of Research, Technology and Higher Education. Keputusan Direktur Jenderal Penguatan dan Pengembangan Kementrian Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia NO. 30/E/KPT/2019, 11 November 2019

Summary Information

- Journal Title: **Jurnal Riset Manajemen dan Bisnis (JRMB)**
- Publisher: **Faculty of Economy, Universitas Islam Attahiriyah**
- Publication Frequency: **3 issues a year (February, June, and October)**
- P-ISSN **2527-7502**
- E-ISSN **2581-2165**
- DOI Prefix: **10.36226**
- Accredited: **SINTA 3**
- Indexed By: **Google**, **SINTA**, **GARUDA**, **NELITI**, etc
- OAI Address: **Link**
- Visitor Statistics: **Stat Counter**

Indexed By

Jurnal Riset Manajemen dan Bisnis (JRMB) Vol 5, No. 1 (November - Februari 2020) akan dionline kan secara berkala melalui metode online first. Mulai Edisi ini, JRMB sudah berstatus Peringkat 3 (SINTA 3) dan Tim Redaksi melakukan perubahan Layout artikel terutama di bagian cover dan lembar terakhir artikel dengan menambahkan informasi mengenai sumber biaya dan pernyataan conflict of interest.

Published: 2019-11-25

Articles

Jurnal RisetManajemen dan Bisnis (JRMB) Fakultas Ekonomi UNIAT
Vol. 5, No 1, November - February 2020: 1 - 12
P-ISSN 2527–7502 E-ISSN 2581-2165

HOW ASEAN ECONOMIC COMMUNITY (AEC) PROGRESS FROM EQUITY MARKET CORRELATION

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Article Information

Category: Business and finance, Research Paper

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Reviewing editor:
Hendryadi, Management, STEI Indonesia, Jakarta, Indonesia

Received 27 Sep 2019
Accepted 25 Oct 2019
Accepted author version posted online: 12 Dec 2019

Published by Economics Faculty of Attahiriyah Islamic University

ABSTRACT

Purpose-This research aims to analyze the dynamic correlation by using stock prices daily data of 6 ASEAN equity markets during the period of 2007 until 2017 and then try to analysis the interdependence between equity markets.

Design/methodology/approach-Univariate and Multivariate model AR (1), GARCH (1,1), and Dynamic Conditional Correlation (DCC).

Findings- Empirical research using a Dynamic Conditional Correlation shows that there is a strong correlation in the countries of Indonesia, Malaysia, and Singapore; While correlation is still weak for Vietnam. The study results also shows from AR (1) and GARCH (1,1) model that the country of Indonesia, Malaysia, the Philippines and Viet Nam have return period t equations is influenced significantly by return lag period before. It can be seen that all the countries of ASEAN 6 have variance period t equations is influenced significantly by the variance to previous period lag and lag error previous period lag. This is consistent with the time-varrying volatility which indicates the persistence of very high volatility of stock return.

Implications-The result shows that the interdependence between ASEAN 6 stock market seems still in high volatility, and progress of correlation between stock market did not have any significant leap as expected from the ASEAN Economic Community.

Keywords: ASEAN Economic Community, Dynamic Correlation, Equity Market

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To link this article
http://jrmb.ejournal-feuniat.net/index.php/JRMB/article/view/326

HOW ASEAN ECONOMIC COMMUNITY (AEC) PROGRESS FROM EQUITY MARKET CORRELATION

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ABSTRAK

Tujuan– Penelitian ini bertujuan untuk menganalisa korelasi dinamis dengan menggunakan harga saham data harian dari 6 pasar ekuitas ASEAN selama periode 2007 hingga 2017 dan kemudian mencoba untuk menganalisa saling ketergantungan antar pasar ekuitas.

Metode– Model *Univariate* dan *Multivariate*AR (1), GARCH (1,1), dan *Dynamic Conditional Correlation* (DCC).

Temuan– Penelitian empirik yang menggunakan korelasi dinamis menunjukkan bahwa ada korelasi yang kuat di antara negara Indonesia, Malaysia, dan Singapura; Sementara korelasi masih lemah untuk negara Vietnam. Hasil studi juga menunjukkan dari AR (1) dan GARCH (1, 1) model bahwa negara Indonesia, Malaysia, Filipina dan Vietnam memiliki persamaan *return*t yang dipengaruhi secara signifikan oleh *return*periode lag sebelumnya. Terlihat bahwa semua negara ASEAN 6 memiliki persamaan periode *varians* t yang dipengaruhi secara signifikan oleh lag *varians* periode sebelumnya dan *lag error* periode sebelumnya. Hal ini sejalan dengan *time varying volatility* yang mengindikasikan adanya volatilitas yang sangat tinggi dari *return* saham.

Implikasi / keterbatasan– Hasil penelitian menunjukkan bahwa adanya saling ketergantungan antara pasar ekuitas ASEAN 6 yang sepertinya masih dalam tingkat volatilitas tinggi, dan perkembangan tingkat korelasi antara pasar saham tidak memiliki lompatan signifikan seperti yang diharapkan dari masyarakat ekonomi ASEAN.

Kata Kunci: Masyarakat Ekonomi *ASEAN,* Korelasi Dinamis, Pasar Ekuitas

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1. Introduction

The tendency of economic cooperation between countries these days is in regional economic groups, so that in the conduct of international portfolio investment strategy strongly depends on the level of market integration, while there is mainly regional market. The theory of Finance has predicted that there will be a source of potential acceptance of diversified stock portfolio if the return from investing in the stock market of each country is not perfectly correlated, and if it has a correlation structure that was stable enough.

Standard economic theory also said when a group of countries more integrated financially, return dispersion of assets between countries will be getting smaller, cross border flows will be increased and the bias of investment origin will become dwarfed. Financial integration offers advantages in form of dividing existing risks and a higher financial stability (Borensztein & Loungani, 2011).

ASEAN Economic Community (AEC) is a cooperation of ASEAN countries which started in 2007, with ASEAN member countries of Indonesia, Malaysia, Singapore, Brunei Darussalam, Cambodia, the Philippines, Thailand, Laos, Myanmar, and Viet Nam. This is a realization of the ultimate goal of economic integration that has been set in 2020 vision, which is based on the common interest of ASEAN countries for the wider and deeper economic integration through

new and existing initiatives with a clear deadline (Association of Southeast Asian Nation, 2008).

Based on the trade percentage between ASEAN countries in years 1990 – 2011 in general there is an increase (Chia, 2013). In the year 2015 is also visible the development of ASEAN economic cooperation that was the inflated of number of ASEAN trade nearly 1 trillion dollars, ASEAN has become the world's investment objectives with a very fast growth (Association of Souteast Asian Nation, 2015). The year 2015 is one of important milestone in the agenda of the AEC, ASEAN GDP has increased almost 2 times by the year 2014, with a population of 622 million inhabitants, with the third world largest economy in Asia and the seven biggest economy worldwide, and also with 50% of the population who become potential workforce in the future (Association of Souteast Asian Nation, 2015).

Based on earlier research, the correlation between country are increasing, where the correlation of equity markets in Asian countries seems are more responsive to regional rather than with other countries beyond its regional (Yu, Fung & Tam, 2010).

The correlation of the stock price return approach has an advantage in terms of simplicity, accountability, and no subjectof the model's fault or data limitation. Unlike other market indicators, stock prices also have an advantage in terms of the long history of inter-market trading that has been carried out and recorded so that the data is readily available on every open market around the world.

Financial integration demonstrates comovements of increasing prices in a regional and usually followed by an increase in the number of sales of financial assets within the region and held by regional participants (ADB, 2008). Inter-country integration has three interconnected pillars: the trade pillar, the foreign direct investment (FDI) pillar, and the last cooperation on political, social, and technical issues. The interactions of these three pillars help in creating a more stable environment. But trade surge in recent decades has made the instability between the three pillars and brings new challenges (ADB, 2012).

The objective of this research was to get a viewpoint of ASEAN Economic Community progress since 2007 and investigate about financial integration of ASEAN 6 equity market using the dynamic correlation between return of each equity market bilaterally. The ARCH/GARCH Model is one of the common analytical techniques used in various financial research analyses for analyzing regional and global integration. One of the development models of the ARCH/GARCH model is the DCC model used to calculate dynamic correlation based on time.

This study will use dynamic conditional correlation (DCC) models to analyze the level of financial integration of equity markets among several countries. This model is one of the models that is quite popular because it has the advantage such asKuper&Lestano (2007) had used this model and find out about the value of conditional correlation matrix that is always positive at any point in time. Furthermore, the number of parameters that grow linearly, has making the model is relatively more parsimoni. Savva (2009) also had analysed the price of spillover displacement and volatility in the American and European stock markets, saying that the DCC model became the best tool in capturing the relationships between existing markets. Syllignakis& Kouretas (2011) Explains the fact that we can obtain a wise coefficients correlation of the stock index's sample return and study behavior during the studied period, such as periods with financial shocks. Huang et al (2012) also uses the DCC model to measure the inter-bank correlation explaining that pairwise correlation is assuming the homogenity of the data, but if using the data heterogenity assumption then the DCC approach is more appropriate to use. Min, McDonalds & Shin (2016) use DCC model for 6 OECD countries equity market and the result are inidicating a positive correlation in several countries, but also negative correlation in some countries.

2. Literature review

Financial integration has strong implications on financial stability. Financial integration help countries to improve their capacity to absorb pressure and boost growth. But on the other

hand, the intensity of the financial relationships in a world with increasing capital mobility can bridge the contagion of risk between the financial boundaries. (Yu, et al, 2010).

The price of stock indexes can reflect the perception of investors about the profitability of investment in a country's economy in the future, so that the return of stock indexes can serve as an indicator that is quite effective for measuring the risk of a country's economy. Then price of the stock indexes approach as the market-based value to measure the level of integration between countries has became one good alternative.

A common approach has been used to test integration in equity markets is by calculating the pairwise correlation between stock index of some countries and see if the correlation has increased over time (ADB, 2008). Some studies have used the correlation to find out the level of financial integration between countries such as Chen, Firth & Rui (2002) did research about the relationship between stock markets in Latin America that uses simple correlation matrix as one of the tools of analysis. Yu et al (2010) use several methods in analyzing the integration of equity markets between countries where one of them using a Dynamic Conditional Correlation model (DCC).

Economics science have explained that contagion refers to the spread of crises from one country to another. This deployment will provide effects on interest rates, asset prices, currency exchange rates, capital flow, and the probability of crisis. Definition of contagion according to some economic experts is referring to the displacement of jolts from one market to another market. Other experts said the contagion appears if there is a significant improvement in relations between the international markets which could not be explained by fundamental economic conditions of a country. If contagion associated with fundamental economic relations between some countries occurred in the period of normal (non-crisis period) then usually called interdependence(Princeton Press - Liang & Willet, 2009). Forbes &Rigobon (2002) have defined contagion as a significant improvement in relations between the market after the shock in a country. While interdependence has defined as the level of a high correlation between increasing market continuously appearing on any condition. This definition avoids the need for direct measurement and differentiate between the different propagation mechanisms.

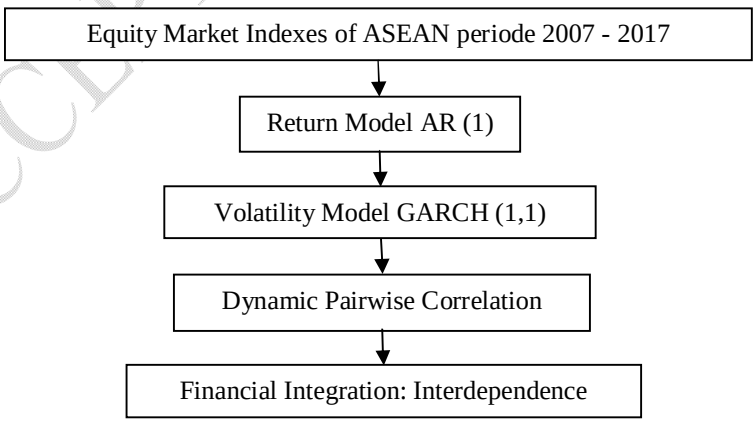

Figure 1. Research Framework

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3. Methods

The object of the research is consisting of 6 ASEAN countries that are include in ASEAN regional markets. The scope of the study is limited to the period of data of 3 January 2007 until 5 April 2017, so the time period of observation is more than 10 years. The starting time period of the study was where AEC first agreement until approximately 1 year after the first AEC milestone has passed.

The data used in this study using daily data (time series) from Reuters which is a high frequency daily index price for equity markets in each countries in order to capture a better effect of movement of capital. If the data is not available due to national holidays or other reasons, then the price will be assumed to be the same price as the previous day. This research uses stock index in American Dollar currency so the pricing on the equity markets is the actual pricing of the market.

Table 1. Equity Market Stock Index ASEAN 6 Countries

IndeksSaham Pasar Ekuitas	Negara ASEAN	No
JKSE	Indonesia	1
KLSE	Malaysia	2
PSI	Philipina	3
STI	Singapura	4
SETI	Thailand	5
VNI	Vietnam	6

Daily index price data at time t (Yt) is used to calculate the log-normal returns (rt) which is defined as follows:

$r_t \equiv \ln(y_t) - \ln(y_{t-1})$

Log return is used to adjust the return data on thin trading that is commonly occur. The data processed by using statistics application program such as Eviews 7.0 and Oxmetrics.

Equity Market Index Return Movements

Univariate model of autoregressive(AR) from returnseriesused in this study is following conventional approaches such as on research by Chiang et al (2007) that is AR(1) to establish a model for estimation of mean process is as follows:

$$r_{it} = \alpha_0 + \phi r_{it-1} + u_{it}$$

where: r_{it} is the return i on day t

r_{it-1} is the lag return i on day t

u_{it} is the error return i on day t with $u_t \square I_{t-1} \sim N(0. H_t)$

with I_{t-1} is information available on the day t-1,

The mean multiplied by 240 to get value per year.

Equity Market Index Volatility Movements

Univariate Model of generalised autoregressive conditional heterocedasticity(GARCH) from returnseriesused in this study using a model that has been widely used in research such as Chiang et al (2007) that is GARCH(1,1) describing the conditionals variance equation as follows:

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta\sigma_{t-1}^2$$

Where: σ_t^2 is the conditionals variance on the day t

u_{t-1}^2 is the lag square error

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σ_{t-1}^2 is the lag conditional variance
Where for *unconditional variance* with the constant value at the time of $\alpha_1 + \beta < 1$ is

$$\text{var}(u_t) = \frac{\alpha_0}{1-(\alpha_1+\beta)}$$

Where: var(u_t) is unconditional variance
If $\alpha_1 + \beta \geq 1$ then unconditional variance can not be estimate and is call with a non stationarity in ¨ variance. ¨
If $\alpha_1 + \beta \sim 1$ then volatility shows high persistence.

Equity Market Index Correlation

Dynamic conditional correlation model(DCC) from Engle (2002) It is one of the non linear combination model which is the development model of univariate ARCH/GARCH. The model has the versatility of univariate GARCH however does not have the complexity of a conventional multivariate GARCH.The grouping level of correlation use is very high correlation (> 0.6) and correlation is high (0.5 -0,6), whereas the opposite correlation is low (0.4-0.5) and very low (< 0.4) (Hawkesby, Marsh, & Stevens; 2007).

The advantages of the model DCC according to Chiang et al (2007) is the model estimate coefficient correlation of residue standards so as to take into account the heteroskedastis directly, the model could put other explanatory variables in the equation mean to measure the common factor, and the model can be used to analyze multiple asset returns. Model DCC describing dynamic conditionals correlation equation as follows:

$$Ht = Dt\ Rt\ Dt$$

Where: Ht is conditional variance matrixN x N
Dt is diagonal ($h_1^{1t1/2} \ldots h_N^{t1/2}$)
Rt is conditional correlation matrixN x N (ρ_{ijt}), with $\rho_{iit} = 1$
$h_{iit}^{1/2}$ is standard deviations from univariate GARCH(1,1)
$h_{ijt} = \rho_{ijt} (h_{iit} h_{jjt})^{1/2}$ where $\forall_{i \neq j}$
where H_t will always be positive following the positive value of the value R_t and every h_{iit}.
In making the model R_t assumption Q_t is the covariance matrix of the u_t that it has positive value following the model of GARCH(1,1).
$q_{ijt} = \rho_{ij} + \theta_1 (u_{it-1} u_{jt-1} - \rho_{ij}) + \theta_2 (q_{ijt-1} - \rho_{ij})$
where: ρ_{ij} is unconditional correlation between u_{it} and u_{jt} with $q_{ijt} \equiv \rho_{ij}$

$$\rho_{i,j,t} = \frac{q_{i,j,t}}{\sqrt{q_{i,i,t} q_{j,j,t}}}$$

Based on value from q_{iit} not equal with 1, it has correlation matrix as follows
$R_t = (\text{diagonal } Q_t)^{-1/2} Q_t (\text{diagonal } Q_t)^{-1/2}$
with
$Q_t = (1 - \theta_1 - \theta_2) Q + \theta_1 u_{t-1} u'_{t-1} + \theta_2 Q_{t-1}$
where: $u_t = (u_{1t} \ldots u_{Nt})'$ with $u_{it} = \varepsilon_{it} / h_{iit}^{1/2}$
Q is unconditional covariance matrix from u_t' N x N
That is asymmetric and positive
θ_1 and θ_2 is a positive parameter with $\theta_1 + \theta_2 < 1$

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R_t is correlation matrix from covariance matrix Qt and will always be positive Correlation coefficients for bivariate cases such as:

$$\frac{(1-\theta_1-\theta_2)q_{12}+\theta_1 u_{1,t-1}u_{2,t-1}+\theta_2 q_{12,t-1}}{\sqrt{((1-\theta_1-\theta_2)q_{11}+\theta_1 u_{1,t-1}^2+\theta_2 q_{11,t-1})\left((1-\theta_1-\theta_2)q_{22}+\theta_1 u_{2,t-1}^2+\theta_{2q22,t-1}\right)}}$$

Estimation from DCC model use a specific statistic such as:
$\rho_{12t} = r_t \square I_{t-1} \sim N(0.\ H_t)$
Where I_{t-1} is available information on day t-1
At least consist of $(r_{t-1}, r_{t-2}, \ldots)$ which is normally distributed.
DCC model can being estimated by using a two-level approach to maximize the log likelihood function. Where the parameters for conditionals variances (Dt) and the parameters for conditionals correlations (Rt), log likelihood can be calculated as follows:

$$l_t(\theta,\emptyset) = \left[-\frac{1}{2}\sum_{t=1}^{T}(n\ log(2\pi) + log|D_t|^2 + \varepsilon_t' D_t^{-2}\varepsilon_t)\right] + \left[-\frac{1}{2}\sum_{t=1}^{T}(log|R_t| + u_t' R_t^{-1}u_t - u_t' u_t)\right]$$

The initial part of the log likelihood function is the volatility; is the sum of the GARCH likelihoods. The log likelihood function will be maximized in the first level to the parameters Dt. Based on parameter estimation in the first level, the components of the correlation of log likelihood in the second level will be maximized to make estimation of correlation coefficients.

4. Results and Discussion

Equity Market Index Price Movements

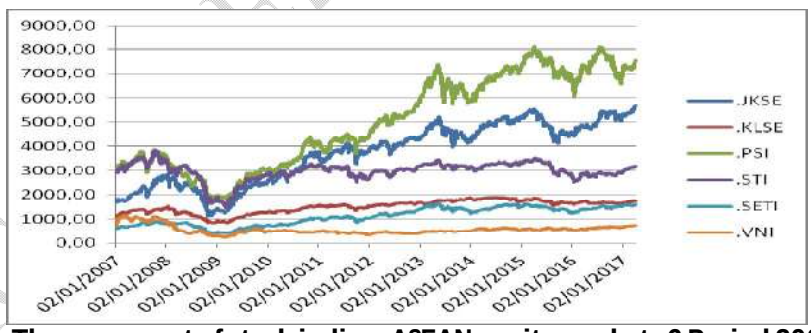

Figure 2. The movement of stock indices ASEAN equity markets 6 Period 2007-2017

The price of the stock indexes ASEAN 6 equity markets has the same movement pattern, with the price of the stock indexes equity markets of country like Philippines, Indonesia, and Singapore has increased of price movement quite significant.

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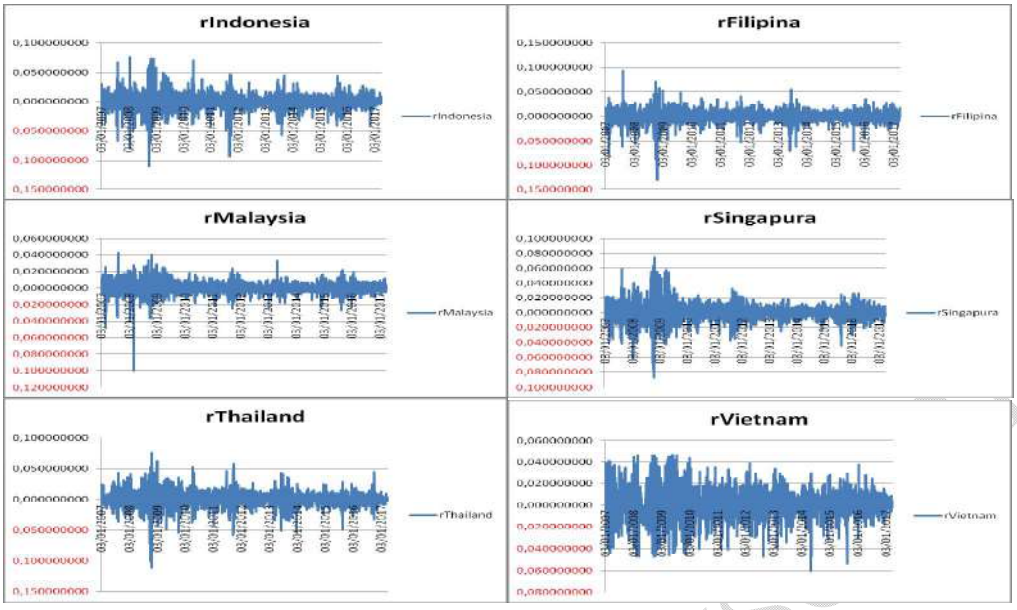

Figure 3. Equity Market Index Return ASEAN 6 Countries Period 2007-2017

The biggest return volatility occurs in between end of year 2008 and early year 2009, where this was the period of the global financial crisis. However, the stock index's daily return equity markets have showed that Viet Nam volatility is very high throughout the period of the study. Based on descriptive statistics the average highest daily return during the period of the research was Indonesia equity market index return with the value of 0.000385 and the average lowest daily return during the period of research was Viet Nam equity market index return with the value of -2.10 E-05. While the highest daily return dispersion data was return index equity markets of Viet Nam with value of 0.013986 and the lowest daily return dispersion data was a return index equity market of Malaysia with value of 0.007217. Based on the results of normality test on daily return data on ASEAN 6 countries can be seen data is not normal distributed. Stationary test by using Augmented Dickey Fuller (ADF) test has showed that data is in stationer condition and without any symptoms of autocorrelation.

Equity Market Index Return Movements

Based on estimation of AR(1) model, it can be seen that the countries of Indonesia, Malaysia, the Philippines and Viet Nam have return period t equations is influenced significantly by return lag period before. A significant positive influence on the equity market return is a result of friction of the price adjustment or partially (Chiang et al, 2007) the countries of Singapore and Thailand have an AR (1) which is not significant.

Table 2. Estimation of AR(1) Model Period 2007-2017

Rvietnam	Rthailand	Rsingapura	Rfilipina	Rmalaysia	Rindonesia	
0.000	0.000	0.000	0.000	0.000	0.000	α_0
0.955	0.180	0.915	0.207	0.300	0.141	Probability
0.227	0.025	0.029	0.101	0.101	0.095	ϕ
0.000*	0.180	0.124	0.000*	0.000*	0.000*	Probability

Information: * Significant at $\alpha = 5\%$

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Equity Market Index Volatility Movements

Based on the estimation of GARCH (1,1) model for unconditional variance equation, all the countries of ASEAN 6 have variance period t equations is influenced significantly by the variance of the lag period before and the period lag error before. This is consistent with the time-varying volatility and it is an evidence of precisely the use of GARCH specification (1.1). The values $\alpha 1 + \beta$ approaching one on each estimated model demonstrate the persistence of very high volatility of stock return.

Table 3. Estimation of GARCH(1,1) Model Period 2007-2017

Rvietnam	Rthailand	Rsingapura	Rfilipina	Rmalaysia	Rindonesia	
0.000	0.000	0.000	0.000	0.000	0.000	α_0
0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	Probability
0.130	0.098	0.078	0.103	0.113	0.098	α_1
0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	Probability
0.850	0.896	0.918	0.877	0.874	0.894	β
0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	Probability
0.980	0.994	0.996	0.980	0.987	0.992	$\alpha_1 + \beta$

Information: * Significant at $\alpha = 5\%$

Equity Market Index Correlation Using Dynamic Pair Wise Correlation

It can be seen from the table dynamic pair wise correlation, a very high correlation of equity market return exists between Indonesia, Malaysia, and Singapore. While the high correlation between equity market return between Malaysia and the Philippines. Look among the ASEAN 6 countries which has a high correlation of equity market index return with other countries are Indonesia, Malaysia, and Singapore, while having low correlations with other countries are Viet Nam.

Table 4. Dynamic Pair Wise Correlation Equity Market Stock Index Return ASEAN 6 Countries Period 2007-2017

rVIE	rPHI	rTHA	rSIN	rMAL	rIND	
0,082122	0,460571	0,485381	0,730797	0,638839	1	rIND
0,038788	0,501026	0,429957	0,75504	1		rMAL
0,100868	0,473215	0,497837	1			rSIN
-0,032112	0,274074	1				rTHA
0,203394	1					rPHI
1						rVIE

Very high correlation (>0.60)
High correlation (0.50 - 0.60)
Low correlation (0.40 - 0.50)
Very low correlation (<0.40)

5. Limitation and Future Research

This research only analyse ASEAN 6 equity market from the return, varians, and correlation between market, but it hasn't captured the long-term and shor-term relationship between market. For further research, analysis of Johansen Cointegration test and Granger Causality as

an alternative methodto see the direction of influence between the equity market index return. So, it can be analyzed more deeply about the co movement between ASEAN 6 countries equity markets. A good example can be seen in the research of Meera, Omar, & Aziz (2009) that has been done research about relationship between ASEAN equity market, but Vietnam is not included yet in this research.

6. Conclusion

Price movements between equity market index overall has a same pattern which has shown us that ASEAN countries are integrated. While volatility are still moderate for every market, but there is still Viet Nam, the youngest member that has a very high volatility. Singapore and Thailand market seems to have a minor price adjustment if we compare to other market in ASEAN 6 country. Dynamic pair wise correlation between equity market index return for ASEAN 6 countries during the period of 2007 to 2017 indicate a strong correlation in the countries of Indonesia, Malaysia, and Singapore; while correlation is still weak for Viet Nam. This showed that ASEAN Economic Community progress are still slow even though it has been initiated for over 10 years.

Theoritically financial integration between countries should give result of financial stability, but the intensity of the financial relationships in a world with increasing capital mobility can bridge the contagion of risk between the financial boundaries. If ASEAN 6 countries are not improving their system with a more integrated way, ASEAN Economic Community could be intensified risk contagion between countries.

Aknowledgement

The authors like to thanks to the Program Bantuan Seminar Luar Negeri, Ditjen Penguatan Riset dan Pengembangan, Kemenristekdikti that has supported the author financially for joining Osaka Conference on Interdisciplinary Business & Economic Research which has provided extra insight that greatly improved the manuscript, insight that we have received from participants of the conference for their comments on an earlier version of the manuscript, although any errors are our own and should not tarnish the reputations of these esteemed persons. Although the result may not inline with the expectations of all parties.The author would also like to thank STIE Indonesia Banking School for supported with time and resources that greatly assisted this research.

Funding

The authors received direct funding for this research from internal grant of STIE Indonesia Banking School.

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Ossi Ferli ST., SE., MSM. is a permanent lecturer speciality In finance and also Head of Management Program at STIE Indonesia Banking School Jakarta. She gain her bachelor degree from Ocean Engineering Program in Bandung Institut of Technology and also from Management Program in Padjadjaran University. She also gain her master degree from Financial Management Science in University of Indonesia. Research interest generally In finance including Investment and Financial Literacy. Author can be contacted at ossi.ferli@ibs.ac.id.

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Citation information
Ferli, O. (2020). HOW ASEAN ECONOMIC COMMUNITY (AEC) PROGRESS FROM EQUITY MARKET CORRELATION. A. *JurnalRisetManajemen dan Bisnis (JRMB) FakultasEkonomi UNIAT*, 5(1), 1-12. DOI: https://doi.org/10.36226/jrmb.v5i1.326

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Accepted author version posted online: 11 Dec 2019
Hendryadi (Reviewing editor)

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Lampiran 7

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : JURNAL ILMIAH*

Judul karya ilmiah(artikel) : **How Asean Economic Community (AEC) Progress From Equity Market Correlation**

Jumlah Penulis : 1 (satu)

Status Pengusul : Penulis Pertama

Identitas Jurnal Ilmiah :
a. Nama Jurnal : Jurnal Riset Manajemen dan Bisnis (JRMB)
b. Nomor ISSN : 2581 - 2165
c. Volume, nomor, bulan, tahun : Vol. 5 No. 1 (2020)
d. Penerbit : Fakultas Ekonomi UNIAT
e. DOI Artikel : 10.36226
f. Alamat web Jurnal : http://jrmb.ejournal-feuniat.net/index.php/JRMB
g. Terindeks di Google Schoolar, Garuda, Neliti, Moraref, PKP Index, Journal Seeker, One Search, Copernicus, Sinta 3**

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12 April 2021

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Lampiran 7

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
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d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)		6		5.16
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