International Journal of Finance, Insurance and Risk Management
Volume X, Issue 2, 2020

pp. 17-33

Causality Between Exchange Rate and Stock Prices: Evidence From ASEAN-5 Countries

Sub 20/01/20, 1st revision 10/02/20, 2nd revision 18/03/20, 3rd revision 20/04/20, accepted 08/05/20

Faizal Reza[1], Titin Ruliana[2], Imam Nazarudin Latif [3], Adisthy Shabrina Nurqamarani[4]

Abstract:

Purpose: *The primary aim of this study is to explain the causality between exchange rate and stock prices, particulary in ASEAN-5 countries. The research also aims to complement previous researches discussing the relationship between exchange rate and stock prices.*
Design/Methodology/Approach: *This research employs secondary data from 5 ASEAN countries, Malaysia, Indonesia, Singapore, Thailand, and the Philippines. The data include stock prices and daily exchange rates in the period 2010-2018. The research uses time series analysis through several procedures such as stationarity test and cointegration test, then applies Bivariate Vector Autoreggresive (BVAR) towards the data to identify whether they support traditional approach or portfolio balance aproach. This research also applies time series analysis to increase the accuracy of the findings.*
Findings: *This research found that between the period 2010-2018, there were two countries within the ASEAN-5 which support the research hypothesis of portfolio balance approach, Singapore and Malaysia, whereas the rest did not support neither hypotheses, the traditional approach and the portfolio balance approach.*
Practical Implications: *Among three of the ASEAN-5, Indonesia, Thailand, and the Philippines, it can be assumed that exchange rate is not the proper indicator for stock market condition in those countries as previously assumed by researchers. On the other hand, the result of the remaining two countries Malaysia and Singapore showed vibrant insight on the causality between their financial sector and exchange rate.*
Originality/Value: *By this far, there has been numerous studies discussing the causality between exchange rate and stock market in emerging markets or developed countries, however, there are only few studies which compare countries in ASEAN-5 using two indicators.*

Keywords: *Exchange rate, stock prices, Portfolio Balance and Traditional Approach.*

JEL codes:

Paper type: *Research article.*

[1]*University of 17 Agustus 1945 Samarinda, Faculty of Economic,*
e-mail: rezafaizaluntagsmd@gmail.com
[2]*Same as above, e-mail: titin.ruliana15@gmail.com*
[3]*Same as above, e-mail: imamlatif5@gmail.com*
[4]*Corresponding author, same as above, e-mail: adisthy.shabrina@gmail.com*

1. Introduction

The relationship between exchange rates and stock prices until now remains a debatable topic, the debate not only includes whether the time series exchange rate has a long-term relationship to stock prices but also includes the direction of causality between exchange rate and stock price. The examples of the effects of the exchange rate on the financial sector, especially the capital markets, are seen when China devalues the Yuan currency against the US Dollar to boost export growth in 2015.

The weakening of the Yuan against the Dollar resulted many stock prices in the world stock market declining. Not until there, even further strategies involving exchange rates can also lead to declining economic growth of other countries in the world. If a country with strong economic power such as USA could be affected by the biggest economic growth machine like China, now what happened to the financial sector in developing countries such as Asia which is still much influenced by global economic conditions? Currently, 63% of the ownership of shares in Indonesia capital market is not owned by foreign parties.

In comparison to other Asian countries, the Philippines' ratio of local investors to the population is only 0.6%, this amount is actually better than Indonesia's which is only 0.2%. It seems that in this case the Singapore ratio is more encouraging being 30% of the total population. Nevertheless, apart from the comparison of size (big vs small) and strength (strong vs weak), it seems that the relationship between exchange rate and stock prices is still interesting to investigate.

The works to examine the relationship between exchange rate and stock prices were done by Aggarwal (1981), Soenen (1988), Hennigar (1988) with correlations between exchange rates and stock prices (Agrawal, Srivastav, and Srivastava, 2010). Agrawal, Srivastav, and Srivastava (2010) used the daily closing index price during October 2007 to March 2009 concluded that there is a correlation between stock returns and exchange rates but not vice versa. Umoru and Asekome (2013) stated that there is a bidirectional causal relationship between exchange rates and stock prices in Nigeria over the period 2000-2012.

This means that there is a two-way relationship between exchange rates affecting stock prices, and stock prices also affect the exchange rate. They also found that there is unidirectional causality between Naira-US Dollar against all stock price indices. Other results reported by Rahman and Uddin (2009) using monthly data from 2003 to 2008 found that there is no causality between exchange rates and stock prices in three countries in South Asia namely Bangladesh, Pakistan and India.

Many studies have been developed by exploring the empirical facts between exchange rates and stock prices in developed and developing countries, different results often found among researchers with the same country. This paper aims to

investigate whether there is causality that supports the theory of Portfolio Balance Approach and Traditional Approach between exchange rate and stock prices in ASEAN-5 countries in Southeast Asia i.e., Mayasia, Indonesia, Singapore, Thailand and the Philippines. The rest of this paper will be presented as follows: section 2 provides review literature and empirical studies between exchange rates and stock prices, section 3 presents data, research methodology and estimation techniques. Section 4 is the result and discussion, and the last section 5 concludes the paper.

2. Literature Review

There are two theories that focus on discussing the relationship between exchange rates and stock returns namely Traditional Approach and Portfolio Balance Approach. According to the Traditional Approach, the relationship between exchange rates and stock prices occurs when there is an excess on imports rather than exports, this increase in imports results in a depreciating exchange rate (weakening against foreign currencies).

Depreciation also causes the cost of imported raw materials to rise, the increase in foreign currency relative to the domestic currency causes the company's profits to fall, with the decline in earnings, many investors will release its shares to avoid losses at a higher level. The disposal of these shares resulted stock prices coming down. Conversely, if exports are bigger than imports, then the domestic currency appreciates, the appreciation of the domestic currency will cause an increased profit followed by the stock price.

The exchange rate can affect profit not only for multinational companies but also for domestic companies. For multinational companies, changes or movements in the exchange rate will affect its foreign operational costs that affect earnings and stock prices. The bigger the operational cost, the less profit the company gets. For domestic companies, changes in exchange rates will affect the company's stock price due to import export activities. Adjasi *et al.* (2008) concluded by using EGARCH model there is a negative relationship between exchange rate volatility and stock returns in Ghana in the long run. The study also found that an increase or decrease in trade deficits and expectations of an increase in the decline in trade deficits will lead to decrease or increase the capital market volatility.

In contrast, the direction of reversed causality between the stock price to the exchange rate is expressed by the Portfolio Balance Approach. This theory states that domestic and foreign bonds are an imperfect substitute. According to Nurrohim (2013) the exchange rate is actually a process to balance the total demand and supply of financial assets (in this case money only as one form of financial assets) in each country. An increase in domestic money supply will lead to lower interest rates, causing investors to change their bonds into foreign bonds, this massive purchases of foreign bonds will result in depreciation of the domestic currency, and vice versa.

The Portfolio Balance Approach explains the linkages between the financial sector and exchange rates.

Akdogu and Birkan (2016) tried to see the causality of exchange rates on stock prices in 21 emerging markets in the world whether following the theory of Portfolio Balance Approach or Traditional Approach. They concluded that from 21 countries a significanct influence between exchange rate and stock price variables in 13 countries was found. Korea, Indonesia, Malaysia, Czech, Hungary, Brazil, Peru and Thailand are found to support the Portfolio Balance Approach theory of stock prices affecting exchange rates. Colombia supports the Traditional Approach which states exchange rate affects stock prices. For the rest of countries no significant effect between exchange rates and stock prices was found.

Elhendawy (2017) using data from January 2003 to June 2016 concludes that there is an inverse relationship between stock prices and exchange rates. One percent increase in stock price volatility will decrease the Egyptian exchange rate relative to the US Dollar by 0.03 percent, This result is in accordance with Portfolio Balance Approach. Aslam (2014) concluded that there is bidirectional causality between exchange rate and KSE 100 Pakistan index during the period of January 2006 until December 2012, with daily data also concluded that the correlation between exchange rate and stock index is very small with negative relationship between exchange rate and stock price.

The inverse relationship between the exchange rate and the stock prices is also reported by Alagidede *et al.* (2010) using sample of five countries namely Japan, Australia, Switzerland, Canada, and the United Kingdom. They concluded that by using cointegration tests it was no long-term relationship of the variables studied. With the Granger causality during 1992 to 2005 it was concluded that exchange rate causality affects stock prices only in Canada, Switzerland and England. The weak causality and the inverse relationship between exchange rate and stock prices occur in Switzerland, while Japan has an inverse causality between stock prices to exchange rates. Smyth and Nandha (2003) using Bangladesh, India, Pakistan and Sri Lanka data concluded that there is no long-term relationship between exchange rates and stock prices in these four countries. There is a unidirectional causality of exchange rates to stock prices for India and Sri Lanka, while Bangladesh and Pakistan have independent causality.

Along the journey, according to Alagidede *et al.* (2010) many studies in this area also used different methods and time ranges as the Standard Granger Non Causality (Granger, 1969), Error Correction Model (Engle and Granger, 1987) VECM (Johansen, 1995), longterm causality (Toda and Yamato, 1995). Ali *et al.* (2015) using several different methods found that there is a longterm relationship between exchange rates and stock prices with Engle Granger cointegration, Threshold Auto Regressive (TAR) method, and with Momentum Threshold Auto Regressive (M-TAR). Research in this area also reported using many different data time periods by

researchers such as monthly data performed by Stavarek (2005), Mgammal (2012), Tudor and Pupescu-Dutaa (2012), Zubair (2013), Suriani *et al.* (2015) and Tursoy (2017). Similar works using daily data in this field also undertaken among others by Bernard and Galati (2000), Ooi *et al.* (2009), Araghi and Pak (2012), Tabak (2016), Hu (2017) and John and Kisava (2018).

3. Methodology

The data used in this study comes from five Asean countries (ASEAN-5) namely Malaysia, Indonesia, Singapore, Thailand, and the Philippines. The data consists of stock prices and exchange rate data during the period 2010 to 2018 taken from investing.com and usforex.com. Because there are three countries namely Singapore, Thailand, and the Philippines which have availability data from 2011 the beginning and end of the data sries in this research is determined from the available data of each country.

Each pair of data will be estimated of each country namely Malaysia Exchange Rate / MER (USD / MYR) and KLCI for Malaysia, Indonesia Exchange Rate / IER (USD / IDR) and IHSG for Indonesia, Singapore Exchange Rate / SER (USD / SGD) and STI for Singapore, TER (USD / THB) and SETI for Thailand, and FER (USD / PHP) and PSEi for the Philippines. Before we estimated the data, we will use some procedures such as stationery test with Augmented Dickey-Fuller (ADF). This test used to determine whether the data we use have been stationary or not. Besides widely used in many literatures, the ADF test concluded better to be used as unit root testing with small and moderate samples (Ha, 2007). The ADF test used is written as follows:

$$\mathbf{Y_t = \alpha_0 + \rho Y_{t-1} + \sum_{i=1}^{n} \beta i \Delta Y_{y-1} + e_t} \quad (1)$$

where: the variable Y_t is the endogenous variable, α_0 is the intercept, and e_t is the error term.
In this paper we also consider a popular integration test in the analysis of the financial time series that is Phillips-Perron (PP) test which allows serial correlation and heteroscedasticity in equation error. We also consider Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test. PP test is written as follows:

$$\Delta \mathbf{y_t} = \boldsymbol{\zeta}' \mathbf{D_t} + \boldsymbol{\pi} \mathbf{y_{t-1}} + \mathbf{u_t} \quad (2)$$

Since there is an important issue in the selection of lag lengths on unit root tests to anticipate powerloss, in this paper we will use lag lengths that minimize Akaike's Information Criteria (AIC). To see the cointegration between variables, we use the Engle-Granger procedure with the following formulation:

$$\Delta \mathbf{Y_t = \lambda_0 + \delta \Delta X_t + \theta U_{t-1} + \mu_t} \quad (3)$$

where: Y_t and X_t are endogenous variables, Δ is the first difference operator, μ_t is white noise error term, U_{t-1} is equilibrium error term.
To strengthen cointegration conjecture we will compare the results of the Engle-Granger cointegration with Phillips-Ouliaris cointegration test. Finally we will examine the causality between the exchange rate and the ASEAN-5 stock price whether it supports Traditional Approach or Portfolio Balance Approach with Bivariate Vector Autoreggresive (BVAR) method in data estimation by using the following formula:

$$\mathbf{X_t = \sigma_0 + \sum_{j=1}^{p} A_j X_{t-j} + \sum_{j=1}^{p} B_j Y_{t-j} + u_{xt}} \quad (4)$$

$$\mathbf{Y_t = \psi_0 + \sum_{j=1}^{p} C_j X_{t-j} + \sum_{j=1}^{p} D_j Y_{t-j} + u_{yt}} \quad (5)$$

From the equations (4) and (5) for Granger Causality X does not cause Y, if $B_j = 0$, and Y does not cause X, if $D_i = 0$. In this paper we will also consider the Johansen cointegration test procedure which is considered an alternative test which seems to be preferred over the two-step Engel-Granger cointegration procedure (Sjo, 2008). Johansen test is written by the formula:

$$\mathbf{y_t = \alpha_0 + \Pi Y_{t-1} + \sum_{j=1}^{n} \Gamma_j \Delta Y_{t-j} + \varepsilon_t} \quad (6)$$

where: Y_t is the nx1 vector of the variable integrated in I(1), and ε_t is the innovation vector.
Equation (6) is then tested by two statistical tests namely Trace Test (J_{trace}) and Maximum Eigenvalue Test (J_{max}), each test can be written as in Equations 7 and 8:

$$\boldsymbol{J_{trace}} \mathbf{= -T \sum_{i=r+1}^{n} ln(1 - \lambda)} \quad (7)$$

$$\boldsymbol{J_{max}} \mathbf{= -T \ln (1-\lambda)} \quad (8)$$

where: T is the sample size and $\boldsymbol{\lambda}$ is the largest canonical correlation.
Trace test tests the null hypothesis of the cointegration vector r against the alternative hypothesis of the cointegration vector n, while the Maximum Eigenvalue test tests the null hypothesis of cointegration vector r on the alternative hypothesis of the cointegration vector r+1.

4. Results

4.1 Descriptive Statistics and Unit Root Test

In order to investigate the causality between the exchange rate and the stock price, we will use Granger Non Causality, where the countries that examine in this paper are the ASEAN-5 countries. Table 1 is a descriptive statistics of ASEAN-5 which includes mean, standard deviation, index name of each country, name of currency, etc.

Table 1. *ASEAN-5 Descriptive Statistics*

No.	**Malaysia**		**Indonesia**	
	MER	**KLCI**	**IER**	**IHSG**
a.	3.5399	1675.129	11287.5	4581.843
b.	0.5027	137.7647	1945.708	904.19
c.	4.4972	1895.18	14765	6689.29
d.	2.9289	1304.16	8434.5	2475.57
e.	Ringgit Malaysia		Rupiah Indonesia	
f.	Bursa Malaysia Stock Exc.		Indonesian Stock Exchange	
g.	Managed Floating Exc. Rate		Managed Floating Exc. Rate	
h.	KLCI		IHSG	
i.	903		537	
j.	360		426	
	Singapore		**Thailand**	
	FER	**STI**	**TER**	**SETI**
a.	1.31	3111.623	32.6139	1410.820
b.	0.0654	230.2531	1.9194	204.4614
c.	1.4523	3613.93	36.497	1838.96
d.	1.2011	2528.71	28.6895	855.45
e.	Dollar Singapore		Bath Thailand	
f.	Singapore Stock Exchange		Stock Exchange of Thailand	
g.	Managed Floating Exc. Rate		Managed Floating Exc. Rate	
h.	STI		SETI	
i.	757		656	
j.	640		433	
	Philippine		**Market Characteristic**	
	PER	**PSEi**		
a.	45.6749	6849.801	Mean (a)	
b.	3.2372	1063.734	Std. Deviation (a)	
c.	52.478	9058.62	Max (a)	
d.	40.568	4210.25	Min (a)	
e.	Peso Philippine		Currency	
f.	Philippine Stock Exchange		Stock Exchange	
g.	Managed Floating Exc. Rate		Exchange Regime	
h.	PSEi		Index Name	
i.	265		Number of Listed Company in 2016 (b)	
j.	240		Market Capitalization in 2016 (US$ billion) (b)	
Note: (a) based on range of research, (b) based on OECD report 2016.				

Source: *Own calculations.*

Before the estimation, stationary test was performed using ADF test with lag based on AIC criteria, we also used unit root PP test on stock prices and exchange rate of each country. ADF test results and PP tests results are reported in the Table 2.

Table 2. *Unit Root Test for Stock Price and Exchange Rate*

No.	**ADF test**		
	Level	**1st Diff.**	**Ln**

			level	**1st diff.**
a.	-0.7629 (14)	-11.0437* (13)	-0.6306*** (3)	-27.4809* (2)
b.	-2.432 (1)	-40.7445* (0)	-2.6409 (1)	-40.7129* (0)
c.	-2.1451 (2)	-35.3792* (1)	-2.1511 (18)	-9.8036* (17)
d.	-2.8014 (7)	-18.2032* (6)	-2.9835 (7)	-18.5145* (6)
f.	-1.5259 (10)	-13.3907* (9)	-1.5319 (10)	-13.2928* (9)
g.	-1.7702 (1)	-39.9226* (0)	-1.7943 (16)	-11.5095* (15)
h.	-1.3954 (1)	-43.8442* (0)	-1.4212 (1)	-44.0118* (0)
i.	-1.4391 (1)	-39.6229* (0)	-1.6778 (1)	-39.8384* (0)
j.	-0.2007 (1)	-42.3924* (0)	-0.2763 (1)	-42.4418* (0)
k.	-2.31 (13)	-10.3797* (12)	-2.6751*** (12)	-11.1994* (11)

No.	**PP Test**			
	Level	**1st Diff.**	**Ln**	
			level	**1st diff.**
a.	-0.8026 (1)	-47.5618* (3)	-0.7373 (3)	-48.136* (5)
b.	-2.3959 (12)	-40.6278* (16)	-2.6171 (12)	-40.6181* (15)
c.	-3.233 (11)	-51.0156* (10)	-2.0825 (11)	-52.8096* (9)
d.	-3.0199 (14)	43.0138* (18)	-3.2079*** (16)	-43.5624* (20)
f.	-1.5677 (9)	-44.6286* (9)	-1.5641 (9)	-44.6749* (9)
g.	-1.8833 (10)	-39.9830* (8)	-1.9758 (9)	-39.8590* (7)
h.	-1.4193 (5)	-43.7978* (6)	-1.4352 (4)	-43.9631* (6)
i.	-1.4486 (10)	-39.5745* (12)	-1.7278 (8)	-39.7999* (10)
j.	-0.3213 (0)	-42.4063* (2)	-0.3043 (3)	-42.5131* (4)
k.	-2.2657 (14)	-37.6998* (16)	-2.6615*** (15)	-37.4175* (16)

No	**KPSS Test**				Varia	Countries
	Level	**1st Diff.**	**Ln**			
			level	**1st diff.**		
a.	4.8081 (34)	0.1479*** (0)	4.8895 (34)	0.1616*** (2)	MER	MALAYSIA
b.	2.8822 (34)	0.1328*** (13)	2.9325 (34)	0.1581*** (12)	KLCI	
c.	0.6196 (34)	0.1356** (13)	0.6629 (34)	0.1713* (13)	IER	INDONESIA
d.	3.9 (34)	0.0424*** (17)	0.5878 (34)	0.0513*** (19)	IHSG	
f.	3.8294 (33)	0.0827*** (8)	3.8583 (33)	0.0799*** (9)	SER	SINGAPORE
g.	0.617* (33)	0.0953*** (9)	0.593* (33)	0.0875*** (8)	STI	
h.	3.286 (33)	0.2869*** (4)	3.319 (33)	0.2806*** (4)	TER	THAILAND
i.	3.3277 (33)	0.0639*** (11)	3.3162 (33)	0.0728*** (8)	SETI	
j.	4.4019 (32)	0.0941*** (0)	4.4105 (32)	0.0943*** (2)	FER	PHILIPPINE
k.	3.8623 (31)	0.1415*** (15)	3.7759 (31)	0.2326*** (14)	PSEi	

Note: **, **, and *** indicated the rejection of the null hypothesis for α:0,01, α:0,05, and α: ,1. for ADF test and PP test. *, **, and *** indicated the acceptence of the null hypothesis for α:0,01, α:0,05, and α:0,1 for KPSS test. Figures in parenthesis is lag lengths for ADF and bandwith for PP and KPSS test.*

Source: *Own calculations.*

From the results of ADF and PP test, it is concluded that all ASEAN-5 data are stationary on the first difference for both exchange rate and stock prices. In addition to the ADF and PP tests, we also tried to check the stationarity of the data through the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. Although the average results of the KPSS tests confirm the stationarity of the data at level of confidence 5% and 10%, it can be summarized as in the previous two tests, that exchange rates and stock prices have been stationary at the first difference level. Based on the results of

these three tests, it is concluded that the exchange rate and stock prices are stationary at first difference.

4.2 Cointegration Test

After conducting stationary tests, cointegration test was done by using Engle-Granger procedure. From cointegration test, it was concluded that from five ASEAN-5 countries, there was one country that experienced cointegration, namely the Philippines. Because the existence of cointegration in the Philippines, there should be two different approaches to be used in this paper.

Table 3. *ASEAN-5 Cointegration Test*

Countries	**Engle-Granger**	**Phiilips-Ouliaris**
Malaysia	-1.6228 (0.4041)	-1.6009 (0.4149)
Indonesia	-2.6429 (0.4424)	-3.1816 (0.1927)
Singapore	-1.885 (0.2833)	-1.9067 (0.2742)
Thailand	-1.3571 (0.5376)	-1.3578 (0.5372)
The Philippines	-3.0385** (0.0246)	-2.8215** (0.0434)

Note: *** indicated cointegration at 0.05 level. Figure in parenthesis are probability values.*
Source: *Own calculations.*

From the Phillips-Ouliaris test it is concluded that only the Philippines are cointegrated at 5%. While the other four ASEAN-5 countries do not experience cointegration. These results are similar to previous Engle-Granger procedures, to ensure cointegration among ASEAN-5 countries. Johansen test applied to this research in which the Johansen cointegration test results are reported in Table 4.

Table 4. *ASEAN-5 Johansen Cointegration*

Countries	**No. of CE(s)**	**Johansen Test**			
		Trace Sta.	**0.05 CV**	**Max-Eigen Sta.**	**0.05 CV**
Malaysia	None	11.8188	20.2619	9.0032	15.8921
	At most 1	2.8156	9.1645	2.8156	9.1645
Indonesia	None	16.43	25.8721	12.064	19.387
	At most 1	4.3661	12.5179	4.3661	12.5179
Singapore	None	5.8315	20.2618	3.7622	15.8921
	At most 1	2.0693	9.1645	2.0693	9.1645
Thailand	None	8.5821	20.2618	6.6113	15.8921
	At most 1	1.9709	9.1645	1.9709	9.1645
Philippine	None	17.7544	20.2618	10.3256	15.8921
	At most 1	7.4288	9.1645	7.4288	9.1645

Note: *No cointegration at least on one countries.*
Source: *Own calculations.*

From Johansen test results, we face a problem where the Johansen test concludes that there is no cointegration in ASEAN-5 including the Philippines. Based on Bilgili (1998), some of Monte Carlo's experimental evidence suggests that Johansen's procedure performance is better than the Engle-Granger procedure for both single equation and multivariate methods. This is because with the Engle-

Granger cointegration two-stage procedure, the error in the first stage i.e., generating residuals will potentially carry to the second stage. In addition, Johansen test is also known to be well used on large samples. Osterholm (2003) states that with the criteria of Akaike and Schwarz found great distortions for the Augmented Engle-Granger test. Ssekuma (2011) states that one of Johansen test's advantages over Engle-Granger and Phillips-Ouliaris test is to estimate more than one cointegration relationship if data consists of two or more time series. So, for the Philippines in this paper we will use Johansen test results for further estimation.

4.3 Estimation and Granger Non Causality

After conducting the analysis, it is found that the ASEAN-5 does not have cointegration, then this research applies BVAR approach to estimate the interaction between exchange rate and stock price. The BVAR estimation results in this paper are reported in Table 5. Since there is a lag length selection issue that greatly affects the sensitivity of the results. Then, this research uses lag length criteria based on recommendations of LR, FPE, AIC, SC, and HQ. In this paper, in order to corroborate the conclusions of the estimates, instead of choosing one of the criteria, authors included the results of the criterias.

For Malaysia lag 3 is recommended by AIC, FPE, and LR while the rest use lag 1. For Indonesia 4 criteria are used i.e., AIC, FPE, LR, and HQ suggesting lag 6 while lag 7 is used after resolving an autocorrelation problem on criteria suggested by SC. Using the Newey-West Heteroskedasticity and Autocorrelation Consistent (HAC) we used lag 7 for Indonesia and lag 6 for the Philippines with the formula p = T¼, where T is the number of samples (Green, 2002). For Singapore we selected lag 1 and 7 respectively the five criteria above, while for Thailand we will use lag 1 and 3. Test results are also included in Table 5 by using Serial Correlation LM Test and White's Heteroskedasticity Test.

Eventhough the problem of autocorrelation in equations is solved, but for all ASEAN-5 countries the null hypotheses of no heteroscedasticity cannot be accepted. The problem of heteroscedasticity will have a great impact on a small sample and suffer from autocorrelation problems. Then based on the results of Table 6, Granger Non Causality is performed to see the causality between exchange rates and stock prices.

5. Discussion

Result from causality between exchange rates and stock prices show different results among members of ASEAN-5. None of the ASEAN-5 countries support the Traditional Approach theory. Therefore, we can conclude that the changes in stock price which started from changes in exchange rate are not found in these 5 ASEAN countries.

Table 5. *ASEAN-5 Full Information BVAR Estimation (Malaysia, Indonesia)*

No	**Malaysia**					**Indonesia**		
	Exc. Rate cause		**Stock Price cause**			**Exc. Rate cause**	**Stock Price cause**	
	Stock Price		**Exc. Rate**			**Stock Price**	**Exc. Rate**	
a.	ΔSP		ΔER			ΔSP	ΔER	
b.	SC, HQ	AIC, FPE, LR	SC, HQ	AIC, FPE, LR	NWHAC	HQ, AIC, FPE, LR	NWHAC	HQ, AIC, FPE, LR
c.	1	3	1	3	7	6	7	6
d.	0.0796	0.0789	-0.0005	-0.0005	0.0425	0.0401	-0.3129	-0.3066
	(3.4602)*	(3.4225)*	(-10.5374)*	(10.4921)*	-19.039	-18.102	(-10.4741)*	(-10.3293)*
e.		0.0189		-3.32E-05	-0.0209	-0.0217	-0.0711	-0.0692
		(0.7959)		(-0.6564)	(-0.9196)	(-0.9561)	(-2.3353)**	(-2.2723)**
f.		0.0338		-0.0001	-0.1431	-0.1453	-0.0844	-0.0799
		-14.272		(-2.8455)*	(-6.2599)*	(-6.3713)*	(-2.7565)*	(-2.6211)*
g.					-0.0511	-0.0578	-0.0621	-0.0544
					(-2.2094)**	(-2.5311)**	(-2.0026)**	(-1.7754)
h.					-0.0261	-0.0271	-0.0729	-0.07
					(-1.1377)	(-1.1809)	(-2.3723)**	(-2.2842)**
i.					-0.0953	-0.0944	-0.041	-0.0392
					(-4.1486)*	(-4.1167)*	(-1.3337)	(-1.2772)
j.					-0.0426		-0.0533	
					-18.491		(-1.7279)	
k.	-104.548	-90.376	-0.1203	-0.1228	-0.0272	-0.0269	-0.1607	-0.1585
	(10.4447)*	(-0.8369)	(-5.3687)*	(-5.3402)*	(-1.6327)	(-1.6239)	(-7.1995)*	(-7.1204)*
l.		-60.419		-0.0029	-0.032	-0.0335	-0.0847	-0.0823
		(-0.5575)		(-0.1284)	(-1.901)	(-1.9908)**	(-3.7547)*	(-3.6533)*
m.		-85.118		-0.0656	-0.0097	-0.0114	-0.0497	-0.0476
		(-0.8074)		(-2.9194)*	(-0.5749)	(-0.6776)	(-2.1945)**	(-2.1068)**
n.					-0.0403	-0.042	-0.0087	-0.0051
					(-2.3826)**	(-2.4956)**	(-0.3824)	(-0.2276)
o.					-0.0281	-0.0288	-0.0237	-0.02
					(-1.6624)	(-1.7157)	(-1.0477)	(-0.8913)
p.					-0.0503	-0.0551	-0.0628	-0.0519
					(-2.9909)*	(-3.3955)*	(-2.7906)*	(-2.3901)**
q.					-0.013		-0.0206	
					(-0.7969)		(-0.9433)	
r.	1.6895 [0.7926] (a)		4.6593 [0.3241] (b)			0.9969 [0.9103] (c)	6.6042 [0.1583] (d)	
s.			4.2372 [0.3748] (b)			3.8628 [0.4249] (c)	2.1139 [0.7148] (d)	
t.			3.1544 [0.5323] (b)			3.2396 [0.5186] (c)	2.2244 [0.6946] (d)	
u.						6.7222 [0.1513] (c)	4.4336 [0.3505] (d)	
v.						5.0727 [0.2799] (c)	2.6061 [0.6258] (d)	
w.						2.4009 [0.6625] (c)	3.9416 [0.4140] (d)	
x.						3.5211 [0.4747] (c)		

Source: *Own calculations.*

Table 5. *(cont.) ASEAN-5 Full Information BVAR Estimation (Singapore, Thailand)*

No	Singapore				Thailand			
	Exc. Rate cause		**Stock Price cause**		**Exc. Rate cause**		**Stock Price cause**	
	Stock Price		**Exc. Rate**		**Stock Price**		**Exc. Rate**	
a.	ΔSP		ΔER		ΔSP		ΔER	
b.	HQ, SC, AIC, FPE	LR	HQ, SC, AIC, FPE	LR	SC, HQ	AIC, FPE, LR	SC, HQ	AIC, FPE, LR
c.	1	7	1	7	1	3	1	3
d.	0.0798	0.0562	-0.0005	-4.26E-05	0.0417	0.0412	-0.002	-0.0021
	(3.4602)*	(2.3516)**	(-10.5374)*	(-8.7073)*	-17.386	-17.049	(-10.1184)*	(-10.228)*
e.		-0.0184		-5.49E-06		-0.0211		-0.0003
		(-0.7577)		-11.043		(0.8487)		(-1.2839)
f.		0.0241		-6.8E-06		-0.0264		-0.0007
		(0.9916)		(-1.3754)		(-1.0683)		(-3.5429)*
g.		-0.0138		1.37E-05				
		(-0.5658)		(2.7515)*				
h.		0.0387		-2.35E-06				
		-15.898		(-0.4725)				
i.		-0.0457		1.44E-06				
		(-1.8763)		(0.2889)				
j.		0.0168		-3.53E-06				
		(0.6925)		(-0.7116)				
k.	-104.548	-1.924.828	0.1203	-0.0753	-100.162	-107.923	-0.0747	-0.0859
	(-1.0009)	(-1.6458)	(-5.3687)*	(-3.1479)*	(-3.5728)*	(-3.7323)*	(-3.1883)*	(-3.566)*
l.		-691.263		-0.0356		-17.896		-0.0383
		(-0.5887)		(-1.4849)		(-0.6142)		(-1.5764)
m.		1.129.845		-0.0031		36.359		-0.0129
		(0.9627)		(-0.1298)		-12.865		(-0.5479)
n.		-558.744		0.0094				
		(-0.4767)		(0.3941)				
o.		-891.459		0.0345				
		(-0.7607)		(-1.439)				
p.		-2.009.162		0.0186				
		(-1.7129)		(0.7757)				
q.		3.327.144		0.0419				
		(-2.8926)*		-17.804				
r.	1.6895 [0.7926] (e)		3.7278 [0.4441] (f)		3.5631 [0.4683] (g)		5.5999 [0.2311] (h)	
s.			3.0638 [0.5472] (f)				2.2995 [0.6809] (h)	
t.			6.0814 [0.1932] (f)				8.7314 [0.0682] (h)	
u.			2.2533 [0.6893] (f)					
v.			9.4985 [0.0498] (f)					
w.			1.8702 [0.7596] (f)					
x.			2.3585 [0.6701] (f)					

Source: *Own calculations.*

Table 5. (*cont.) ASEAN-5 Full Information BVAR Estimation (Philippines)*

No	**Philippines**				**Equation**
	Exc. Rate cause		**Stock Price cause**		
	Stock Price		**Exc. Rate**		
a.	ΔSP		ΔER		Dependent variable
b.	NWHAC	AIC, FPE, LR	NWHAC	AIC, FPE, LR	Criterion
c.	6	4	6	4	Lag structure
d.	0,0343	0.036	-0.0002	-0.0002	ΔSPt-1
	-13.333	(-1.4082)	(-3.7355)*	(-3.697)*	
e.	-0.0716	-0.0692	-5.51E-05	-4.75E-05	ΔSPt-2
	(-2.7809)*	(-2.6953)*	(-0.9357)	(-0.81)	
f.	-0.0437	-0.0409	-4.37E-05	-3.77E-05	ΔSPt-3
	(-1.6949)	(-1.5969)	(-0.7421)	(-0.6427)	
g.	-0.0572	-0.0603	-0.0001	-0.0001	ΔSPt-4
	(-2.2189)**	(-2.355)**	(-2.3479)**	(-2.1367)**	
h.	-0.0506		1.12E-07		ΔSPt-5
	(-1.9611)**		(-0.0019)		
i.	-0.0067		-8.50E-05		ΔSPt-6
	(-0.2617)		(-1.4443)		
j.					ΔSPt-7
k.	-332.807	-327.364	-0.0817	-0.0818	ΔERt-1
	(-2.9642)*	(-2.9256)*	(-3.1866)*	(-3.2031)*	
l.	-160.873	-150.659	-0.0332	-0.0275	ΔERt-2
	(-1.4207)	(-1.3371)	(-1.2817)	(-1.0684)	
m.	-86.391	-88.138	-0.0368	-0.0371	ΔERt-3
	(-0.7638)	(-0.7825)	(-1.4255)	(-1.4405)	
n.	-142.406	-133.321	-0.0359	-0.0302	ΔERt-4
	(-1.2598)	(-1.1925)	(-1.39)	(-1.1816)	
o.	137.031		-0.0247		ΔERt-5
	-12.136		(-0.9557)		
p.	-46.675		-0.0025		ΔERt-6
	(-0.4165)		(-0.0968)		
q.					ΔERt-7
r.	1.8113 [0.7704] (i)		3.0575 [0.5482] (j)		LM 1st lag order
s.	1.4943 [0.8277] (i)		6.5532 [0.1615] (j)		LM 2nd lag order
t.	2.6124 [0.6246] (i)		4.2592 [0.3721] (j)		LM 3rd lag order
u.	3.1864 [0.5271] (i)		9.0475 [0.06] (j)		LM 4th lag order
v.	4.2455 [0.3738] (i)				LM 5th lag order
w.	3.0843 [0.5438] (i)				LM 6th lag order
x.					LM 7th lag order
y.	-	-	-	-	LM white

Source: *Own calculations.*

*Note: * and ** indicated significant at the 0.01 and 0.05 level. the figure in round parenthesis are t-statistic.*
(a) 1st lag order for Malaysia, (b) 3rd lag order for Malaysia, (c) 1st lag order for Indonesia,
(d) 6th lag order for Indonesia, (e) 1st lag order for Singapore, (f) 7th lag order for Singapore,
(g) 1st lag order for Thailand, (h) 3rd lag order for Thailand, (i) 6th lag order for Philippine, (j) 4th lag order
for Philippine. the figure in round parenthesis are t-statistic. the figure in square parenthesis are prob. value.

Table 6. *ASEAN-5 Granger Non Causality Estimation*

Countries	**Null Hypothesis (H0)**	**F-statistics**	**Result**
Malaysia	DMER does not Granger cause DKLCI	0.4995 [0.6826]	accept H0
	DKLCI does not Granger cause DMER	40.0571 [4.E-19]*	reject H0
Indonesia	DIER does not Granger cause DIHSG	3.713 [0.0011]*	reject H0
	DIHSG does not Granger cause DIER	20.2031 [5.E-23]*	reject H0
Singapore	DSER does not Granger cause DSTI	1.7499 [0.186]	accept H0
	DSTI does not Granger cause DSER	76.5707 [5.E-18]*	reject H0
Thailand	DTER does not Granger cause DSETI	5.3102 [0.0012]*	reject H0
	DSETI does not Granger cause DTER	39.1825 [2.E-24]*	reject H0
Philippine	DPER does not Granger cause DPSEi	2.7777 [0.0257]*	reject H0
	DPSEi does not Granger cause DPER	4.5969 [0.0011]*	reject H0
Note: * indicated the rejection of the null hypothesis for Granger Causality for α:0,01			

Source: *Own calculations.*

For the case of Malaysia and Singapore, the interaction between the exchange rate and stock price going from stock prices to exchange rates which accepts the null hypothesis that the exchange rate (ER) does not affect the stock prices (SP). This indicates that changes in the economic situation of Singapore and Malaysia will affect directly towards bond's demand and supply which in turn lead to the movement of exchange rate in both countries.

One of the causes is because the exchange rates in these two countries are more responsive to capital market changes. The existence of investors' sense or expectations that are *"more sensitive"* to relocate their financial assets to achieve portfolio balance in the short term and long term indicates that speed of adjustment in the financial sector is better. This also shows that investors in these two countries are faster and more mature in dividing their asset portfolio between the placement of securities in the country and abroad. Is this a sign that people in these two countries are more literate about financial instruments is hard to say.

In addition, there are numerous factors which cause the Portfolio Balanced Approach Theory can be supported in two ASEAN-5 countries compared to the other namely an increase in domestic consumption as a result of current account conditions which also include an increase in imports of goods from abroad, foreign exchange demand causes a shift in the relative exchange rate against the domestic currency. This is why the exchange rate can be reflected in the balance of the current account. On the other hand, for Indonesia, the Philippines, and Thailand, the existence of independence causality between stock prices and the exchange rate is a signal that the exchange rate stabilization policy in these countries should be carried out in other channels such as inflation policy, foreign exchange reserves, real sector policy, determination of the amount of money circulating, or other lines.

6. Conclusion

The causality between exchange rates and stock prices has been widely debated over the past few decades. Traditional Approach hypothesizes the existence of the causality of the exchange rate against the stock prices, while the Portfolio Balance Approach indicates the condition of the exchange rate caused by the movement of stock prices. The condition of the ASEAN-5 financial system as an emerging economy is heavily influenced by fluctuations in the foreign economy, based on time series testing concluded that two of the five countries namely Malaysia and Singapore from ASEAN-5 support Portfolio Balance Approach, while there are independence causality among Indonesia, Thailand and the Philippines. A number of factors affect exchange rate, including stock market. Is the lack of support for one approach a sign of a country's capital market unfavorability is hard to say.

References:

Adjasi, C., Harvey, K.S., Agyapong, D. 2008. Effect of Exchange Rate Volatility on The Ghana Stock Exchange. African Journal of Accounting, Economics, Finance, and Banking, 3(3), 28-47.

Agrawal, G., Srivastav, K.A., Srivastava, A. 2010. A Study of Exchange Rate Movement and Stock Market Volatility. International Journal of Business and Management, 5(12), 62-73.

Akdogu, S.K., Birkan, O.A. 2016. Interaction between Stock Price and Exhange Rate in Emergin Market Economies. Research in World Economy, 7(1), 80-94.

Alagidede, P., Panagiotidis, Th., Zhang, X. 2010. Causal Relationship Between Stock Price and Exchange Rates. Stirling Economics, Discussion Paper 2010-05.

Ali, H.S., Mukhtar, U., Maniam, S.G. 2015. Dynamic Links between Exchange Rate and Stock Price in Malaysia: An Assymetric Cointegration Analysis. Journal of Economics and Political Economy, 2(3), 411-417.

Araghi, M.K., Pak, M.M. 2012. Assesing the Exchange Rate Fluctuation on Tehran Stock Market Price: A GARCH Application. International Journal Management Business Research, 2(2), 95-112.

Aslam, W. 2014. Relationship Between Stock Market Volatility and Exchange Rate: A Study of KSE. Journal of Public Administration, Finance and Law, 5, 62-72.

Bernard, H.J., Gabriele, E., Galati, B. 2000. Special Feature: The Co-movement of US Stock Market and The Dollar. Bis Quarterly Review, August.

Bilgili, F. 1998. Stationary and Cointegration Test: Comparison of Engle-Granger and Johansen Methodologies. MPRA, Paper no. 75967.

Elhendawy, E.O. 2017. Stock Price and Exchange Rate Dynamic: Empirical Evidence from Egypt. International Journal of Economics, Commerce, and Management, 5(1), 29-43.

Fredynandy, J., Zakayo, M., Kisava, S. 2018. The Relationship between Stock Price and Exchange Rate: The Focus on Dar Es Salaam Exchange Rate (DSE). Business and Economic Research, 8(1), 1-12.

Greene, W.H. 2012. Econometric Analysis, 7th Edition, Pearson, New York.

Ha-Tran, V. 2007. Do Stock Price in Ho Chi Minh City Trading Centre Have Unit Roots? A Discussion on Power of ADF Test with Unexpected Initial Value. Thesis at School of Economics, Kyoto University.

Hu, S. 2017. RMB Exchange Rate and Stock Return Interactions in Chinese Financial Market: Evidence of CNY, CNH-CNY Spread and Capital Flow Change. Thesis at Business Honors Program, NYU Shanghai.

Mgammal, M., Hussein, H. 2012. The Effect of Inflation, Interest Rates and Exchange Rates: A Stock Price Comparative Study Among Two GCC Countries. International Journal of Finance and Accounting, 1(6), 179-189.

Nurrohim, M. 2013. Analisis Kusalitas Volatilitas Nilai Tukar Mata Uang dengan Kinerja Sektor Keuangan dan Sektor Riil. Economics Development Analysis Journal, 2(4), 351-366.

Ooi, Ai-Yee, et al. 2009. Causality between Exchange Rate and Stock Price: Evidence from Malaysia and Thailand. International Journal of Business and Management, 4(3), 86-98.

Osterholm, P. 2003. Testing for Cointegration in Misspecified System-Monte Carlo Study of Size Distortions. Working Paper Series, Uppsala University.

Rahman, L., Uddin, J. 2009. Dynamic Relationship between Stock Price and Exchange Rates: Evidence from Three South Asian Countries. International Business Research, 2(2), 167-174.

Scwerth, G.W. 1989. Test for Unit-Root: Monte Carlo Investigation. Journal of Business and Economic Statistics, 7, 147-159.

Sjo, B. 2008. Testing for Unit Roots and Cointegration. Retrieved from https://www.google.com/url?sa=t&source=web&rct=j&url=https://pdfs.semanticscholar.org.

Smyth, R., Nandha, M. 2003. Bivariate Causality between Exchange Rate and Stock Price in South Asia. Applied Economics Letters, 10, 699-704.

Ssekuma, R. 2011. A Study of Cointegration Models with Applications. Thesis at University of South Africa.

Stavarek, D. 2005. Stock Price and Exchange in the EU and the USA: Evidence of Their Mutual Interactions. Czech Journal of Economics and Finance, 55(3-4), 141-161.

Suriani, S.M., Kumar, D., Jamil, F., Muneer, S. 2015. Impact of Exchange Rate on Stock Market. International Journal of Economics and Financial Issues, 5 (Special Issue), 385-388.

Tabak, B.M. 2016. The Dynamic Relationship between Stock Price and Exchange Rate: Evidence for Brazil. The Banco Central do Brasil, Working Paper, no 124.

Tudor, C., Popescu-Dutaa, C. 2012. On the Causal Relationship between Stock Return and Exchange Rate Change for 13 Developed and Emerging Markets. Procedia-Social and Behavioral Sciences, 57, 257-282.

Tursoy, T. 2017. Causality between Stock Price and Exchange Rates in Turkey: Empirical Evidence from the ARDL Bounds Test and a Combined Cointegration Approach. International Journal of Financial Studies, 5(8), 1-10.

Umoru, D., Asekome, O.M. 2013. Stock Price and Exchange Rate Variability in Nigeria: Econometric Analysis. European Scientific Journal, 9(25), 261-285.

Zubair, A. 2013. Causal Relationship between Stock Market Index and Exchange Rate: Evidence from Nigeria. CBN Journal of Applied Statistics, 4(2), 87-110.