### Domestic and Foreign Shocks and the Indonesian Stock Market: Time Series Evidence

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#### Abstract

The economy of Indonesia was particularly hard hit by the financial crisis of 1998. Policymakers believe that Indonesia's economy is vulnerable to capital flight in response to foreign source shocks. Understanding the impact of domestic and foreign source shocks on the Indonesian stock market is important for prudent management of the Indonesia's macroeconomy. This paper examines both short- and long-run relationships between domestic and foreign source shocks to the Jakarta Composite Stock Market Index (JCI). We find evidence that the JCI is cointegrated with several domestic macroeconomic variables. Further, we estimate an error correction model to identify the long-run equilibrium relationship between the JCI and domestic and foreign source macroeconomic shocks. We find that the Indonesian-dollar exchange rate has bidirectional influences on the JCI. In addition to domestic macroeconomic variables, we report evidence that the JCI is cointegrated with the stock markets. We find no evidence, however, of cointegration among the JCI and the U.S. and Japanese stock markets, suggesting that the JCI is influenced by regional stock markets. We also estimate an impulse response function to simulate the effect of domestic and foreign source shocks on the JCI.

Keywords: Cointegration, Granger Causality, Southeast Asian Stock Markets.

# **I. Introduction**

Over the past several decades, emerging countries have experienced persistent and high rates of economic growth. While many factors explain economic growth, trade and capital market liberalization have played an important role. The Institute of International Finance (2012) estimates that net private capital flowing into emerging economies will reach \$746 billion in 2012 and could increase to \$893 billion in 2013. More than half of the capital flows are in the form of equity investments which includes direct and portfolio investment in stock markets. Stock markets attract investors not only from within the host country but also from offshore. Stock markets encourage capital accumulation and act as a channel for the efficient allocation of capital (Sok-Gee, 2010). As more investors become involved in stock markets, the amount of capital available increases. Capital is then used by companies to support their activities leading to positive economic developments in the host country.

However, portfolio investment, including stock market investments, does not come without attendant risks. International capital flows, particularly portfolio investment, create volatility in financial markets. For example, according to the World Bank, total market capitalization of global stock markets before the 2008 global financial crisis reached \$64 trillion. This amount was almost halved by the 2008 financial crisis. In the three years following the crisis, stock markets have partially recovered, reaching \$45 trillion of market capitalization by the end of 2011. Stock markets continue to experience relatively high volatility, creating concerns for both policymakers and investors.

The common belief among Indonesian policymakers is that, in addition to movements of domestic macroeconomic variables, large advanced countries' stock markets, particularly the Japanese and U.S. stock markets, influence the Indonesian stock market. The objective of this research is to empirically gauge the relationship between the Indonesian stock market index, domestic macroeconomic variables, regional stock markets, and advanced countries' stock markets. Using monthly data covering the period from January 1997 to December 2011, we conduct cointegration and Granger causality tests to identify interconnections among the Jakarta Composite Stock Index (JCI), domestic macroeconomic variables, regional stock market indexes and advanced market stock indexes. We also estimate impulse response functions to understand the reaction of the Indonesia stock market index to random shocks to the independent variables. For domestic source shocks, we find evidence that several variables play important roles in explaining movements in the Indonesian stock market index. These variables show bidirectional causality, suggesting a complementary relationship among them. Contrary to popular perceptions, we find that shocks from advanced country stock markets, namely the Japanese and U.S. stock markets, do not have a statistically significant effect on the Indonesian stock market index, while shocks from regional stock markets have a statistically and economically significant effect on the Indonesian stock market index. These findings have important implications for economic surveillance and macroeconomic management.

The remainder of this paper is organized as follows. The following section provides some background on the 1998 and 2008 financial crises and their impact on Southeast Asian stock markets and Indonesia's real economy. Section III describes the data used for this study. Section IV describes the empirical model, and Section V provides a summary of the empirical results. Section VI concludes.

### **II. Background**

Price changes in stock markets have the power to influence real economic activity and act as a channel of monetary transmission. Al-Jafari (2011) emphasizes that economic variables not only affect but are also affected by stock prices. The positive growth effects facilitated by stock markets are desirable; whereas, the adverse volatility effects are best avoided. For large developed countries, the effect of financial market volatility are fairly modest; while for emerging economies, the effects can be substantial. In the case of the 1997/98 financial crisis, for example, the sudden depreciation of several Southeast Asian currencies triggered a crisis that spread throughout the region and adversely affected many developing and transition countries.

The source of the crisis is often attributed to current account imbalances in the region. However, the influence of net capital outflows from regional stock markets and the resulting contagion effects should not be discounted as potential explanations of the crisis. Woo *et al.* (2000) contend that the fact that the five countries hardest hit by the crisis (Indonesia, Malaysia, Thailand, Philippines, and South Korea) are in the same geographical region and experienced currency crises within the same year tend to support the financial contagion explanation of the crisis.

Figure 1 shows that stock market profiles of countries in the region are similar, but the stock market profiles in Japan and the U.S. differ from those in Southeast Asia. As the crisis deepened, the five Southeast Asian countries stocks market indexes follow a similar trend. The U.S. and European stock market indexes, however, followed a different trend. In addition, Thailand's stock market falloff precedes the decline of other indexes in the region highlighting where the first symptoms of currency depreciation began. Given the depreciation of local currencies as

pictured in Figure 2, foreign investors may have decided to sell their investment to avoid the resulting loss the value of their investments thereby deepening the regional decline in stock market prices. The result was a capital outflow in portfolio investments in the region, a decline in stock market indexes, and further depreciation in regional currencies. King (2001) contends that the devaluation of Thailand's Baht and the government's broken promise to bailout financial institutions led foreign institutional investors to reassess the risks of investments in the country. This risk reassessment also affected other countries in the region. Combined with failing banking sectors, the region plunged into a deep economic recession.

Corsetti *et al.* (1999) state that one view regarding the 1997 crisis is that sudden shifts in market expectations and confidence were the key sources of the initial financial turmoil, its propagation over time and regional contagion. Comparable conditions happened again in 2008 (Figure 3) due to the global financial crisis. Many stock market indexes declined together during the crisis period. The difference between the 2008 financial crisis and the one in 1998 is that in the case of the former the contagion was isolated to emerging markets; whereas, in the case of the latter, both advanced and emerging country stock market indexes followed similar trends.

The Asian currency crisis in 1997 spread into the real sectors. According to Cerra and Saxena (2000) foreign shock contagion was instrumental in the 1998 Indonesian economic crisis and was a clear case of contagion from neighboring countries. Figure 4 describes the condition of Indonesia's economy during the Asian financial crisis. The capital outflow associated with the Indonesian rupiah – U.S. dollar exchange rate depreciation is reflected in the negative capital account. During that period, the exchange rate crisis led to a crisis in the real economy as companies with debt obligations in foreign currencies went bankrupt as they were no longer able to service their debts. This led to an increase in unemployment and a decrease in aggregate

demand. During the six month period from July to December 1997, the Indonesian economy contracted by more than 10 percent. The decline in gross domestic product reached a record low of -18 percent in the last quarter of 1998.

The 1997 crisis was an important event for Indonesia. Sound fiscal and monetary policies implemented by the Indonesian government after the crisis helped Indonesia to restore net capital inflows and domestic economic stability. Figure 5 shows the growth in the Indonesian stock market index compared to that of its regional neighbors, and figure 6 shows the amount of private capital inflows for five countries in the region over the past 5 years. In recent years, the Indonesian capital market grew, surpassing the performance of neighboring countries. Aside from this development, however, foreign contagion effects are still a big challenge for Indonesian policymakers. With financial liberalization implemented in many countries, capital can now move easily between countries, creating volatility spillovers. Further, Tambunan (2010) among others contend that integration into world markets is one of factors creating vulnerabilities for the Indonesian economy.

The purpose of this study is to gauge the extent and source of these vulnerabilities. Having a clear picture of the extent and source of vulnerabilities from foreign source financial shocks is crucial for economic surveillance and macroeconomic management of the Indonesian economy.

### III. Data

According to Wong *et al.* (2004), the profile of long-run relations between stock markets change over time because of both political and economic circumstances. Yang, Kolari and Min (2003) discover that cointegration among financial variables changes over time and can be intensified during a financial crisis. Furthermore, Sakthivel *et al.* (2012) believe that although two markets may be related through trade and investment, their relation will also depend on the time and methodology employed to identify the interdependence.

For purposes of this study, we use monthly data covering the period from January 1997 to December 2011. The data come from the Bloomberg Professional Service, Indonesian Central Bank and Indonesian Bureau of Statistics. As suggested by Marashdeh and Shrestha (2010), the use of monthly data in stock market analysis can help to avoid distortions common in weekly and daily data arising from non-trading and non-synchronous trading. Moreover, this time period covers several important economic and political events in Indonesia, such as the 1998 Asian financial crisis, the 2004 gas price increase and general election, and the 2008 global financial crisis. All variables are measured in their natural logarithmic form to account for potential nonlinear relationships.

## **IV. Methodology**

The long-run relationships among the variables are examined using cointegration analysis. According to Hamilton (1997), cointegration means that although developments can cause permanent changes in the individual elements of  $Y_t$ , where  $Y_t$  is a vector of economic variables, there are some long-run equilibrium relationships tying the individual components of  $Y_t$  together. This method is useful for examining long-run relationships among non-stationary variables. Moreover, examining cointegration profiles among variables of interest is also useful in avoiding spurious regression structures.

Before deciding to buy or sell stocks in a given country, we believe that investors take into account domestic macroeconomic conditions. We also examine the potential influence of foreign source shocks because of Indonesia's recent experience with financial market contagion. As previously described, in 1998, Indonesia suffered a severe financial crisis, which led to an economic crisis, triggered by foreign source financial shocks.

We conduct a unit root test for each variable to identify the level of integration. Both Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) tests, which are reported in Table 1, show that most of the variables are non-stationary in levels. The exception is the exchange rate, however, created a varying integration level in domestic variables. This situation limits us to using conventional cointegration tests, such as the Johansen (1990) method. We use the Autoregressive Distributed Lag (ARDL) method, developed by Pesaran and Shin (1997, 1999) and Pesaran *et al.* (2001) for the cointegration test. According to Duasa (2007), one advantage of using this method is that it allows variables to be different in their level of integration. In addition, other researchers have used the ARDL method of cointegration tests using emerging market data.<sup>1</sup> The ARDL method uses a single reduced form equation instead of a system of equations. Following Pesaran (1997), the ARDL (p,q) representation for unrestricted intercept and no trend model can be represented by the following equation:

$$\mathbf{y}_{t} = \alpha_{0} + \sum_{i=1}^{p} \varphi_{i} \mathbf{y}_{t-i} + \beta' \mathbf{X}_{t-1} + \sum_{j=0}^{q} \beta_{t}^{*'} \Delta \mathbf{X}_{t-j} + \varepsilon_{t}$$
(1)

where  $\mathbf{X}_t$  is a k-dimensional vector and  $\varepsilon_t$  is a disturbance term with zero mean and p and q are the lag lengths of  $y_t$  and  $\mathbf{X}_t$ , respectively. The cointegration relation will be examined by the statistical significance of the estimated coefficients in the k-dimensional vector  $\beta'$ .

Our analysis will consist of examining the long-run influence of three domestic macroeconomic variables, namely the money supply (M2), industrial production (IP) and the

<sup>&</sup>lt;sup>1</sup> See, for example, Duasa (2007), Hasan *et al.* (2008), Atif, *et al.* (2010), Asari *et al.* (2011), Yadav and Lagesh (2011) and Islam (2012).

Indonesian Rupiah - U.S. Dollar exchange rate (ER) as well as five regional stock market indexes, namely the Singapore FSSTI Index<sup>2</sup>, Malaysian FBMKLCI index, Thailand SET index, Philippines PCOMP index and two advanced countries stock markets, namely the U.S. S&P 500 index (SP) and the Japanese Nikkei stock index (NKY). Our complete model is given by the following expression:

$$\Delta \ln(JCI)_{t} = \alpha_{0} + \sum_{l=1}^{p} \beta_{l} \Delta \ln(JCI)_{t-i} + \sum_{l=0}^{q} \gamma_{l} \Delta \ln(M2)_{t-i} + \sum_{l=0}^{q} \zeta_{l} \Delta \ln(IP)_{t-i} + \sum_{l=0}^{q} \eta_{l} \Delta \ln(ER)_{t-i} + \sum_{l=0}^{q} \theta_{l} \Delta \ln(FSSTI)_{t-i} + \sum_{l=0}^{q} \kappa_{l} \Delta \ln(FBMKLCI)_{t-i} + \sum_{l=0}^{q} \lambda_{l} \Delta \ln(SET)_{t-i} + \sum_{l=0}^{q} \nu_{l} \Delta \ln(PCOMP)_{t-i} + \sum_{l=0}^{q} \rho_{l} \Delta \ln(NKY)_{t-i} + \sum_{l=0}^{q} \varphi_{l} \Delta \ln(SP)_{t-i} + \delta_{1} \ln(JCI)_{t-1} + \delta_{2} \ln(M2)_{t-1} + \delta_{3} \ln(IP)_{t-1} + \delta_{4} \ln(ER)_{t-1} + \delta_{5} \ln(FSSTI)_{t-1} + \delta_{6} \ln(FBMKLCI)_{t-1} + \delta_{7} \ln(SET)_{t-1} + \delta_{8} \ln(PCOMP)_{t-1} + \delta_{9} \ln(NKY)_{t-1} + \delta_{10} \ln(SP)_{t-1} + \varepsilon_{t}$$
(2)

For the purpose of the hypothesis testing, Pesaran *et al.* (2001) formulated sets of appropriate critical values because ARDL method has non-standard limiting distributions. These critical values are used for the case that variables might be stationary in level term or in first difference thus the f-statistic will be examine against an upper and lower bound. If the F-Statistic lies above the upper level, the null hypothesis is rejected while if it is below the lower bound, we cannot reject the null of no cointegration. In the case of F-Statistic lies in between the lower and upper value, an inconclusive result of the cointegration test is taken. In order to select the

 $<sup>^{2}</sup>$  Since it only started in August 1999, we generate synthetic set of data using the actual weight of each stock in the index from period before 1999.

appropriate lag length in a monthly dataset, we follow Perera and Paudel (2009) by setting the maximum lag of 6 and pare it down to the appropriate lag by examining the Akaike Information Criteria (AIC) and the Swartz Bayesian Criterion (SBC).

If there is evidence of cointegration, we specify the long-run model as follows:

$$\ln(JCI)_{t} = \alpha_{0} + \sum_{i=1}^{p} \beta_{i} \ln(JCI)_{t-i} + \sum_{i=0}^{q} \gamma_{i} \ln(M2)_{t-i} + \sum_{i=0}^{q} \zeta_{i} \ln(IP)_{t-i} + \sum_{i=0}^{q} \eta_{i} \ln(ER)_{t-i} + \sum_{i=0}^{q} \theta_{i} \ln(FSSTI)_{t-i} + \sum_{i=0}^{q} \kappa_{i} \ln(FBMKLCI)_{t-i} + \sum_{i=0}^{q} \lambda_{i} \ln(SET)_{t-i} + \sum_{i=0}^{q} \nu_{i} \ln(PCOMP)_{t-i} + \sum_{i=0}^{q} \rho_{i} \ln(NKY)_{t-i} + \sum_{i=0}^{q} \varphi_{i} \ln(SP)_{t-i} + \mu_{t}$$
(3)

The lag length is again selected based on AIC and SBC criteria. The long-run relation is predicted using OLS. Furthermore, the existence of cointegration implies that causality exist in at least one direction. Granger (1969) causality test have been extensively used in financial research to describes if one variable precedes other variable. While cointegration is concerned with long-run equilibrium between variables, Granger causality is concerned with short-run forecastability (Maddala and Kim, 1998). There are four possibilities for a X and Y relationship in Granger test which are unidirectional causality from X to Y, unidirectional causality from Y to X, bilateral causality, meaning that X and Y cause each other and both X and Y are independent of each other. Test results that state X Granger causes Y does not imply that Y is the effect or the result of X. Granger's reason in proposing the definition was that if an event Y is the cause of another event X, then the event Y should precede X (Hamilton, 1994). If cointegration is detected between the variables, Granger causality test will incorporate an error correction term (ECT) in the model. The model with error correction term takes the following form:

$$\Delta \ln(JCI)_{t} = \alpha_{0} + \sum_{i=1}^{p} \beta_{i} \Delta \ln(JCI)_{t-i} + \sum_{i=0}^{q} \gamma_{i} \Delta \ln(M2)_{t-i} + \sum_{i=0}^{q} \zeta_{i} \Delta \ln(IP)_{t-i} + \sum_{i=0}^{q} \eta_{i} \Delta \ln(ER)_{t-i} + \sum_{i=0}^{q} \theta_{i} \Delta \ln(FSSTI)_{t-i} + \sum_{i=0}^{q} \kappa_{i} \Delta \ln(FBMKLCI)_{t-i} + \sum_{i=0}^{q} \lambda_{i} \Delta \ln(SET)_{t-i} + \sum_{i=0}^{q} \nu_{i} \Delta \ln(PCOMP)_{t-i} + \sum_{i=0}^{q} \rho_{i} \Delta \ln(NKY)_{t-i} + \sum_{i=0}^{q} \varphi_{i} \Delta \ln(SP)_{t-i} + \psi \text{ECT}_{t-1} + \varepsilon_{t}$$

$$(4)$$

Where variable ECT is the error correction term taken from long-run equation (3) and defined as follows:

$$ECT_{t} = \ln(JCI)_{t} - \alpha_{0} - \sum_{i=1}^{p} \beta_{i} \ln(JCI)_{t-i} - \sum_{i=0}^{q} \gamma_{i} \ln(M2)_{t-i} - \sum_{i=0}^{q} \zeta_{i} \ln(IP)_{t-i} - \sum_{i=0}^{q} \eta_{i} \ln(ER)_{t-i} - \sum_{i=0}^{q} \theta_{i} \ln(FSSTI)_{t-i}$$
$$- \sum_{i=0}^{q} \kappa_{i} \ln(FBMKLCI)_{t-i} - \sum_{i=0}^{q} \lambda_{i} \ln(SET)_{t-i} - \sum_{i=0}^{q} \nu_{i} \ln(PCOMP)_{t-i} - \sum_{i=0}^{q} \rho_{i} \ln(NKY)_{t-i}$$
$$- \sum_{i=0}^{q} \varphi_{i} \ln(SP)_{t-i}$$

(5)

A negative and significant coefficient on the ECT in equation 4 indicates that any shortterm movement between the independent and dependent variable will converge back to the longrun relation. In addition, through this testing, we examine which domestic macroeconomic variables and stock indexes precede changes in the Indonesian stock market index.

We also build an Impulse Response Function (IRF) graph for each model to show the profile of a shock response. IRF helps to trace responses of variables to its own shocks and shocks in other variables. In the context of economic surveillance, by using the IRFs we can assess the direction, magnitude and persistence of the Indonesian stock market index responses to innovations in both domestic macroeconomic variables and foreign stock markets.

## V. Summary of results

Following the ARDL model in equation 3, our Wald test result is reported in Table 2. Setting our maximum lag to 6, we found the F-Statistic of 4.98 is higher compared to both lower and upper bound of critical value in Pesaran (2001), suggesting rejection of null hypothesis of no cointegration. In other words, we find evidence of long-run relation among the variables in equation 3. As the bounds test detects the presence of long run relationship amongst the variables, further we construct the error correction model to examine the causality between the variables.

We find that that exchange rate and industrial production granger cause the JCI index. The latter relation is aligned with findings from Choi, Hauser and Kopecky (1999) which highlights the cointegration, implying a long-run relationship, between industrial production and stock market return. The money supply in our result, however, shows no strong evidence of Granger causality to the Indonesian stock market index, implying that its movements might not be good long-run predictor of JCI index. Furthermore, other research from Sjuib (2009) also fails to detect causal relationship of the Indonesian money supply to economic output. Using this finding and our calculation results, we can infer that money supply is not a good variable to use as the main factor in Indonesian economic surveillance because it shows no strong evidence of causality for both economic output and stock market index movements. Further, we examine the Granger relation in the opposite direction. We find that the Indonesian stock market index Granger causes all the selected domestic macroeconomic variables. Our Granger causality test result, summarized in Table 3, indicates a unidirectional Granger causality of money supply to stock market index and bidirectional causality in both industrial production and exchange rate. The last relationship is similar with findings from Tai (2007), advising that in emerging Asian stock markets, shocks originating from domestic stock market will also spread to foreign exchange market.

In regards to the foreign source of shocks, Table 4 describes our complete error correction model result. The p-value shows that all foreign stock market indexes significantly influence the Indonesian stock market index. Specifically in the advanced countries stock markets, our result shows that although Indonesian stock market is influenced by the Japanese market, its relation to U.S. stock market is less significant. Causality between the Indonesian and U.S. stock market is only significant in 10% level. However, we acknowledge that the larger effect of U.S. stock market might not first hand to Indonesia. The influence could come from other pathways in global financial markets since the U.S. stock market may influence other stock markets. Further, these influences could have an effect on Indonesia. In the long run causality test, our lagged error correction term is statistically significant at 1% level with a negative sign as expected. The negative sign indicates a move back towards equilibrium. The value of the coefficients represents the speed of adjustment back towards the equilibrium level on the model. Using this result, we can moderately imply that a deviation from the equilibrium level of the Indonesian stock market index in the current period would all be corrected in the next period. Furthermore, the model also passes through a battery of diagnostic tests such as serial correlation, functional form, normality and heteroskedasticity as presented in end of Table 4. We also examine the stability of the error correction representation of the ARDL model by applying the CUSUM and CUSUMSQ stability tests. Figure 7 and Figure 8 show that the residuals of the ARDL model are stable and are bounded inside the 5% significance level line. Overall, the results show no evidence of structural instability and hence our ARDL model is unlikely to suffer from significant misspecification problems.

In the impulse response function, we find several responses that are noticeable. In the domestic macroeconomic variable, an exchange rate shock creates a negative response from the Indonesian stock market index. This negative response magnifies after 7 months, showing a lag profile of the shock effects. Other noticeable domestic macroeconomic variable impulse is the industrial production changes. The effect of a shock in industrial production is negative and peaked in the sixth month before it reverts back to normal. The leading impulse responses in the regional stock markets are the Singapore stock market and the Japanese stock market. Figure 10 pictures how these two countries are predominantly the two largest trade partners for Indonesia. These findings could be used as a base for further examination between Indonesia's trade relationships and stock market developments.

# **VI.** Conclusions

This paper investigates the long run relationship between the Indonesian stock market by using several domestic macroeconomic variables and foreign stock market indexes over the period of 1997 to 2011. The selection of a long span of data includes several financial crises that happened in Indonesia and are related to capital movements. The use of Autoregressive Distributed Lag (ARDL) method to examine the cointegration relationship was to incorporate the different level of integration amongst the variables. Using an ARDL method, we find evidence of cointegration in the selected variables. The result of a Wald test lies above the upper bound of critical value, suggesting long-run relationship between the variables. Our Granger causality test results that the influence of money supply and exchange rate is evident to the Indonesian stock market.

Our examination of long-run relation between the Indonesian stock market, domestic macroeconomic variables and foreign stock markets gave two stimulating discoveries. Our first finding is that exchange rate and industrial production has bidirectional causality to the Indonesian stock market index while no significant evidence showing causality of money supply to the Indonesian stock market index movements. Unlike industrial production and exchange rate, money supply is less substantial to be included as main factor of Indonesian economic surveillance. Our second finding is that the S&P 500 index has less significant relation to the Indonesian stock market index compared to the Southeast Asian stock market indexes. In other words, regional stock markets are better predictor for future movement of the Indonesian stock market.

We believe that these findings have several important implications for future Indonesia's economic policy. In public finance perspective, the exchange rate is used as macroeconomic assumptions in the Indonesian national budget, and interferences or changes in the budget assumption can have a large effect on the national budget. Better knowledge of the assumption variables, such as exchange rate, will give substantial impact for future budget planning process. The bidirectional causality of exchange rate to stock market indices asserts the importance of including exchange rate movements monitoring in the Indonesian economic surveillance process. Lastly, the common belief that the Indonesian stock market is highly influenced by the profile of US stock markets is proved incorrect. Policy makers and investors in Indonesia should use regional stock markets as primary factor to consider. However, we acknowledge that the effect of US stock market may be indirect to Indonesia and that the influence could come from other pathways in the global financial market.

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Figure 1. Movements of stock market indexes in the case of 1997 Asian financial crisis



Figure 2. Movements of Southeast Asian exchange rate in the case of 1997 Asian financial crisis







Figure 4. Movements of capital account, GDP gropwth and growth of electricity consumption in









Figure 6. Ammount of private capital flows to emerging ASEAN (% of GDP)





Figure 7. Plot of cummulative sum of recursive residuals

Figure 8. Plot of cummulative sum of squares recursive residuals





#### Figure 9. Noticable impulse response function of Indonesian stock market index

Figure 10. Percentage of Indonesian big-3 share of trade





### Figure 11. Impulse response function of Indonesian stock market index

Variables	Augmented Dickey Fuller Test		Phillip-Perron Test	
(in natural log form)	t-statistic	inference*	Adj t-statistic	inference*
Domestic Macroeconomic Variable				
Money Supply	0.42	Nonstationary	-1.65	Nonstationary
Industrial Production	-0.07	Nonstationary	-4.34	Stationary
Exchange Rate	-4.49	Stationary	-4.24	Stationary
Stock Market Indexes				
Indonesian Stock Market Index	0.06	Nonstationary	0.02	Nonstationary
Singapore Stock Index	-2.08	Nonstationary	-1.88	Nonstationary
Malaysian Stock Index	-1.91	Nonstationary	-1.56	Nonstationary
Thailand Stock Index	-1.38	Nonstationary	-1.45	Nonstationary
Phillipines Stock Index	-1.19	Nonstationary	-1.14	Nonstationary
Japan Stock Index	-1.63	Nonstationary	-1.69	Nonstationary
S&P 500 Stock Index	-2.93	Nonstationary	-2.80	Nonstationary

# Table 1. Result of unit root test of variables in the model

\* Tested at 1% level

Table 2	. Result	of ARDL	Cointegration	test
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Tost Statistic	Max Lag	Significance	Bound Critical Values	
	IVIAX Lag	Level	unrestricted intercept and no trend	
4.98	6		I(0)	I(1)
		1%	2.65	3.97
		5%	2.14	3.30
		10%	1.88	2.99

\* Taken from Pesaran (2001)

# Table 3. Result of Granger causality test for the selected macroeconomic variables.

Dependent Variable	Regressor	Granger Cause
Indonesian Stock Market Index	Exchange Rate Industrial Production Money Supply	Evident Evident Not Evident
Exchange Rate	Industrial Production Money Supply Indonesian Stock Market Index	Not Evident Evident Evident
Industrial Production	Exchange Rate Money Supply Indonesian Stock Market Index	Evident Not Evident Evident
Money Supply	Exchange Rate Industrial Production Indonesian Stock Market Index	Evident Not Evident Evident

Independent Variables	Dependent Variable : Indonesian Stock Market Index		
	F Statistic	P-value	
Domestic Macroeconomic Variable			
Money Supply	1.46	0.1875	
Industrial Production*	2.17	0.0417	
Exchange Rate*	3.10	0.0050	
Stock Market Indexes			
Malaysian Stock Index*	3.18	0.0019	
Singapore Stock Index*	3.57	0.0048	
Phillipines Stock Index*	10.20	0.0001	
Thailand Stock Index*	3.71	0.0012	
Japan Stock Index*	5.28	0.0001	
S&P 500 Stock Index	2.06	0.0628	
ECM Coefficient (t-statistic)*	-0.97		
	(0.000)		
<b></b>			
Diagnostic Test -			
Far	0.99	0.37	
Fhet	1.21	0.20	
Jbnormal	0.40	0.82	
R-Square	0.84		

# Table 4. Result of error correction model representation regression

\* Statistically significant at 5% level