Long Run Cointegration In Asean-4 Stock Market: What We Learned?

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ABSTRACT

ASEAN-4 is an emerging market that experienced promising developed financial sector in recent years. The interaction between stock prices and macroeconomic variables has been extensively researched by researchers. By using secondary monthly ASEAN-4 data from January 2009 to December 2017 and using the ARDL estimation, it was found that exchange rates and GDP had a long-term positive effect on stock prices. While inflation, current account, and GDP have no effect on stock price formation. It is also found that there are co-integration in the short and long term in four ASEAN-4 countries. To strengthen the results of co-integration, using "one to one" interactions concluded that inflation, current accounts and interest rates have a very small contribution to the share price in ASEAN-4.

Keywords: macroeconomic variables, stock price, ARDL, cointegration.

INTRODUCTION

The relationship between macroeconomic variables and stock prices has been extensively studied until now, various tests were conducted by researchers to find causality between macroeconomic variables and stock prices, one of the most popular theories is Arbitrage Pricing Theory (APT). Various findings suggest that the investigation surrounding this issue is far from satisfactory, the difficulty in determining the determinant factors affecting stock prices in APT approach brings its own challenges for researchers. Huberman and Wang (2005) suggest that based on economic intuition, researchers continously add new factors which are too numerous to mention in the relationship between stock prices and economic variables. Since there is no specific consensus of any determinant factor affecting stock prices, then its result many macroeconomic variables that can be checked in relation to the stock price itself. Even Reza et al. (2018) states that since there are changes in countries behavior in the trade sector, a definite relationship among the variables can not be held on this issue. ASEAN-4 as an emerging market that have potential land for investors to obtain a large yield, uncertainty in the global financial sector is currently characterized by a larger capital inflow to developing countries than any other region in the world.

The ability of developing countries to create and sustain their economic growth also causes the financial sector in these countries to be seen as more secure and stable. For examples, the economic growth of India and Indonesia in recent years have been a magnet for investors to invest in developing countries. Based on some reports in the long term conditions in developing countries can be said positive. Overall contribution of developing countries to global economic growth in 2015-2016 amounted to 58.15%. In 2017, the growth of Gross Domestic Product of Southeast Asia countries is quite encouraging where Indonesia reaching 5.1%, Cambodia 6.9%, Malaysia 5.9%, Philippines and Myanmar 6.7%, Vietnam 6.8% Thailand and Singapore respectively 3.9% and 3.6%. Based on data from the IMF and Word Bank, during the period 1990-2017 the average growth of exporters of commodities such as Malaysia and Indonesia amounted to 5.3%, while the growth of importers of commodities such as Thailand and the Philippines amounted to 4.8%.

The good prospect in the emerging market financial sector is in consequence of the macroeconomic factors that have been maintained in recent years. Despite strong export performance and strong domestic demand, some major economies in Asia such as China, Indonesia, Malaysia and Vietnam are conducting fiscal consolidation efforts in 2018. Historically, the interaction between macroeconomic variables and the financial sector has been studied by experts for few decades. Zubair (2013) using Granger Causality states that there is no relationship between monetary indicators (exchange rates and M2) before and during Nigeria's financial crisis. Wickremansinghe (2016) using emerging market data tested the relationship between macroeconomic variables and stock price during 1985 to 2004. It was concluded that there are a long-term and short-run relationship between stock prices and macroeconomic variables in Sri Lanka. Belgacem (2013) uses the macroeconomic variable announcement on French stock prices, concluding that the importance of information about the United States economy on the development of the world economy.

Bahloul et. al. (2017) with a sample of developed and developing countries found that during 2002-2014 the index of Islamic stocks in developed and developing countries was influenced by money supply and conventional stock returns both on high volatility and low volatility regimes, while other macroeconomic variables concluded did not affect index of Islamic stocks at high volatility regime. Although there is few research about interaction of stock price and macroeconomic variables on emerging markets that have identical characters in one region in Asia, but it still yet to be found how macroeconomic variables work to influence stock prices in exact way. This paper aims to see whether there is a long-term relationship between macroeconomic variables and stock prices in ASEAN-4 countries. This will help us to understand the channel and how macroeconomic force influenced the stock price. The remainder of this paper will be presented as follows: section two is a literature review, section three provide research methodology, section four discuss the results and finally the section five is conclusions of the paper.

LITERATURE REVIEW

There is one big theory in asset pricing theory that underlies macroeconomic variable relationship and stock price namely Arbitrage Pricing Theory (APT). This theory states that the formation of stock price is not only influenced by single factor β risk as what as Capital Asset Pricing Model (CAPM) told at the beginning of asset pricing model development. Although some experts argue that CAPM is more intuitive and theoretically easy to apply, however there are several reasons why APT is seen as having an advantage over CAPM. First, APT does not require assumption of distribution from asset return. Secondly, we no need the strong assumptions about utility like in the CAPM derivation. Third, with consider some risk sources

in APT so that the forecast will be better than CAPM. Finally, there is no need for the special role of an efficient market portfolio as in the CAPM theory (Rasiah and Kim, 2011).

The formation of stock prices in APT can be said to be influenced by macroeconomic factors. Until now a lot of economic factors that have been analyzed by experts in relation to stock prices in various capital markets in the world. Some variables that are often associated with stock prices include exchange rates, inflation, interest rates, current accounts, GDP, oil prices, etc. Because APT considered many factors that affected stock market,it also seen asa weakness of APT that not considered have a good theoretical foundation on the habits of investors. Some experts believe that it is dangerous to focus only on mean-beta space as some studies show that the generating return asset process is also influenced by other factors such as Earning Price Ratio, firm size, etc. (Rasiah and Kim, 2011). First attempts to examine the interaction between macroeconomic variables and stock returns were performed by Chen, Roll, and Ross (1986) who found that stock returns in the US were also influenced by macroeconomic factors.

Further studies using macroeconomic variables show some empirical findings that vary from one another. Yau and Nieh (2009) with non-linear regression stated that there is a long-term relationship between the New Taiwan Dollar (NTD) exchange rate against Japanese Yen (JPY) with stock prices in Japan and Taiwan from January 1991 to March 2008. Their research also found that there is a long-term cointegration between the NTD / USD exchange rate against the stock price in Taiwan. Umoru and Asekome (2013) conclude that there is a bidirectional cointegration and causality between Naira's exchange rate against US Dollar and the stock price in Nigeria. These results support flow and stock-oriented economic theory. Sharma and Mahendru (2010) using weekly data found that there was an impact between exchange rates and gold prices on stock prices during January 2008 to January 2009 in India. Rahman and Uddin (2009) found no cointegration and causality among stock prices and exchange rates in the three South Asian countries namely Bangladesh, India and Pakistan.

While Parsva and Tang (2017) found a biderectional causality between exchange rates and stock prices in three of the four Middle East countries namely Iran, Oman and Saudi Arabia during January 2004 and December 2011, Quadir (2012) found that although there was a positive relationship between macroeconomic variables i.e treasury bill interest rate and production industrial sector on stock returns in Dhaka Exchange Rate during January 2000 to February 2007, but he concluded no significance among the variables studied. Patel (2012) states that in the long run there is a relationship between macroeconomic variables and stock indices in India from January 1991 to December 2011. Exchange rates, industrial production indices, inflation, money supply, and commodity prices such as gold, oil and silver is also an important factor in determining the stock index. Ouma and Muriu (2014) concluded that during 2003-2013 using APT and CAPM, money supply, exchange rates, and inflation affected stock returns in Kenya, while the interest rate does not affect the stock return. From many studies, a general conclusion can be drawn is from Pilinkus (2011) that stated investors need to pay attention to the different effects of macroeconomic variables on stock indices as a result of speculative motives. He stated that the relationship between stock index and macroeconomic variables is more reliable in the long run.

METHODOLOGY

In this paper we use monthly data of stock price and five macroeconomic variables i.e exchange rate, inflation, interest rate, current account, and GDP from January 2009 until December 2017. Stock price data accessed from investing.com, while for macroeconomic variables obtained from central banks and statistical authority of each country. To ensure

validity data, we also check data from other sources such as from the World Bank, IMF, and Asian Development Bank (ADB) reports. To estimate the interaction between stock prices and macroeconomic variables in ASEAN-4 countries, we will follow the following equation:

$$SP_t = \alpha_0 + \alpha_1 ExR_t + \alpha_2 Inf_t + \alpha_3 CuA_t + \alpha_4 InRt + \alpha_5 GDP_t + e_t \ldots\ldots\ldots (1)$$

Where α_0 is a constant, α_i is the coefficient where i = 1, 2, ..., n. SP is the stock price, ExR is the exchange rate of each country against US Dollar, while Inf is inflation, CuA is current account, InR and GDP is the interest rate and Gross Domestic Product, and e_t is error term. The existence of different order of integration in variables that we estimate can be used by Autoregressive Distributed Lag Model (ARDL) which can we write in the following form:

$$SP_t = \beta_0 + \gamma_0 ExR_t + \delta_0 Inf_t + \varphi_0 CuA_t + \phi_0 InR_t + \theta_0 GDP_t + \sum_{i=0}^{n} \beta i SPt - i + \sum_{i=0}^{n} \gamma i ExRt - i + \sum_{i=0}^{n} \delta i Inft - i + \sum_{i=0}^{n} \varphi i CuAt - i + \sum_{i=0}^{n} \phi i InRt - i + \sum_{i=0}^{n} \theta i GDPt - i + \varepsilon_t \ldots\ldots\ldots (2)$$

From equation (2), we can find for the cointegration of ARDL with following equation:

$$\Delta SP_t = \Psi_0 + \sum_{i=0}^{p} Bi\Delta ExRt - i + \sum_{i=0}^{p} Ci\Delta Inft - i + \sum_{i=0}^{p} Di\Delta CuAt - i + \sum_{i=0}^{p} Ei\Delta InRt - i + \sum_{i=0}^{p} Fi\Delta GDPt - i + \rho_1 SP_{t-1} + \sigma_2 ExR_{t-1} + \tau_3 Inf_{t-1} + \omega_4 CuA_{t-1} + Y_5 InR_{t-1} + \psi_6 GDP_{t-1} + \zeta_t \ldots\ldots (3)$$

Where Δ is the first difference operator, B_i, C_i, D_i, E_i, F_i are variable coefficients, p is lags length, and ζ_t is an error term. By using cointegration of ARDL, we can estimate the long run of the ARDL equation as follows:

$$SP_t = \eta_0 + \eta_1 ExR + \eta_2 Inf + \eta_3 CuA + \eta_4 InR + \eta_5 GDP + \xi_t \ldots\ldots\ldots (4)$$

We use unrestricted Error Corection Model in this paper to see the dynamic short term parameters of the respective ARDL equations of ASEAN-4 countries by the formula:

$$\Delta SP_t = \lambda_0 + \sum_{i=0}^{p} \lambda 1i\Delta SPt - i \sum_{i=0}^{p} \lambda 2i\Delta ExRt - i + \sum_{i=0}^{p} \lambda 3i\Delta Inft - i + \sum_{i=0}^{p} \lambda 4i\Delta CuAt - i + \sum_{i=0}^{p} \lambda 5i\Delta InRt - i + \sum_{i=0}^{p} \lambda 6i\Delta GDPt - i + \pi ECT_{t-1} + v_t \ldots\ldots\ldots (5)$$

Where π is the coefficient of ECT showing dynamic short term cointegration and adjustment speed. ECT coefficients with negative and significant values indicate there is short-term cointegration in the equations that we estimate.

FINDINGS AND DISCUSSION
Descriptive Statistics and Unit Root Test
As in the estimation of time series equations, the interaction between stock prices and macroeconomic variables in this paper is done by testing the stationarity between variables. In this paper to sharpen the conclusions of the paper, we choose and examine the countries that categorized of emerging markets and developing economies based on the IMF classification, which means that the countries we examine have similar characteristics to each other. Differences in estimates will lead us to new perspectives on causality between macroeconomic variables and stock prices in emerging markets in some Southeast Asia countries. Table 1 is a descriptive statistic of ASEAN-4 countries.

Table 1. ASEAN-4 Descriptive Statistics

Variable	Mean			
	Philippines	Malaysia	Indonesia	Thailand
Stock Price	5709,024	1589,961	4248,688	1237,894
Exchange Rate	45,3834	3,5177	11107,99	32,6949
Inflation	3,0472	2,2733	0,4029	1,258
Current Account	0,6063	4,4309	-3,1526	4,2354
Interest Rate	3,7939	2,8843	6,4468	2,6551
GDP	167577	239902,5	19995	8872816
Standard Deviation				
Stock Price	1852,407	233,1736	1134,89	338,7687
Exchange Rate	2,7088	0,473	1873,054	1,8968
Inflation	1,4199	1,3435	0.5334	2,2409
Current Account	0,5545	2,5605	3,7211	5,3438
Interest Rate	0,4868	0,3813	1,0116	0,6833
GDP	356921	33186,23	391073,8	757617,4
Max Value				
Stock Price	8558,42	1882,71	6355,65	1753,71
Exchange Rate	51,4049	4,4599	14406,03	36,1347
Inflation	7,2	4,921	3,29	4,292
Current Account	1,908	9,06	3,44	16,8
Interest Rate	5	3,25	8,75	3,5
GDP	2344536	308078	2552217	10206201
Min Value				
Stock Price	1825,090	872,55	1285,48	431,5
Exchange Rate	40,6814	2,9868	8528,203	29,0646
Inflation	0	-2,48	-0,45	-4,378
Current Account	-1.3	0,5	-10,13	-6
Interest Rate	3	2	4,25	1,25
GDP	0	178543,5	0	7657100
Observation: 108				

Characteristic				
Stock Exchange	Philippine SE	Bursa Malaysia	Indonesia SE	SE of Thailand
Name index	PSEi	KLCI	IHSG	SETI
Number Listed Companies	265	903	537	656
Total Volume Traded 2016 (billion USD)	37	106	92	329
Market Capitalisation 2016 (billion USD)	240	360	426	433
Clasification by IMF -Emerging Market & Developing Economies	yes	yes	yes	yes
-Emerging & Developing ASIA	yes	yes	yes	yes

Note: processed by author.

To test the stationarity of variables in this paper, we will use the Phillips-Perron (PP) test with the null hypothesis non stationary variable or have the unit root and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. We do not explain the unit root test methodology in this paper to compress the discussion. By using the Akaike's Information Criteria (AIC), table 2 presents the results of PP unit root test and KPSS between stock price and macroeconomic variables. From table 2 it was found that from four ASEAN-4 countries, variables stationary at different degrees i.e at I (0) and I (1), no variable was found to be integrated in I (2). This means that we can apply the ARDL approach to examine the effect of stock prices and macroeconomic variables.

Table 2. ASEAN-4 Unit Root Test

Variable	PP Test				KPPS Test				Countries
	Level		1st diff		Level		1st diff		
SP	-1,4539	(1)	-9,7774*	(1)	1,1409	(9)	0,1057***	(1)	
ExR	-0.5343	(6)	-8,2151*	(13)	0,4494**	(9)	0,4633*	(6)	
Inf	-3,0483**	(3)	-6,4053*	(3)	0,7821	(8)	0,1318***	(3)	Philippines
CuA	-1,8569	(7)	-7,6139*	(13)	0,3182***	(7)	0,298***	(12)	
InR	-2,2092	(5)	-9,4537*	(4)	0,7711	(8)	0,0892***	(5)	
GDP	-4,8868*	(0)	-9,5986*	(8)	1,3069	(8)	0,257***	(8)	
SP	-3,8362*	(11)	-10,5922*	(0)	0,9424	(8)	0,5495*	(2)	
ExR	-0,6339	(3)	-6,9781*	(2)	0,7556	(9)	0,2753***	(3)	
Inf	-3,0611**	(2)	-6,4509*	(4)	0,3788**	(7)	0,1028***	(0)	Malaysia
CuA	-1,5001	(0)	-4,0247*	(9)	1,0664	(8)	0,0952***	(0)	
InR	-1,3725	(5)	-12,5624*	(6)	0,7639	(9)	0,1265***	(5)	
GDP	0,3787	(5)	-5,0594*	(11)	1,1974	(9)	0,0815***	(5)	
SP	-1,8407	(4)	-9,6241*	(2)	1,1871	(8)	0,1682***	(2)	
ExR	-0,2664	(5)	-8,255*	(5)	0,9447	(9)	0,3763**	(5)	
Inf	-6,8532*	(37)	-19,0946*	(20)	0,1563***	(39)	0,0913***	(20)	Indonesia
CuA	-1,4355	(4)	-4,6058*	(29)	'0,6639*	(9)	0,094***	(5)	
InR	-1,6859	(6)	-6,5141*	(1)	0,2572***	(8)	0,1846***	(6)	
GDP	-5,6497*	(6)	-10,2541*	(0)	1,2917	(8)	0,3192***	(0)	
SP	-1,8604	(1)	-9,0641*	(1)	1,049	(9)	0,1632***	(1)	
ExR	-1,6063	(2)	-6,3421*	(7)	0,4326**	(9)	0,2601***	(1)	
Inf	-1,9317	(2)	-8,4112*	(0)	0,7338*	(8)	0,0555***	(1)	Thailand
CuA	-1,3544	(7)	-4,2908*	(21)	0,9343	(8)	0.1070***	(9)	
InR	-1,2912	(6)	-8,8720*	(4)	0,6679*	(9)	0,1194***	(6)	
GDP	0,3938	(8)	-2,9817**	(3)	1,1694	(9)	0,0897***	(8)	

Note: *, **, and *** indicates significant at 1%, 5%, and 10% level. The parenthesis are a lag length based on Akaike's Information Criteria (AIC).

The ASEAN-4 Cointegration Test
After the unit root test performed, the bound cointegration test of ARDL is applied to see the cointegration between stock prices and macroeconomic variables. One of the advantages of ARDL is that it can be applied to equations where there are different degrees of integration between the variables. Another requirement is ARDL can not be performed if there are stationary variables on I (2). Cointegration test results can be seen in table 3 with the dependent variable is the stock price (SP). In this test, As in the unit root test, lag length for depedent variables and regressors we choose by using AIC criteria for Philippines, Malaysia, Indonesia, and Thailand. To avoid the problem of autocorrelation, for Thailand we use the rule oft humbs lags 10. Brandt and Williams (2007) stated that for the rule of thumbs, the

autoregressive model must include enough lag to capture the cyclical phenomena in the data. For monthly and quarterly data there are usually monthly cycles that carried over from year to year and month to month, so to strengthen the estimates it should be possible used lag 8 or 10 to solve the problem. The bound test concludes there is the long-term cointegration of four ASEAN-4 countries where the F-statistic value is greater than the critical value of upper bounds I (1) of Pesaran, Shin, and Smith (2001).

Table 3. Bounds Test of Cointegration ASEAN-4

Model:	FSP(SP|ExR, Inf, CuA, InR, GDP)Philippines				FSP(SP|ExR, Inf, CuA, InR, GDP)Malaysia			
F-Statistics (Bound Test)	3.1458*				4.2154*			
Critical Values	1%	2.50%	5%	10%	1%	2.50%	5%	10%
Upper Bounds I(1)	3.06	2.7	2.39	2.08	4.15	3.73	3.38	3
Lower Bounds I(0)	4.15	3.73	3.38	3	3.06	2.7	2.39	2.08
k	5				5			
Lag length	(5,5)				(8,8)			
R²	0.3658				0.3385			
Adj. R²	0.2625				0.2333			
F-Statistics	3.5428				3.2171			

Model:	FSP(SP|ExR, Inf, CuA, InR, GDP)Indonesia				FSP(SP|ExR, Inf, CuA, InR, GDP)Thailand			
F-Statistics (Bound Test)	4.1062*				3.7522*			
Critical Values	1%	2.50%	5%	10%	1%	2.50%	5%	10%
Upper Bounds I(0)	3.06	2.7	2.39	2.08	3.06	2.7	2.39	2.08
Lower Bounds I(1)	4.15	3.73	3.38	3	4.15	3.73	3.38	3
k	5				5			
Lag length	(6,6)				(10,10)			
R²	0.3317				0.5915			
Adj. R²	0.2341				0.4646			
F-Statistics	3.3982				4.6591			

Note: * indicates significant at 1% level.

For the short term it is concluded from the four ASEAN-4 countries there is a short-term cointegration where ECT_{t-1} values are negative and significant at 1% level. This indicates that the presence of disequilibrium at current time will be corrected in the next month for each ASEAN-4 country. For Philippines, 23.24% disequilibrium at current time will be corrected in the next month.While Malaysia, Indonesia, and Thailand are 18.54%, 14.12%, and 11.16% respectively. Table 4 is an ARDL with error correction model and long-term estimation of ASEAN-4. From the long-term equation, it is found that exchange rate and GDP have a significant effect on stock prices in all ASEAN-4 countries. While other variables have no effect, except current account for Malaysia.

Table 4. ARDL Cointegration for ASEAN-4

Estimation 1: ARDL with ECM

Variable	Dependent Variable = SP			
	Philippines	Malaysia	Indonesia	Thailand
ΔSP_{t-1}	-0.0902	-0.2018		-0.2997
	(-0.8994)	(-1.8338)***		(-2.7755)*
ΔSP_{t-2}	0.0576			-0.1941
	(0.6132)			(-2.1708)**
ΔSP_{t-3}	0.194			
	(2.0419)**			
ΔExR	-210.9369	-242.0652	-0.3614	-86.6304
	(-4.9936)*	(-4.0786)*	(-4.1896)*	(-6.8881)*
ΔExR_{t-1}		73.9366		
		(0.7863)		
ΔExR_{t-2}		-14.9266		
		(-0.1613)		
ΔExR_{t-3}		-54.4877		
		(-0.6106)		
ΔExR_{t-4}		-104.9151		
		(1.898)***		
ΔInf	-102.1008	0.7396	19.1263	15.9805
	(1.7162)***	(0.1762)	(0.6023)	(3.0061)**
ΔInf	-13.0216		-54.7778	
	(-0.136)		(-1.5084)	
ΔInf	42.3244		-83.6278	
	(0.4637)		(-2.2902)*	
ΔInf	-73.2492		116.3183	
	(-1.3056)		(3.3794)*	
ΔInf			-56.1215	
			(-1.6123)	
ΔCuA	36.8899	-4.7725	-5.6435	-4.6962
	(0.8188)	(-1.6409)	(-0.9084)	(-1.6195)
ΔInR	-35.8612	-33.3957	9.9298	31.6267
	(-0.4843)	(-1.4274)	(0.4386)	(0.5118)
ΔInR_{t-1}				-40.3742
				(-0.4197)
ΔInR_{t-2}				-94.7006
				(-1.4571)
ΔGDP	0.0006	0.0014	0.0001	0.00004
	(0.9708)	(0.7562)	(0.0425)	(0.0887)
ΔGDP_{t-1}	-0.0014	-0.0035	0.0044	-0.001
	(-2.1806)**	(-1.7168)***	(1.8853)***	(-0.8856)
ΔGDP_{t-2}	-0.00009		-0.0038	0.0002
	(-0.5389)		(-3.0091)*	(0.2289)
ΔGDP_{t-3}			-0.0001	0.00002
			(-1.1593)	(0.0172)
ΔGDP_{t-4}			0.0002	-0.0009
			(2.1561)**	(-0.8004)

	Philippines	Malaysia	Indonesia	Thailand
ΔGDPt-5				0.0009
				(0.8071)
ΔGDPt-6				-0.001
				(-0.9233)
ΔGDPt-7				0.0014
				(1.3446)
ΔGDPt-8				0.0005
				(0.4872)
ΔGDPt-9				-0.001
				(-2.0751)**
ECTt-1	-0.2324	-0.1854	-0.1412	-0.1168
	(-3.6343)*	(-2.9064)*	(-2.5942)*	(-1.6708)***
Estimation 2: Long Run Coeficcients				
	Philippines	Malaysia	Indonesia	Thailand
C	2706.4962	1955.7479	3638.6282	2089.0586
	[0.3427]	[0.0007]*	[0.094]***	[0.1935]
ExR	223.2993	-408.0369	-0.4628	-108.7932
	[0.0000]*	[0.0000]*	[0.0195]*	[0.0623]***
Inf	76.4536	3.9908	172.5932	136.7661
	[0.5237]	[0.8582]	[0.7909]	[0.1874]
CuA	158.7245	-25.7486	-39.9732	16.563
	[0.3829]	[0.0913]***	[0.3657]	[0.4376]
InR	-154.2986	-180.1752	70.3327	-104.1137
	[0.6348]	[0.2073]	[0.6537]	[0.4288]
GDP	0.0081	0.0074	0.0064	0.0008
	[0.0000]*	[0.0003]*	[0.0002]*	[0.0063]*

Note: *, **, and *** indicates significant at 1%, 5%, and 10% level.
Round parenthesis show t-statistics, square parenthesis indicates prob. Value.

Stability and Diagnostic Check
Diagnostic tests for serial correlation, heteroskedasticity, and normality tests can be seen in Table 5 where we conclude there is no time series problem in our estimation. Ramsey Reset test also applied with the null hypothesis the model has been specified correctly. For four countries, we accept the null hypothesis which concludes that there is no misspecified problem in our equation.

Table 5. Stability Diagnostic Check for ASEAN-4

Countries	BG$_{sc}$	BPG$_{ht}$	JB$_{nt}$	Ramsey Reset Test
Philippines	7.6934 (0.174)	15.6381 (0.5496)	2.9969 (0.2235)	0.0977 (0.7554)
Malaysia	6.0288 (0.644)	23.0449 (0.0595)	3.8782 (0.1438)	0.8992 (0.3456)
Indonesia	5.6307 (0.4658)	16.9958 (0.4547)	1.8559 (0.3954)	2.9277 (0.0591)
Thailand	14.3844 (0.1562)	31.8092 (0.1042)	1.0848 (0.5814)	0.1293 (0.7202)

Note: BG$_{sc}$, BPG$_{ht}$, and JB$_{nt}$, is a Breusch-Pagan serial correlation, Breusch-Pagan-Godfrey heteroskedasticity, and Jarque-Bera normality test. Round parenthesis show prob. Value.

The interesting result from the long-term findings from the ASEAN-4 countries we found a similar failure pattern on the inflation, interest rate, and current account on average in three of the four ASEAN-4. So to corroborate our previous results, in this paper we will estimate the influence of each variable of inflation, current account, and interest rate in "one for one" sceme against stock price by bivariate analysis. For efficiency, the unit root test and cointegration results are not shown in this paper. From the cointegration test of Engle-Granger and Phillips-Ouliaris concluded that there is no cointegration in three ASEAN-4 countries namely Philippines, Indonesia, and Thailand. While for Malaysia because it is concluded that there is cointegration so we will use ECM compared to autoregressive bivariate (BVAR) in Phillippines, Indonesia, and Thailand. We can write BVAR equations for each country as follows:

$$x_t = S_0 + \sum_{j=1}^{p} g_j x_{t-j} + \sum_{j=1}^{p} h_j y_{t-j} + u_{xt} \ldots\ldots (6)$$
$$y_t = \kappa_0 + \sum_{j=1}^{p} i_j x_{t-j} + \sum_{j=1}^{p} j_j y_{t-j} + u_{yt} \ldots\ldots (7)$$

Table 6 is a variance decomposition with the stock price is dependent variable. From the result of variance decomposition we can know whether the contribution of regressor is too small or not to influenced the formation of stock price.

**Table 6. Contribution Inf, CuA, and InR on SP**

Period	Variance Decomposition of SP										
	Philippines			Malaysia		Indonesia			Thailand		
	Inf	CuA	InR	Inf	InR	Inf	CuA	InR	Inf	CuA	InR
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0002	0.2189	0.0305	0.1493	0.2042	3.13	0.1498	0.5203	0.0001	0.0042	1.1454
3	0.0556	0.5117	0.0965	0.1166	0.1453	4.599	0.1029	1.1194	0.0004	0.1086	1.4388
4	0.2867	0.7785	0.193	0.8502	0.1403	3.2973	0.0785	1.6873	0.0007	0.4985	1.7909
5	0.7209	0.9956	0.3153	2.9157	0.2263	4.9835	0.0662	2.2139	0.0012	0.1307	1.7824
6	1.3127	1.1653	0.4594	5.9439	0.4114	7.9097	0.0725	2.7095	0.0017	1.6033	1.7757
7	1.9915	1.2964	0.6215	9.259	0.6942	9.1798	0.1288	3.1843	0.0024	2.2114	1.9205
8	2.6924	1.3982	0.7984	12.3671	1.0696	10.1335	0.1956	3.6459	0.003	2.9056	2.0119
9	3.3692	1.4782	0.9872	15.0431	1.5308	10.2661	0.2584	4.0992	0.0038	3.5795	2.0858
10	3.9949	1.542	0.1853	17.2472	2.0699	10.2925	0.2749	4.5472	0.0045	4.0639	2.0264
Diagnostic Test											
p	2	2	1	2	1	6	6	2	1	7	6
χ^2_{sc}	0.9618	0.1169	0.767	0.5222	0.1072	0.9946	0.6433	0.0384	0.1396	0.8548	0.2308
	0.7066	0.4892	-	0.6922		0.7433	0.7277	0.2384		0.4356	0.6858
						0.1349	0.0783			0.0000	0.6938
						0.3732	0.2126			0.0786	0.0991
						0.5236	0.4205			0.2917	0.6713
						0.3903	0.0069			0.0019	0.1727
										0.4272	
χ^2_{ht}	-	0.1529	0.4695	-	0.9635	0.3628	0.4599	-	0.0258	0.2985	-

Note: p is lag length, χ^2_{sc} is serial correlation test, χ^2_{ht} is a heteroskedasticity test based on bivariate analysis "one for one" regressors against SP.

From table 6 it can be concluded even at the end of the tenth period, the contribution of regressors has increased but their amounts is very small to influence the formation of stock price in ASEAN-4 countries. This finding strengthen our previous result. Finally, the test of cusum and cusumq we applied to test the stability of the model that we propose. It is seen that from ASEAN-4 model, we conclude that our equation has fulfilled the diagnostic test and also the stability test, where cusum and cusumq are within the 5% significance limit.
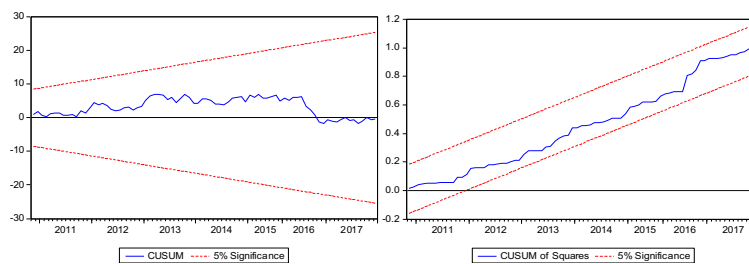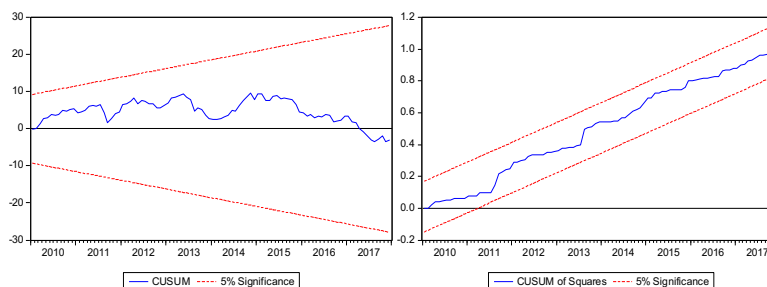
(a) Philippines Cusum dan Cusumq
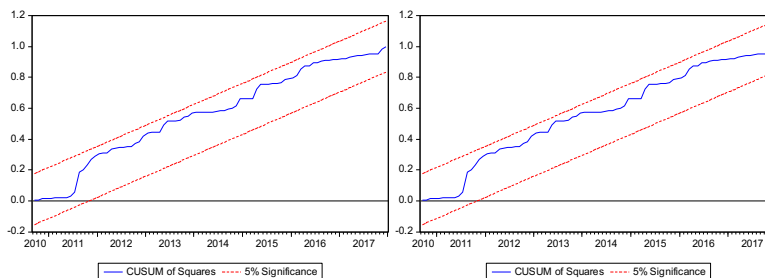
(b) Malaysia Cusum dan Cusumq
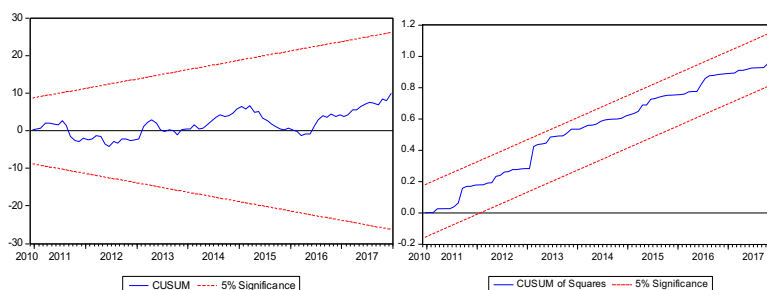
(c) Indonesia Cusum dan Cusumq

(d) Thailand Cusum dan Cusumq

CONCLUSION AND SUGGESTION

The effect of macroeconomic variables on stock prices is much debated. Research on this issue in countries that using the IMF classification is still limited. Given the similarity of macroeconomic characteristic in ASEAN-4 countries namely Philippines, Malaysia, Indonesia, and Thailand also resulted similar findings around causality the macroeconomic variable and stock prices. In addition to short and long-term cointegration for all ASEAN-4 countries, exchange rates and GDP in the long run strongly indicate a significant effect on stock prices.While other macroeconomic variables such as inflation, current accounts and GDP do not show strong evidence to influence the stock price formation. By applying the "one to one" scheme, inflation, current accounts, and interest rates concluded play a small role among other macroeconomic variables. The very small contribution is an initial indication of the failure of some macroeconomic variables in explaining the force of the capital market. The important question now: do we excessively to modeled the capital markets through many macroeconomic forces?, or do we have to go back to CAPM?.

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