The Economic Correlation between China and Southeast Asian Countries: derivative market and real sector analysis

Irzal, Muhamad and Verico, Kiki

Ministry of Trade of Republic of Indonesia, LPEM FEB University of Indonesia

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The Economic Correlation between China and Southeast Asian Countries:
Derivative Market and Real Sector Analysis

Muhamad Irzal[1] and Kiki Verico[2]

1. Ministry of Trade of Republic of Indonesia and 2. the Institute for Economic and Social Research (LPEM) Faculty of Economics & Business University of Indonesia (FEB UI)

Abstract
This paper attempts to analyse the economic integration of China and Southeast Asian countries. This paper adopts several methods: One, stationarity for correlation, Error Correction Model (ECM) for short-run relation and Cointegration for long-run relationships. Two, Structural Vector Autoregression (SVAR) analysis to identify the cause and impact. As stock market index follows real sector performance this paper utilizes: One, elasticity analysis of economic growth between China and these countries as a proxy for real sector economic relations between them and two, descriptive statistical analysis on real effective exchange rate as well as Current Account Balance as a proxy of external economic performance between them. In correlation analysis, this paper found that one, stationarity of each country is the difference at level; two, short-run economic relations (ECM) between China and these Southeast Asian countries and three, they have long-run economic relations. In causality, this paper found that China affects all of these Southeast Asian countries and no causality between Singapore and the Philippines. In term of real sector analysis, this paper found that one, economic growth in China significantly affects all of these countries' economic growth. Two, the external economic performance of these countries are the difference with special finding on Indonesia's current account.

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[1] Government Officer of the Ministry of Trade of Republic of Indonesia
[2] Vice Director for Research of the LPEM Faculty of Economics and Business of University of Indonesia (FEB UI) and Lecturer at the FEB UI (Corresponding Author). Email: kiverico@gmail.com. Phone: +6221-3143177

1. Introduction

1.1. Background

The future of ASEAN economic integration depends on how ASEAN utilizes her open economic integration principle towards non-member states (Verico, 2017a). ASEAN needs this to enhance her economic integration from trade to investment. She needs strong investor host countries to increase intra-investment ratio and financial integration afterward. China and Southeast Asia are having an increasing economic integration assembly in the last 15 years because of two reasons. One is trade liberalization of China at the global level since she joined the WTO in 2001. Two is limited trade liberalization between China and Southeast Asia since both negotiated the ASEAN-China FTA (ACFTA). The latter has become fully in force in 2010 by implementing zero tariffs on 6,682 tariff posts for 17 sectors including 12 sectors in manufacturing and five sectors in the agriculture, mining and maritime.

China and Southeast Asia have been implementing a free trade area by abolishing tariff barriers between them while keeping external tariff rates between China and non-ASEAN members to their trade partners. Following this agreement, economic integration between China and ASEAN has significantly increased and turned China to become a major trade partner for ASEAN countries. As for Indonesia, the increasing political economic relations with China increased after China economic liberalization and the Suharto regime ended (Fukuoka & Verico, 2015).

Study of Verico (2018) found that ASEAN needs other countries to expand her regional economic integration coverage and shift them from one phase to another in particular from free flows of trade to investment. The natural process afterward is shifting the regional economic integration from investment as the characteristic of comprehensive regional real sector integration to the financial sector as the representative of comprehensive monetary integration.

There are several types of economic liberalization in the context of economic integration from unilateral, bilateral, sub-regional, regional, and regional plus to multilateral of the

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WTO. ASEAN and China FTA are part of the regional plus frameworks which gives mutual benefits for both parties. ASEAN needs a country like China which booked high economic growth via industrialization-based development as ASEAN requires to join production networks from investment connections. ASEAN needs China in her economic integration shifting from free flows of trade to free flows of investment and production networks as she has been making with Japan and Korea. On the other side, China needs ASEAN as the big and promising consumer market products for free flows of final goods and source of raw materials and energy such as coal for free flows of inputs.

In the short run, China needs some raw materials and energy sources from Southeast Asia countries to support her massive industrialization economy and needs consumer in Southeast Asia to sell her final product. In the medium to long run, China needs Southeast Asia as a regional production base to expand her industrialization and please her consumer in Southeast Asia. In the short run, Southeast Asia enjoys benefit from the increase of consumer surplus as the cost of domestic industry lose. In the medium to long run, Southeast Asia will obtain benefit from investment (FDI) inflows at the cost of undervaluing of Rupiah if the production only aims individual domestic market. This needs a commitment for China and ASEAN to aim at least ASEAN markets before moving forward to supply global market demand.

In addition to trade liberalisation of ASEAN China FTA and its potential impacts on investment and regional production networks like Japan and South Korea in Southeast Asia, there are several channels which connect ASEAN and China such as development aid via the credit allocation from the Asian Infrastructure Investment Bank (AIIB), tourist visits, and professional workers motilities.

All of the channels on the trade of goods, investment, services, development aid, infrastructure obligation, people mobility both tourists and workers have generated impact on financial sector from the economic transaction and payment commitment. These transactions also influence the derivative markets both in China and Southeast Asia as real

sector activities lead to derivative market performances such as stock and obligation. This shows that before the shifting in regional economic integration process from free flows of trade to investment and finance, there was an economic integration in the real sector which influence financial sector in particular derivative market such as stock.

1.2. Research Question

Based on the introduction above this paper attempts to answer the following research questions:

1. Are the derivative stock market of China and Southeast Asian countries correlated?
    a. If so, how do they correlated in the long run?
    b. How do they correlated in the short run?
2. What kind of causality relations happened within the observed countries?
3. Do the real and financial sector of China and Southeast Asian countries really connected?

1.3. Objective

The objective of this paper is to measure economic integration of China and Southeast Asian countries as an indicator for economic cooperation enlargement of ASEAN towards her economic partner, China. This paper uses the derivative market of stock to assess this economic cooperation because the stock is a financial instrument that its performance is strongly related to the real sector performance. This variable represents both the real and financial sector and describes the key success factor of ASEAN economic enlargement with her economic partner including China. Economic integration in the stock market shows the potential success of economic integration shifting from free flows of trade to that of investment and finance. As ASEAN needs a big potential economic partner to optimize her regional plus frameworks, then the ASEAN China FTA with China as the recent major trading partner for ASEAN is the most appropriate context to be observed.

1.4. Specific Coverage

This paper limits its analysis on China and selected ASEAN members of Indonesia, Malaysia, Philippines, Singapore, and Thailand. These members are the founding member

states of ASEAN. There are the ASEAN Six with Brunei Darussalam in it, yet it excluded Brunei given that it focuses on the derivative market of stock. As for the time coverage, in time series analysis this paper uses daily based data from January 1st, 2005 to December 31st, 2014. In descriptive data analysis, this paper uses the latest data available for all of the observed countries

2. References Analysis
2.1. Stock Market and Real Economic Activity

There are at least two reasons why the stock market is closely related to real sector activities (Mankiw, 2007). First stock is part of household wealth, a fall in stock prices will make people poorer and thus depresses consumer spending, and the end reduces the aggregate demand. Second, a fall in stock prices might reflect bad news on technological progress and the expectation of long-run economic growth. Therefore the natural level of output—and the aggregate supply—is expected to grow more slowly than before.

Furthermore, some economists refer to the Efficient Markets Hypothesis (EMH) which explains that the market price of a company's stock is completely rational as it represents the company performance and value. This described the most represented information about the company's business prospects. This hypothesis based on two assumptions:

a) Each listed company in major stock exchange is closely followed by professional portfolio managers those who run mutual funds. On the daily basis these managers closely monitor news, stories and various information sources for finding and determining the company's value. Their responsibility is to buy stock whenever the price falls below its value and to sell it when the price rises above its value.

b) The price of stock lies in the equilibrium of supply and demand of the stock. At the market price, the number of shares which being offered for sale is exactly equal to the number of shares that people is willing to buy. Therefore at the market price, the number of people who thought that the stock is overvalued is exactly similar to the number of people who

thought the price is undervalued. As led-valued by the professional people therefore in the market, usually the price of stock has been fairly valued.

c) EMH theory has also stated that .the stock market is informationally efficient since it reflected all available information on the value of the asset. Stock's prices has changed whenever the information changed. If good news happens to the company then its potential public value increase. On the opposite if the expectation of the company performance has been deteriorated, the value and price of stock falls. Yet on average, the market price is naturally rational depends on the expectation on the company given all of its available information. On the other side, some believes that, the evidence for the efficient markets hypothesis is uneasy if the stock market was operated in buying at undervalued and selling at overvalued.

2.2. Stock Market Interdependency

In general, three categories explain why it is co-movement within different stock markets (Pretorius, 2002). First is the so-called contagion effect. This is the part of stock market co-movement that cannot be explained by economic per se. The second category is economic integration. It defines that the more integrated two countries are, the more interdependent or integrated their stock markets would be. Economic integration covers not only trade relationships but also co-movement on the economic indicators which affect stock market values such as the interest and inflation rate. The third category includes the stock market characteristics which affect the extent of stock market interdependent, namely industrial similarity, stock market volatility, and market size.

2.2.1. Contagion Effect

Contagion effect is defined as a systematic effect of speculation activities in the country either on the exchange rate, stock or other money market instruments which generates a similar effect on other financial markets and other countries. The financial crisis might spread from one country to another since the impacts affect the volatility of the exchange rate and stock prices simultaneously. Speculation affects the aggregate demand, significantly influences the

commodity prices, the exchange rate within countries, and trade relations. Contagion is unexpected and unmeasurable, but its impact can be estimated using the proxy of the residual produced by the co-movement which was not explained in a normal situation. There are two general categories in the literature about this definition. One is based on informational factors based on institutional factors. The category of informational factors is based on the so-named the comparison between the stock market and the Keynesian 'beauty contest'.

In the Keynesian beauty contest, each voter chooses the way he thinks on what would be the majority decisions resulted by the major voters would accept. Similarly, investors would sell their investment on a specific asset only if they believe that other investors would sell their investment on that asset too. Rationally people will hold the assets which most people kept and will sell the assets that they thought most people would sell too. The decision to buy or sell does not depend on how he/she thought about the asset but how he/she thought about what people would like to buy or sell. This explains why in the financial market the dynamic movement follows a so-called herd behavior based on the 'animal spirit.' This also explains why the emerging market securities have a sufficient number of investors who believe that other investors have become disenchanted with the 'emerging markets' asset. The herd behavior among investors led a general declining and up swinging in the emerging markets. If this widespread effect did not cause by real sector fundamental basis, then it might be caused by the so-called 'contagion effect.'

2.2.2. Economic Integration

There are two general classifications in economic variables which affect the level of stock market interdependent. One, two economies which dependence on each other influence their stock markets which made they are interdependent. In other words, the stronger the bilateral trade between the two countries, the higher the degree of co-movement between their stock markets. Second, according to the cash flow model, several macroeconomic variables, e.g., interest rates and inflation affect stock market performance. As these variables influence stock market returns, the correlation between them will affect the correlation between their stock markets. As these macroeconomic variables of the two countries are the same, then

their stock market performance would be similar. Accordingly, over time, macroeconomic variables of the two countries would be convergent (divergent) then their stock market performances would converge (diverge) as well.

2.2.3. Stock Market Characteristic

In addition to the economic variables discussed above, some other variables have also been discussed in the literature. They are potential to influence the size of stock market correlation. These factors are stock market extent, stock market volatility and industrial similarity. **Market Size** shows the stages of development and the level of information and transaction costs are associated to trade in capital markets. The greater the disparity in the market size between the two capital markets the lower the co-movement between the two markets, vice versa. **Volatility** determines the rate of return of each capital market assets. Two capital markets that have more or less the similar pattern of volatility would give the equal rate of return. Therefore, if the volatility of a stock market rose against other capital markets, the returns are also going up accordingly. **Industrial similarity** dominances two capital markets have been resulted from the co-movement of both, as long as it supports their capital markets performance.

2.3. Financial Integration

There is, in general, no general definition of financial integration. Financial openness, free movement of capital and integration of financial services are part of a broad range of definition which frequently cited in the literature. Recently, Yu and Fang in 2010 explained about three methods in measuring the degree of financial integration:

- Price Based Measure

Price based measurement of financial integration is an equal rates of returns of comparable assets across different economies. Most studies rely on interest rate parity condition, including covered interest rate parity (CIP), uncovered interest rate parity (UIP) and real interest rate parity (RIP), to test for the degree of financial market integration

- Quantity Based Measure

    The traditional quantity-based measurement adopts the saving investment correlation as a proxy to test the capital mobility. The idea of this test comes from the world's high capital mobility whereas a country's saving rate is influenced by the world. If the capital market is open then the real interest rate would be equal across economies while saving and investment are not necessarily correlated. Therefore, if capital mobility is low, real interest rate is not equal and the saving and investment ratio is highly correlated among countries. The test is based on the following cross-country regression equation: $(I/Y)_i = \alpha + \beta(S/Y)_i$

    Whereas I is investments in country i, Y is the gross domestic product of country i, and S is savings in country i. hypothetically a very small b coefficient indicates a perfect capital mobility. On the other hand, in a closed economy with a little capital mobility, the b coefficient will be high and closer to one. Feldstein and Horioka (1980) who found this model argue that, with a perfect capital mobility condition, there should be no relation between domestic savings and investment. Therefore if financial market is closely integrated then the correlation between investment and saving would be low.

- Regulatory Based Measure

    Some believe that capital control is the most representative variable for the integration determinant level. Therefore many researchers preferred to use stock market co-movement in applying regulatory-based measurement. Stock market co-movement are generally utilized to measure the degree of capital markets integration both at the regional and global level in analyzing the rate of return of the market. There are some methods which have been utilized to investigate stock market co-movement from the traditional way by seeking inter market correlation to the modern way by developed cointegration model. The latter is commonly used to analyze the long run equilibrium while the Error Correction Model (ECM) has been used to analyze the short run equilibrium.

3. Qualitative Analysis: Descriptive Data and Source of Data

This paper used daily stock market index data base in six countries of ACFTA members: China, Indonesia, Malaysia, Thailand, Singapore and Philippines. The data is published by the *Morgan Stanley Capital International* (MSCI). The similar counting method of stock index for all countries is the major reason why this paper adopted the MSCI stock index. The period of observation have been divided into two periods: January 3rd ,2005 to December 31th 2009 as pre-ACFTA implementation phase and from January 1st ,2010 to December 31th 2014 as post ACFTA implemented phase. Separation date between before and after of the ACFTA is necessary to obtain a clear figure on the impact of the ACFTA to the stock market co movement within these observed countries. The ACFTA is believed to have significant impact on real sector relations between China and ASEAN members and given stock market is the representative variable for real and financial sector therefore ACFTA role is necessary in this model development.

4. Quantitative Analysis: Time Series Analysis

4.1. Cointegration Test

4.1.1. Stationarity Test

This test was developed by David Dickey and Wayne Fuller and named the ADF test. It is- based on the concept of random testing in time series data whether it follows a random walk process or not. Random walk is a stochastic process that is non stationer. Stationarity condition is necessary to avoid a spurious regression. The ADF test model is formulated as follows:

$$\Delta Y_t = \beta_1 + \delta Y_{t-1}\ \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + et$$

(2)

With hypothesis that:

H0: β_1=0, Have unit root problem (non-stationer)

H1: $\beta_1 \neq 0$, No unit root problem (stationer)

The results of the t statistic estimation in the ADF methods will be compared to McKinnon critical value at 5% degree of confidence (dof). If the t-stat value is higher than McKinnon critical values of 5% dof then the null hypothesis is rejected which means there is no unit root problem or in other words the data is stationer at that particular level, vice versa.

4.1.2. Test of Cointegration Level

Due to a non-stationarity data which has been resulted from the ADF test, then the unit root test will be continued to the first difference level called the test of cointegration level. If all variables stationer at first difference level then all variables will be cointegrated at difference level of I (1)

4.1.3. Johansen Cointegration Test: Long Run Equilibrium Analysis

Johansen Cointegration is the next test after founding that all variables shown no unit root problems from the data at level of difference. In other words, if all variables are stationer at difference level, the Johansen Cointegration test is feasible to be applied to analyze the long run equilibrium. Cointegration concept is associated to the long-term correlation of which the economic system converges over time. If there is a shock happened in one economic system then there will be a reason to push the system back to its equilibrium level. Johansen Cointegration procedure is generally formulated in a model as follow:

$$\Delta X_{t-1} = \Pi_{t-1} + \sum_{i=1}^{p-1} \Pi_i \Delta X_{t-1} + et \tag{3}$$

The formula contains both the long run and short run adjustment to alteration of X_t, Π matrix ranks marked as r, determines how many linear combinations of X_t which are stationer. If $0 < r < n$, than there would be r cointegration vector. In this case, Π could be factorized as $\Pi = \alpha\beta'$, where α and β are n x r matrix. α **matrix** showed the speed of adjustment to disequilibrium and β is long-run coefficient matrix which contained cointegration vector. The null hypothesis is used for this test is $(r) = 0$ (there is no cointegration). If trace statistic is higher than critical value at 5% dof then the model will

reject the null hypothesis. This calculation generates eight (15) stock index combination of two (2) countries at each test (pairs). It brings around 6K2 = 6! / (6-2)! 2! = 15 tests.

4.2. Error Correction Mechanism: Short Run Equilibrium Analysis

ECM (Error Correction Mechanism) is required to be applied for analyzing the short-run equilibrium relations. As for the long rung equilibrium this paper applied the Johansen cointegration test .The equation of the ECM is constructed as follows:

$$\Delta MSCI_{it0} = \beta_0 + \beta_1 \Delta MSCI_{jt0} + U_{t0}$$

$$U_{t0} = \beta_0 - \Delta MSCI_{it0} + \beta_1 \Delta MSCI_{jt0} + \beta_2 (U-1_{t0}) + \varepsilon_{t0}$$

T-stat β_2 > Critical value 5%: significance

$\beta_2 < 1$: stable

As the number of the observed country is six then the running model for ECM in total will follow binomial distribution 6K2 = 6! / (6-2)! 2! = 15 equations then multiply with 2 given its two-way test methods. According to the ECM principle, if the t-stat β_2 is statistically significance then there is a difference between short and long run equilibrium which reflects a "dynamic" relation. If β_2 < 1 then the relation between short and long run is "stable".

4.3. Causality Test of Structural VAR

Structural VAR is a form of VAR (Vector Auto Regressive) which was restricted based on theoretical relations in scheme and ordering between all variables are being used in the system of VAR. SVAR model aims to meet the evolving economic theory in which transmission process is unlimited to orthogonal recursive. Then, to obtain non recursive orthogonal of error term, it requires a creation of some restrictions that can be identified as structural component in error terms. The following matrix represents the modified restriction of SVAR that has been applied in this paper:

$$\begin{pmatrix} e\ China \\ e\ Singapore \\ e\ Malaysia \\ e\ Indonesia \\ e\ Thailand \\ e\ Philippines \end{pmatrix} = \begin{pmatrix} \beta 1 & 0 & 0 & 0 & 0 & 0 \\ \beta 1 & \beta 2 & 0 & 0 & 0 & 0 \\ \beta 1 & \beta 2 & \beta 3 & 0 & 0 & 0 \\ \beta 1 & \beta 2 & \beta 3 & \beta 4 & 0 & 0 \\ \beta 1 & \beta 2 & \beta 3 & \beta 4 & \beta 5 & 0 \\ \beta 1 & \beta 2 & \beta 3 & \beta 4 & \beta 5 & \beta 6 \end{pmatrix} x \begin{pmatrix} \varepsilon\ China \\ \varepsilon\ Singapore \\ \varepsilon\ Malaysia \\ \varepsilon\ Indonesia \\ \varepsilon\ Thailand \\ \varepsilon\ Philippines \end{pmatrix}$$

Based on the above matrix it generates 21 restrictions into 6 residual equations of this SVAR model.

4.4. Granger-Causality Test

Granger-Causality Test (GCT) is measured to understand the causality of each pair of stock variable of the observed countries. This measurement to complete the analysis of correlation in stationarity, ECM and Johansen Procedure of long run cointegration. Correlation does not mean causality therefore GCT is needed. This paper calculates the Structural VAR causality and in addition to that it uses GCT as a simple model to complete these calculations.

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} A_{11}(B) & A_{12}(B) \\ A_{21}(B) & A_{22}(B) \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} u_{yt} \\ u_{xt} \end{bmatrix}$$

$$= \begin{bmatrix} \Phi_{11}(B) & \Phi_{12}(B) \\ \Phi_{21}(B) & \Phi_{22}(B) \end{bmatrix} \begin{bmatrix} u_{yt-1} \\ u_{xt-1} \end{bmatrix} + \begin{bmatrix} u_{yt} \\ u_{xt} \end{bmatrix}$$

Yt is the variable of one country and Xt is the similar variable for another country. This test shows whether Yt affects Xt and what its optimum lag is.

4.5. Economic Growth Elasticity

Economic growth elasticity is calculated to find the correlation and causality of China's economic growth to the observed Southeast Asian countries. There are two motives to calculate this, one is to see how significant the impact of China's economic growth to these countries and two is to measure how much the impact is. This paper uses simple bivariate regression model as follows:

$$Log\ (Ecgrowth(i)) = C + Log(Ecgrowth(Chn))$$

Ecgrowth (i) stands for economic growth of Southeast Asian countries (i), while *Ecgrowth(Chn)* stands for economic growth of China.

4.6. Exchange Rate, Trade Balance in Goods & Current Account Balance

Following the findings in economic growth elasticity, this paper needs to have a descriptive analysis of the real sector through the trade balance and current account balance performance about the exchange rate as the representative of financial sector variable. This paper uses Real Effective Exchange Rate (REER) as the variable for the exchange rate. The REER is calculated by dividing the GNI per capita in PPP (Purchasing Power Parity) to GNI per capita in the nominal exchange rate (Atlas Method). If the result is more than one, then the REER of the country is undervalued and the opposite. If the REER is undervalued and Trade Balance in Goods is positive, then it is matched that undervalue of the exchange rate boost the net trade balance in goods. If the Trade Balance in Goods is positive and Current Account Balance (CAB) is positive, then Trade Balance is Capable to support CAB and the opposite. If the Trade Balance in Goods is negative and CAB is positive, then there is a positive contribution from Service Account Balance (SAB). These figures are important to understanding the economic performance of net inflows of each country given its financial sector stability which represented by the REER.

5. Result
5.1. The Result of Stationarity Test

Stationarity test were separated between before and after the ACFTA. The complete result of stationarity tests of the observed country's stock market index can be found in following tables.

Table 1. Before The Implementation of ACFTA: Stationarity Test

Variable	ADF T-Stat	α 1%	α 5%	α 10%	P-Value
China	-1.36	-3.43	-2.86	-2.57	0.60
Indonesia	-1.15	-3.43	-2.86	-2.57	0.69
Malaysia	-1.15	-3.43	-2.86	-2.57	0.70
Singapore	-1.30	-3.43	-2.86	-2.57	0.63
Thailand	-1.56	-3.43	-2.86	-2.57	0.50
Philippines	-1.52	-3.43	-2.86	-2.57	0.52

Table 2. After The Implementation of ACFTA: Stationarity Test

Variable	ADF T-Stat	α 1%	α 5%	α 10%	P-Value
China	*-2.89*	-3.43	-2.86	-2.57	*0.04*
Indonesia	*-2.97*	-3.43	-2.86	-2.57	*0.03*
Malaysia	*-2.57*	-3.43	-2.86	-2.57	*0.09*
Singapore	-2.56	-3.43	-2.86	-2.57	0.10
Thailand	-2.24	-3.43	-2.86	-2.57	0.19
Philippines	-1.00	-3.43	-2.86	-2.57	0.75

From the table we found that pre ACFTA period all stock index of each observe country are not stationer while post ACFTA period there are three countries are having stationer data, China, Indonesia and Malaysia. This indicates that regression tests with MSCI index will generate spurious regression on non-stationarity data.

5.2. The Result of Cointegration Test

As for the cointegration test, the complete table is shown below:

Table 3. Before The Implementation of ACFTA: Cointegration Test

Variable	ADF T-Stat	α 1%	α 5%	α 10%	P-Value
China	-35.58	-3.43	-2.86	-2.57	0.00
Indonesia	-32.32	-3.43	-2.86	-2.57	0.00
Malaysia	-32.40	-3.43	-2.86	-2.57	0.00
Singapore	-35.93	-3.43	-2.86	-2.57	0.00
Thailand	-35.70	-3.43	-2.86	-2.57	0.00
Philippines	-32.36	-3.43	-2.86	-2.57	0.00

Table 4. After The Implementation of ACFTA: Cointegration Test

Variable	ADF T-Stat	α 1%	α 5%	α 10%	P-Value
China	-35.09	-3.43	-2.86	-2.57	0.00
Indonesia	-21.10	-3.43	-2.86	-2.57	0.00
Malaysia	-32.95	-3.43	-2.86	-2.57	0.00
Singapore	-35.64	-3.43	-2.86	-2.57	0.00
Thailand	-35.24	-3.43	-2.86	-2.57	0.00
Philippines	-33.99	-3.43	-2.86	-2.57	0.00

From both of the tables found that all variables on both before and after the ACFTA had higher ADF t-stat more than McKinnon critical values at 5% level. These indicated that all variables have cointegrated at first difference level I(1). This shown that all variables are cointegrated and the next test is to figure out its long-run equilibrium.

5.3. The Result of Johansen Cointegration Test: Long Run Equilibrium

The complete result for Johansen Cointegration Test of 15 pair's capital markets index can be seen in following tables.

Table 5. Before The Implementation of ACFTA: Johansen Cointegration Test

Countries	Indonesia	Malaysia	Philippines	Singapore	Thailand
China	1 coin	not exist	not exist	not exist	not exist
Indonesia		not exist	not exist	not exist	not exist
Malaysia			not exist	not exist	not exist
Philippines				not exist	not exist
Singapore					not exist
Thailand					

The tables describe that before the ACFTA implementation there is no cointegration exist within all of the 5 ASEAN countries and China except between China and Indonesia.

Table 6. After The Implementation of ACFTA: Johansen Cointegration

Countries	Indonesia	Malaysia	Philippines	Singapore	Thailand
China	2 coin	2 coin	not exist	2 coin	2 coin
Indonesia		not exist	not exist	not exist	not exist
Malaysia			not exist	2 coin	not exist
Philippines				not exist	not exist
Singapore					2 coin
Thailand					

As for after the ACFTA implementation, the Johansen Cointegration Test tables shown that there are six cointegration occurs between China and five ASEAN countries. Almost all of these 5 ASEAN countries are cointegrated with China after the implementation of the ACFTA period except Philippines. There were also cointegration within the ASEAN countries. There are two cointegration occurs, one between Malaysia and Singapore and two between Singapore and Thailand. The changes of cointegration patterns within the observation countries indicates that the ACFTA gives significant effects of capital market

correlation between ASEAN and China countries in the long run equilibrium with China as the cointegration center. This confirmed another study found by Verico (2016).

5.4. The Result of Error Correction Mechanism Test: Short Run Equilibrium

As for the short-run equilibrium, this paper uses the ECM test and the complete result can be seen in the following tables:

Table 7. Before The Implementation of ACFTA: Error Correction Model

Countries	China	Singapore	Malaysia	Indonesia	Thailand	Philippines
China		*Coef=28.48* *et= -0.003* *PValue=0.14*	Coef=1.58 et= -0.01 PValue=0.00**	Coef= 4.71 et= -0.01 PValue=0.00**	Coef=1.40 et= -0.008 PValue=0.01**	Coef=1.73 et= -0.008 PValue=0.01**
Singapore	*Coef=0.01* *et= -0.005* *PValue= 0.05*		Coef=0.04 et= -0.01 PValue=0.00**	Coef=0.12 et= -0.005 PValue=0.04*	Coef=0.03 et= -0.014 PValue=0.00**	Coef=0.04 et= -0.01 PValue=0.00*
Malaysia	Coef=0.18 et= -0.009 PValue=0.02*	Coef=8.47 et= -0.009 PValue=0.02*		Coef=1.52 et= -0.01 PValue=0.01*	Coef=0.43 et= -0.011 PValue=0.00**	Coef=0.64 et= -0.012 PValue=0.01**
Indonesia	*Coef=0.07* *et= -0.007* *PValue= 0.07*	*Coef= 3.25* *et= -0.004* *PValue=0.16*	Coef=0.21 et= -0.007 PValue=0.03*		Coef=0.17 et= -0.01 PValue=0.00**	*Coef=0.21* *et= -0.005* *PValue= 0.10*
Thailand	*Coef=0.16* *et= -0.003* *PValue= 0.14*	*Coef=7.27* *et= -0.006* *PValue=0.06*	*Coef=0.43* *et= -0.002* *PValue= 0.30*	*Coef=1.27* *et= -0.005* *PValue=0.08*		*Coef=0.40* *et= -0.002* *PValue= 0.32*
Philippines	Coef=0.14 et= -0.009 PValue=0.01**	Coef=5.18 et= -0.01 PValue=0.01**	Coef=0.43 et= -0.015 PValue=0.00**	Coef=1.04 et= -0.007 PValue=0.02*	Coef=0.27 et= -0.01 PValue=0.00**	

From the tables found there are ten pairs between 5 ASEAN countries and China which have insignificant of Error Correction Term (ECT). The insignificant ECT indicates that there was no difference between short and long run equilibrium within these countries capital market. In other words, it is shown that there was no dynamic correlation among the observed countries. All ten pairs whose have insignificant ECT are Singapore & China, Indonesia & China, Thailand & China, China & Singapore, Indonesia & Singapore, Thailand & Singapore, Thailand & Malaysia, Thailand & Indonesia, Indonesia & Philippines, and between Thailand & Philippines. These findings showed that before the implementation of the ACFTA most of ASEAN and China countries capital markets do not have short run equilibrium and there was no difference between short and long-run equilibrium between them. How about after the implementation of the ACFTA? The complete result can be found below:

Table 8. After The Implementation of ACFTA: Error Correction Model

Countries	China	Singapore	Malaysia	Indonesia	Thailand	Philippines
China		Coef=33.47 et= -0.008 PValue=0.00**	Coef=0.07 et= -0.005 PValue=0.00**	Coef=8.884 et=-0.007 PValue=0.02*	Coef=3.27 et= -0.004 PValue=0.02**	*Coef=3.07 et= -0.001 PValue=0.27*
Singapore	Coef=0.01 et= -0.01 PValue=0.00**		Coef=0.05 et= -0.01 PValue=0.00**	Coef=0.1788 et= -0.009 PValue=0.00**	Coef=0.06 et= -0.009 PValue=0.00**	*Coef=0.05 et= -0.002 PValue=0.18*
Malaysia	Coef=0.11 et= -0.009 PValue=0.00**	Coef=6.33 et= -0.01 PValue=0.000**		Coef=1.97 et= -0.009 PValue=0.01**	Coef=0.68 et= -0.009 PValue=0.01**	*Coef=0.68 et= -0.001 PValue=0.45*
Indonesia	Coef=0.03 et= -0.001 PValue=0.00**	Coef=1.73 et= -0.007 PValue=0.02**	Coef=0.17 et= -0.004 PValue=0.03**		Coef=0.20 et= -0.006 PValue=0.01**	*Coef=0.20 et= -0.001 PValue=0.40*
Thailand	Coef=0.07 et= -0.011 PValue=0.00**	Coef=4.18 et= -0.016 PValue=0.00**	Coef=0.395 et= -0.009 PValue=0.01**	Coef=1.29 et= -0.012 PValue=0.00**		Coef=0.45 et= -0.005 PValue=0.04**
Philippines	Coef=0.06 et= -0.011 PValue=0.00**	Coef=2.57 et= -0.01 PValue=0.00**	Coef=0.32 et= -0.006 PValue=0.04**	Coef=1.05 et= -0.010 PValue=0.03**	Coef=0.37 et= -0.012 PValue=0.03**	

Post-ACFTA ECM tables show that almost all countries have a dynamic and stable short-run equilibrium. The only Philippines which have no dynamic and stable short-run equilibrium with all countries. These results indicated that after the implementation of the ACFTA similar to the long run condition- the changes in short-run equilibrium patterns existed within the observed countries. This showed that the correlation within these countries is closer than before the implementation of the ACFTA.

5.5. Structural VAR: Causality Test Result

The Structural VAR test shows that all of the observed countries in last decade (5 years from pre-ACFTA to 5 years to Post ACFTA) have the causalities relationships whereas China gives significant effects to all of these ASEAN countries. There is only one causality that misses from the model which is between Singapore and the Philippines. The complete result of the Causality Test of Structural VAR is presented below.

Table 8. Structural VAR Model

Countries		China	Singapore	Malaysia	Indonesia	Thailand	Philippines
China	C	0.986523					
	P	0.00000					
Singapore	C	30.71476	31.15792				
	P	0.00000	0.00000				
Malaysia	C	0.729534	0.038964	2.765341			
	P	0.00000	0.00000	0.00000			
Indonesia	C	2.006688	0.064106	0.966932	8.22484		
	P	0.00000	0.00000	0.00000	0.00000		
Thailand	C	0.46171	0.020274	0.193373	0.088919	3.444932	
	P	0.00000	0.00000	0.00000	0.00000	0.00000	
Philippines	C	0.680831	-0.000133	0.304956	0.081700	0.128193	3.933548
	P	0.0000	0.9623	0.0000	0.0000	0.0000	0.0000

5.6. Granger-Causality Test Result

Given that the data which has been used in this paper is daily dataset of 5 days per week then in calculating Granger-Causality Test, this paper utilises maximum lag in one week which are four lags. The complete results can be seen below:

Table 9. Granger-Causality Test

Pairwise Granger Causality Tests
Date: 07/10/16   Time: 16:56
Sample: 1/03/2005 12/31/2014
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
CHINAMRKT does not Granger Cause CHINA	**2604**	**5.09420**	**0.0004**
CHINA does not Granger Cause CHINAMRKT		1.43520	0.2197
INA does not Granger Cause CHINA	2604	1.87761	0.1116
CHINA does not Granger Cause INA		**2.85162**	**0.0226**
MLY does not Granger Cause CHINA	2604	1.22457	0.2982
CHINA does not Granger Cause MLY		**2.83546**	**0.0232**
PHIL does not Granger Cause CHINA	2604	0.13718	0.9686
CHINA does not Granger Cause PHIL		**11.0295**	**7.E-09**
SING does not Granger Cause CHINA	**2604**	**29.6446**	**4.E-24**
CHINA does not Granger Cause SING		**6.88498**	**2.E-05**
THAI does not Granger Cause CHINA	**2604**	**2.52724**	**0.0389**
CHINA does not Granger Cause THAI		**3.13035**	**0.0140**
INA does not Granger Cause CHINAMRKT	2604	1.39816	0.2320
CHINAMRKT does not Granger Cause INA		**2.18829**	**0.0679**
MLY does not Granger Cause CHINAMRKT	2604	0.47270	0.7558
CHINAMRKT does not Granger Cause MLY		0.74759	0.5595
PHIL does not Granger Cause CHINAMRKT	2604	0.70731	0.5869
CHINAMRKT does not Granger Cause PHIL		1.11431	0.3479
SING does not Granger Cause CHINAMRKT	**2604**	**3.00009**	**0.0175**
CHINAMRKT does not Granger Cause SING		**6.11462**	**7.E-05**
THAI does not Granger Cause CHINAMRKT	2604	0.28345	0.8888
CHINAMRKT does not Granger Cause THAI		1.86108	0.1145
MLY does not Granger Cause INA	2604	0.57583	0.6802
INA does not Granger Cause MLY		**5.66461**	**0.0002**

PHIL does not Granger Cause INA	2604	0.46705	0.7600
INA does not Granger Cause PHIL		**21.4220**	**2.E-17**
SING does not Granger Cause INA	2604	**13.2451**	**1.E-10**
INA does not Granger Cause SING		1.71830	0.1431
THAI does not Granger Cause INA	2604	**3.68358**	**0.0054**
INA does not Granger Cause THAI		**9.62115**	**1.E-07**
PHIL does not Granger Cause MLY	2604	1.16415	0.3247
MLY does not Granger Cause PHIL		**11.3163**	**4.E-09**
SING does not Granger Cause MLY	2604	**16.4535**	**3.E-13**
MLY does not Granger Cause SING		**3.13270**	**0.0140**
THAI does not Granger Cause MLY	2604	1.87153	0.1127
MLY does not Granger Cause THAI		**2.87694**	**0.0216**
SING does not Granger Cause PHIL	2604	**43.8473**	**1.E-35**
PHIL does not Granger Cause SING		0.33826	0.8523
THAI does not Granger Cause PHIL	2604	**20.6967**	**8.E-17**
PHIL does not Granger Cause THAI		1.78781	0.1285
THAI does not Granger Cause SING	2604	0.40408	0.8058
SING does not Granger Cause THAI		**4.68256**	**0.0009**

This test is to figure out the relationship between the stock market index within the observed countries. China has two market index to be tested, one is general, and two is specific that influenced by the market. The test is regardless before and after the ACFTA to found the relations the whole observation years. This table confirmed that China's stock market significantly affects all the ASEAN countries stock market. China's general stock market is affected by China's stock market-based. There are two countries in ASEAN whose stock market can affect China's stock market, Singapore (China Stock Market Index Based Market) and Thailand (China Stock Market Index).

As for the within ASEAN members, Indonesia's stock market affects Malaysia and Philippines's stock market. Thailand's stock market affects Indonesia and Philippines's stock market index. Malaysia's stock market affects the Philippines and Thailand's stock market. Singapore's stock market also affects the Philippine and Thailand's stock market. There were

simultaneous relations between Malaysia and Singapore's stock market. Both countries' stock market is dependent on each other. There were simultaneous relations between Thailand's and China's stock market and between Indonesia's and Thailand's stock market. This paper found that the Philippines stock market is affected by all the observed countries while China and Singapore on the other around affect all the observed countries stock market.

China and Singapore have a strong stock market interdependence while all ASEAN members and this paper attempts to prove real sector relations between them further using the economic growth elasticity indicators. The analysis is below.

5.7. Economic Growth Elasticity

This paper estimated bivariate regression between economic growths of China to all the observed countries' economic growth. Different to the time-series test on the stock market index, this regression uses yearly data of GNP constant price in US$. This measurement is calculated to find the significant level of economic growth of China to all the observed countries and to figure out the impact level of China's economic growth to all the observed countries. The latter describes how much of 1% change in China economic growth will influence economic growth in the percentage of the observed countries economic growth. The complete results can be found below:

Table 10. Economic Growth Elasticity between China and
All the Observed Countries 1999-2014

Log (China)	Log (Indonesia)	Log (Malaysia)	Log (Philippines)	Log (Singapore)	Log (Thailand)
Constant	1.22	3.25	4.21	7.17	6.60
Parameter	0.82	0.64	0.54	0.34	0.38
t-stat parameter	8.09	40.78	5.37	13.28	8.62
Probability Test	0.00	0.00	0.00	0.00	0.00
R-squared	0.84	0.99	0.86	0.96	0.92

This paper found that China's real sector economy significantly affect all the observed countries real sector. This indicator can be seen in economic growth elasticity findings that

shown China's economic growth affect all ASEAN countries with the r-squared more than 0.8. The highest parameter impact is Indonesia while the lowest is for Singapore. These findings confirmed that China gives significant effect to ASEAN economies both in the real sector using the economic growth elasticity and the stock market as a financial variable which also represents real sector performance.

This paper needs to have comprehensive figures on real and financial sector at each observed country therefore in the next part it describes the relation between real sector competitiveness using Net Trade in Goods Balance and Current Account Balance and financial sector variable in particular which describe external competitiveness, the Real Effective Exchange Rate (REER). The complete results can be seen below.

5.8. REER, Trade in Goods and Current Account Balance

This paper calculated the Real Effective Exchange Rate (REER) by dividing the GNI per capita in PPP to GNI per capita in current US$. If the result is more than one, then the nominal exchange rate of the particular country is 'undervalue' and the opposite. If the Trade Balance (TB) in goods is positive then undervalue is 'matched' with the TB which increase export competitiveness and reduce the import value relatively. If the Current Account Balance (CAB) is also positive, then the TB is capable of creating a surplus for the CAB and the opposite. If the TB is negative when the REER is undervalued, then it means undervalue does not match with the TB but if the CAB is positive, then there is the possibility that Service Account (SA) contributes to the surplus of the CAB. The complete results on relations between REER as the representative of the financial variable to the real sector competitiveness on trade balance and the current account can be found below:

Table 11. REER, Value of Nominal ER, Trade Balance in Goods, Current Account Balance

The Observed Countries 2005, 2010 and 2014

Country	Year	GNI per Capita (PPP)	GNI per Capita (Current US$)	REER	Value of ER	Trade Balance (Current US$)	ER & TB	Current Account (Current US$)	ER & CA
China	2005	4,920	1,740	2.83	Undervalue	124,626,797,517	Matched	132,378,493,766	Capable
	2010	9,000	4,240	2.12	Undervalue	223,023,871,713	Matched	237,810,389,608	Capable
	2014	13,170	7,400	1.78	Undervalue	351,766,000,000	Matched	182,807,000,000	Capable
Indonesia	2005	5,510	1,230	4.48	Undervalue	8,411,229,718	Matched	277,554,218	Capable
	2010	7,640	2,500	3.06	Undervalue	21,212,150,708	Matched	5,144,286,802	Capable
	2014	10,190	3,630	2.81	Undervalue	6,982,453,548	Matched	-25,403,179,039	Incapable
Malaysia	2005	15,260	5,240	2.91	Undervalue	30,775,516,791	Matched	19,979,946,360	Capable
	2010	19,330	8,150	2.37	Undervalue	41,851,265,114	Matched	26,998,151,941	Capable

	Year								
	2014	24,770	11,120	2.23	Undervalue	32,494,026,525	Matched	11,731,544,450	Capable
Philippines	2005	5,390	1,530	3.52	Undervalue	-9,998,077,082	Unmatched	1,990,392,913	Service Account
	2010	7,330	2,740	2.68	Undervalue	-11,094,114,051	Unmatched	7,179,160,967	Service Account
	2014	8,450	3,500	2.41	Undervalue	-15,850,957,637	Unmatched	12,650,296,969	Service Account
Singapore	2005	51,310	28,370	1.81	Undervalue	38,006,726,158	Matched	27,867,501,603	Capable
	2010	69,960	44,790	1.56	Undervalue	62,459,024,208	Matched	55,943,112,437	Capable
	2014	80,270	55,150	1.46	Undervalue	68,568,209,063	Matched	58,771,792,747	Capable
Thailand	2005	6,970	2,600	2.68	Undervalue	-3,488,275,971	Unmatched	-7,646,624,975	Incapable
	2010	9,230	4,320	2.14	Undervalue	18,964,131,501	Matched	9,945,884,538	Capable
	2014	14,870	5,780	2.57	Undervalue	24,560,665,519	Matched	13,405,012,075	Capable

Source: Own calculation using World Bank Data

*Note: * REER (Real Effective Exchange Rate) is obtained by divided GNP per Capita in PPP US$ with GNP per Capita in current US$; ** If the REER is higher than 1 then local currency is undervalue and if it less than 1 then local currency is overvalue; *** If local currency (ERV) is undervalue and trade balance (TB) is positive then it is Matched or if it is overvalue and TB is negative. The opposite of these is Unmatched.**** If TB is positive and CA is positive then TB is Capable to make CA positive, If TB is positive/negative and CA is negative then CA is Incapable to make CA positive. If TB is negative but CA is positive then it is because Service Account is significantly compensate negative TB.*

This paper found that all the observed countries have undervalued of local exchange rate towards US$. The only Philippines that has negative trade balance in goods which indicates that undervalue of Peso did not give a positive impact on Philippines trade balance. However, service account in particular of remittance in the Philippines is positive, and it compensated the negative trade balance in goods which made her current account balance positive. This is the competitiveness Philippines that help the country to have a stable exchange rate. All the observed countries have positive current account balance except Indonesia. This finding showed that Indonesia's undervalue does not give a net positive effect on her current account and the real trade in goods balance did not necessarily the result of undervaluing of Rupiah.

6. Conclusion

This paper utilizes three models of regressions, first is the time-series test of correlation of Stationarity, Cointegration and Error Correction Model, and second is the time-series test of causality both the Structural Vector Autoregression and Granger Causality test and three is elasticity regression of economic growth between China, and all ASEAN observed countries. It did two tests on time-series, one using breakpoint before (2005-2010) and after (2010 -2014) the ASEAN China FTA (ACFTA) and two using the whole year test from 2005-2014. This paper found that China's economy both in the financial sector using time-series test of the stock market index and real sector using the economic growth elasticity have a significant impact on Southeast Asian countries. At this point, this paper concluded as China significantly affects both the real and financial sector of ASEAN countries. Therefore, the enlargement of ASEAN economic integration to China throughout the utilization of the ACFTA is potential to enhance ASEAN economic integration from the real sector, i.e., trade to financial integration, i.e., investment. This paper confirmed that the open regionalism of the ASEAN plus frameworks which in this paper took the ASEAN China FTA is effective to transform ASEAN economic integration level from real to financial sector correlation. On the other side, if China's economy is destabilized then in some measure, it will decline Southeast Asia's economy.

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