

**THE RELATIONSHIP BETWEEN JAKARTA ISLAMIC INDEX  
AND OTHER SELECTED MARKETS:  
EVIDENCE FROM IMPULSE RESPONSE FUNCTION**

**Irfan Syauqi Beik<sup>1</sup>**

Head of the Islamic Economic Study Program, Department of Economics,  
Bogor Agricultural University, Indonesia

**Wisnu Wardhana**

Researcher of ISEFID (Islamic Economic Forum for Indonesia Development),  
International Islamic University Malaysia

**ABSTRACT**

*The financial crisis, which was triggered by the subprime credit in the United States, is probably the most severe crisis for the last century. It has affected many countries in the world including Indonesia. In spite of worsening financial market in recent months, Indonesia has a great potency to be a hub for international Islamic finance. This paper attempts to analyze Indonesia's Islamic Stock Market, namely Jakarta Islamic Index (JII), in relation with other Islamic as well as conventional stock markets in Malaysia and the United States, especially during the subprime crisis which started in early 2006. This research uses daily closing data of stock price indices obtained from Bloomberg database from January 1, 2006 until December 31, 2008. It employs time series analysis of cointegration and impulse response function. The results show that there is no long run relationship between Indonesia's capital market and both Malaysia and the US markets. For investors, the results will give them choices for their investment portfolio. Meanwhile, in Indonesia's perspective, this should be an opportunity for promoting its capital market as the potential destination for profitable investment. In the short run, the JII is significantly affected by the shock or disturbance taking place in the other markets. However, the results also indicate that the JII is the least volatile and more stable market.*

**Keywords:** *Jakarta Islamic Index, cointegration analysis, impulse response function*

## 1. INTRODUCTION

The current crisis which takes place in the US market triggering financial crisis in many other parts of the world is probably the most severe crisis that ever happens in the world economy for the last century. The crisis, which was triggered by subprime credit crunch followed by the collapse of several well-known financial institutions such as Lehman Brothers, Freddie Mac and Merrill Lynch, is still showing no signs of end until now.

The 700 billion dollar bail out plan implemented by the US government as response to the crisis is still unable to restore market confidence. Performance of the Wall Street for instance, drops to a very low level in its history for the last fifteen years<sup>2</sup>. This situation has created contagion impact affecting European financial markets. Failure and bankruptcy of Iceland has become an undeniable fact. UK, on the other hand, is also

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<sup>2</sup> For instance, Dow Jones Composite Index felt down below 10,000 on 6<sup>th</sup> October 2008. As of January 14, 2009 it still stands below the level of 9,000.

forced to nationalize some of its banks. Other prominent EU members, such as Germany, have taken various plans and steps in order to overcome worsening effect of the crisis to their economy.

This market fragility has basically created three dooms (Beik, 2008a). The first doom is property doom which is indicated by the collapse of property price in the US market. The second one is financial doom which takes place in major economies in the world. Some financial markets' index has dropped more than 30 percent, such as in China (62.9%), Japan (38.3%), and Russia (62.0%). Furthermore, the third one is commodity doom signified by the fall in the price of world commodities. CPO (Crude Palm Oil)'s price for example, drops more than 61.9%. In addition, the price of rubber also falls around 40.6% (Beik, 2008a). For raw materials exporting countries, especially the developing world, this situation will obviously affect their real sector of the economy.

As one of the major developing countries, Indonesia also suffers the crisis impact. Yet, in October 2008 Indonesia's Stock Exchange Market was suspended for several days in order to restrain the crisis collision which made the index dropped more than 10%. This crisis has forced the government to reduce its projection of economic growth in the year 2009 to 5% - 5.5% after having convincing 6% growth in the year 2008.

In spite of this difficult situation, Sugema (2008) predicted that capital market in Indonesia would play more significant role compared to the banking sector in the future. He argued that availability of long term domestic fund tend to increase through development of bond market, insurance companies and pension fund. He also argued that Indonesia has the potency to become a major international hub for Islamic finance. Hence, he suggested the government to prioritize development of Islamic financial market in the country.

Since all countries in this world tend to integrate into a global village, this paper intends to analyze whether or not Indonesia's capital market is integrated with other selected markets, which are Malaysia and the United States, and share a long run relationship. The paper also attempts to observe empirically the short run relationship between Jakarta Islamic Index, which is the country's shariah-compliance stock market, and other Islamic as well as conventional stock markets which are located in these countries.

## 2. LITERATURE REVIEW

There have been few studies relatively that focuses in exploring the integration of Indonesian stock market and other markets both regionally and globally. Barus (1997), Palac-McMicken (1997), Roca et al. (1998), Wongbangpo (2000), Hee (2002), Azman-Saini et al. (2002), Ibrahim (2005), Majid et al. (2007) and Majid et al. (2008) are some of important studies that examine the relationship of stock market in South East Asia including Indonesia.

Barus (1997) investigated the inter-linkages of financial market between Indonesia and other members of the ASEAN countries during the period 1985 to 1995. By employing cointegration method, the study found that the Indonesian financial market was weakly cointegrated with other ASEAN countries. The study argued that social, political and economic cooperation in ASEAN does not guarantee a cointegrated financial market among the country members. This will give benefit of portfolio diversification within the ASEAN financial markets.

Palac-McMicken (1997) found straight conclusion by employing cointegration approach. The study concluded that without Indonesia, there was evidence of financial linkages among five founding members of ASEAN during the period 1987 – 1995. Roca *et al* (1998) explored the extent and structured of price linkage among five ASEAN markets (i.e. Indonesia, Malaysia, Singapore, Thailand and Philippines) both in long-run and short-run using cointegration technique based on Johansen (1988) procedure, Granger Causality, Variance Decomposition and Impulse Response function during the 1988 – 1995 period. The study depicted that, in

the long-run, ASEAN markets were not significantly cointegrated. However, in the short-run, with the exception of Indonesia, all ASEAN markets had significant linkages with other markets. Furthermore, the study showed that Malaysia was the most influential market while Singapore and Thailand were the market with the most linkages with other markets. However, Indonesia has no linked at all with any other ASEAN markets.

Another study about market integration in ASEAN region was conducted by Wongbangpo (2000). The study revealed that ASEAN stock markets, except for the Philippines, have long-run co-movement during the period 1985 – 1996. This means that an effective long-term diversification of an investor's portfolio among these stock markets cannot be achieved. By employing correlation and cointegration analysis, Hee (2002) found that there was no long-run relationship among ASEAN stock markets. However, correlation analysis indicated that the markets were becoming more integrated.

Azman-Saini et al. (2002) examined the existence of long-run relationship among the ASEAN-5 i.e. Indonesia, Malaysia, Singapore, Thailand and Philippines equity markets. By utilizing cointegration analysis and Seemingly Unrelated Regression (SUR) based on Granger noncausality test, the study showed the evidence of cointegration among the ASEAN-5 equity markets even though not all markets share the common stochastic trends. In addition, the results empirically found that Singapore stock market was not affected by other countries in the long-run except from Philippines, whereas Indonesian stock market did not have long-run relationship with any other markets.

More recent studies on market integration in terms of Indonesian stock market were conducted by Ibrahim (2005), Majid et al. (2007) and Majid et al. (2008). Ibrahim (2005) employed cointegration and vector autoregression (VAR) to analyze the integration among ASEAN markets from the perspective of the Indonesia. The study found that there was no cointegration among the ASEAN markets during the period of 1988 – 2003. Difference from previous studies, Majid et al. (2007) attempted to investigate the financial integration among eight stock markets of Organization of the Islamic Conference (OIC) countries (i.e. Turkey, Egypt, Oman, Kuwait, Malaysia, Indonesia, Bangladesh, and Pakistan) and the relationship of these markets with three largest stock markets in the world namely, US, UK and Japan. The study employed the data for the period January 2002 to March 2006 using cointegration and vector autoregression (VAR) approach. The study revealed the evidence of strong market integration between Malaysia and Indonesia and developed market. Furthermore, the study found that Indonesia was affected more by UK and Japan rather than US.

Finally, Majid et al. (2008) explored empirically the market integration among ASEAN-5 emerging markets and their interdependencies from the US and Japan. By applying cointegration and generalized method of moments (GMM) approach on stock indices data starting from January 1988 to December 2006, the stock markets in the ASEAN region were found to be cointegrated during pre- and post-1997. The degrees of short- and long-run relationship have increased significantly. In addition, the study also documented that each ASEAN market was found to be interrelated with the US and Japan in different ways. However, Indonesian market was found relatively independent both of the US and Japan.

### 3. RESEARCH METHOD

#### Data

This research utilizes the data from both Islamic and Conventional Stock Index of Indonesia, Malaysia and US. The Islamic stock indices used are Jakarta Islamic Index (JII) for Indonesia, Dow Jones Islamic Index of Malaysia (DJIMY) for Malaysia<sup>3</sup> and Dow Jones Islamic of US (IMUS) for US. Furthermore, for conventional part, this study employs Jakarta Composite Index (JCI) for Indonesia, Kuala Lumpur Composite Index (KLCI) for Malaysia and Dow Jones Index for US.

Each stock market uses daily closing data of stock price indices which is obtained from Bloomberg Database for the time period from January 1, 2006 to December 31, 2008. Daily data is used to provide more robust result. Moreover, the time period is chosen to understand the picture of Indonesian Islamic Stock Market comprehensively during the subprime financial crisis which was started from early 2006.

#### Empirical Framework

To evaluate further about the effect of crisis to Indonesian Islamic Stock Market, this study applies time series analysis of cointegration and vector autoregressive (VAR) model. Cointegration test is used to examine the long-run relationship among the stock markets and vector autoregressive model used in evaluating short-run dynamic interactions.

#### Unit Root Test

The first step before testing for cointegration is to determine the stationarity of the variables under consideration. Briefly stated, classical regression techniques may be invalid if applied to variables that do not meet the stationarity property (Thomas, 1997). Regressing this non stationary variables leads to spurious regression whereby the model obtains a very high  $R^2$  (in excess of 0.9), but there is no significant relationship between two variables or else sometimes we expect no relationship between two variables, yet a regression of one on the other variable often shows a significant relationship (Gujarati, 2003).

This paper performs the most commonly used test which are Augmented Dickey Fuller (ADF) Test, Phillips-Perron (PP) test, and Kwiatkowski-Phillips-Schmidt-Shin (KPPS) test to examine the stationarity of the data series.

The ADF test is “augmenting” a random walk with drift around a stochastic trend by adding the lagged values of the dependent variable  $\Delta Y_t$  (Gujarati, 2003). The test will be based on following model:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha \sum_{i=1}^m Y_{t-i} + \varepsilon_t$$

Where  $\beta_1$  and  $\beta_2$  are parameters,  $t$  is the time or trend variable,  $\delta$  represents drift,  $\varepsilon_t$  is a pure white noise error term and  $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ ,  $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$ , etc. The null hypothesis is that  $\delta = 0$ ; that is there is a unit root, the time series is non stationary. The alternative hypothesis is that  $\delta$  is less than zero; the time series is stationary.

<sup>3</sup>Dow Jones Islamic Index of Malaysia is used as replacement for KLSI (Kuala Lumpur Shariah Index) which was discontinued at the end of 2007.

Furthermore, Philip-Perron (PP) test has similar objective except using nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms. PP test is performed as follow:

$$\Delta Z_t = \alpha + \theta t + \lambda Z_{t-1} + u_t$$

Whereby the null hypothesis is that  $\lambda = 0$ , that is  $Z$  is non stationary and alternative hypothesis is  $Z$  is stationary.

Difference from previous tests, Kwiatkowski-Phillips-Schmidt-Shin (KPPS) test has reverse hypothesis testing. The null hypothesis is the variable is stationary and alternative hypothesis is the variable is non stationary.

### **Cointegration Test**

Since the data is non stationary at level, there is a possibility of long run relationship among the stock markets. We employ the multivariate cointegration test of Johansen (1988) and Johansen & Juselius (1990) to examine the existence of long run relationship.

The test is VAR-based test, whereby each variable is treated as an endogenous variable. Each variable depends on its own lags and the lags of other variables. Johansen & Juselius (1990) develop trace and maximal eigenvalue statistics to determine the existence as well as the number of cointegrating vectors in the system. The null hypothesis is that there is no cointegration among the stock prices.

Denoting the lag length chosen in the VAR system as  $k$ , and the number of variables as  $n$ , then the VAR will contain  $(n \times k - 1)$  differenced terms and  $n$  levels terms each of which is lagged by  $k$  periods. Johansen & Juselius cointegration test is run under following form:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \dots + \Gamma_{k-1} \Delta Y_{t-k+1} + \Pi Y_{t-k} + \mu + \varepsilon_t$$

Where  $Y_t$  is  $(n \times 1)$  vector of stock prices at time  $t$ ,  $\mu$  is  $(n \times 1)$  intercept term, and  $\Pi$  is  $(p \times p)$  parameter matrix that indicates whether the  $(n \times 1)$  vector of stock prices has long-run dynamic relationship or not. The rank of  $\Pi$  is zero, equation reduces to a standard vector autoregressive model. If  $\Pi$  has full rank, then all stock prices series are stationary in levels. Cointegration is suggested if the rank of  $\Pi$  is between zero and the number of stock prices.

### **Vector Autoregressive (VAR) Model**

The VAR model is a system of reduced form dynamic linear equations in which each variable is expressed as a function of a serially uncorrelated errors and an equal number of lags of all variables in the system (Abdullah, 1998 and Enders, 1995). This VAR model assumes that the contemporaneous correlations of errors across equations are non-zero and therefore there are no contemporaneous explanatory variables in the model. The error terms (also referred to as *innovations*) can provide a potential source of new information about the movements in a variable during a current period.

If the variables are found to be non-stationary and non-cointegrated, the dynamic interactions amongst the variables are assessed according to the standard VAR model with variables expressed in first difference. Conversely, if the variables are found to be cointegrated, error correction models should be employed and accordingly this justifies the use of VAR model in levels (Yusof *et al*, 2006).

The VAR model is just a multiple time-series generalization of the Autoregressive model. The basic  $n$ -lag vector autoregressive (VAR( $n$ )) model has the form:

$$Y_t = c + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \dots + \Pi_p Y_{t-p} + \varepsilon_t, t = 1, \dots, T$$

where  $\Pi_i$  are  $(n \times n)$  coefficient matrices and  $\varepsilon_t$  is an  $(n \times 1)$  unobservable zero mean white noise vector process (serially uncorrelated or independent) with time invariant covariance matrix  $\Sigma$ .

The basic VAR(p) model may be too restrictive to represent sufficiently the main characteristics of the data. In particular, other deterministic terms such as a linear time trend or seasonal dummy variables may be required to represent the data properly. The general form of the VAR(n) model with deterministic terms and exogenous variables can be written as follow:

$$Y_t = \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \dots + \Pi_p Y_{t-p} + \Phi A_t + B X_t + \varepsilon_t$$

where  $A_t$  represents an  $(1 \times 1)$  matrix of deterministic components,  $X_t$  represents an  $(m \times 1)$  matrix of exogenous variables, and  $\Phi$  and  $B$  are parameter matrices.

### General Impulse Response Function

In order to interpret economic implications from the VAR model, we use Sim's (1980) innovation accounting procedure. As Masih & Masih (2001) correctly put it, variance decompositions (VDCs), which may be termed as out-of-sample causality tests, by partitioning the variance of the forecast error of a certain variable into proportions attributable to shocks in each variable in the system including its own, can provide an indication of these relativities. The information contained in the VDCs can be equivalently represented by graphs of the impulse response functions (IRFs). Both are obtained from the moving average (MA) representation of the original VAR model. IRFs essentially map out the dynamic response path of a variable due to a one-period standard deviation shock to another variable.

## 4. FINDINGS AND ANALYSIS

### Unit Root Test

Table 1: Unit Root Test

Variable	Level			First Difference		
	ADF	PP	KPSS	ADF	PP	KPSS
US	-0.2762	-0.4175	0.6701	-7.6594*	-30.1314*	0.0661***
USISL	-0.336	-0.7464	0.5381	-7.0498*	-29.127*	0.0914***
JCI	-0.2006	0.0995	0.5656	-14.0858*	-24.8418*	0.1425**
JAKISL	-0.1398	-0.1177	0.5191	-14.6327*	-24.7612*	0.1371**
KLCI	0.0028	-0.1254	0.6864	-7.8753*	-24.6854*	0.1105***
KLISL	-0.0278	0.0345	0.5669	-24.6533*	-24.6286*	0.1647*

Source: Authors' own

Note: \*, \*\*, \*\*\* denote significance at 1%, 5%, and 10% respectively. JAKISL refers to Jakarta Islamic Index, JCI for Jakarta Composite Index, KLCI for Kuala Lumpur Composite Index, KLISL for Dow Jones Islamic Malaysia, US for Dow Jones US and USISL for Dow Jones Islamic US.

As may be observed in the Table 1 above, the results of ADF, PP and KPSS tests indicate that all variables are non-stationary in level but become stationary after first differencing. That is, they are integrated of order 1, or I (1). Given these unit root test results, we proceed to cointegration test.

**Cointegration Test**

**Table 2: Cointegration Test**

Null Hypotheses	Trace	Critical Values (5%)	Max Eigenvalue	Critical Values (5%)
$r = 0$	83.35763	95.75366	26.93152	40.07757
$r \leq 1$	56.42611	69.81889	24.4625	33.87687
$r \leq 2$	31.96361	47.85613	13.75211	27.58434
$r \leq 3$	18.2115	29.79707	11.12653	21.13162
$r \leq 4$	7.084964	15.49471	5.128548	14.2646
$r \leq 5$	1.956417	3.841466	1.956417	3.841466

Source: Authors' own

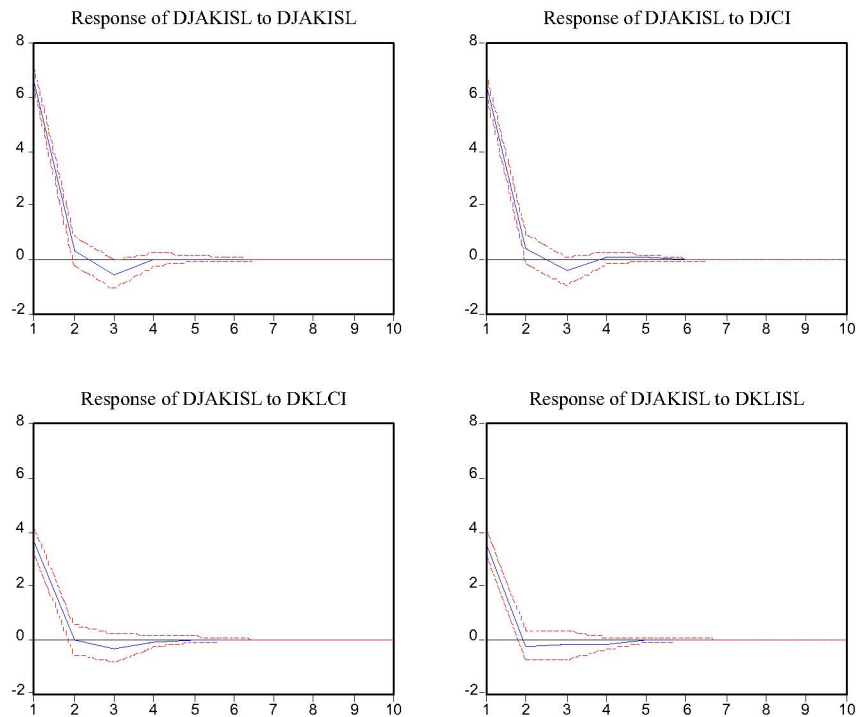
As figured out in the Table 2 above, there are no cointegrations among the variables. This can be observed from the values of trace statistic and Max eigenvalue, respectively, which are smaller than their critical values. The results indicate that there is no long run equilibrium relationship among the variables.

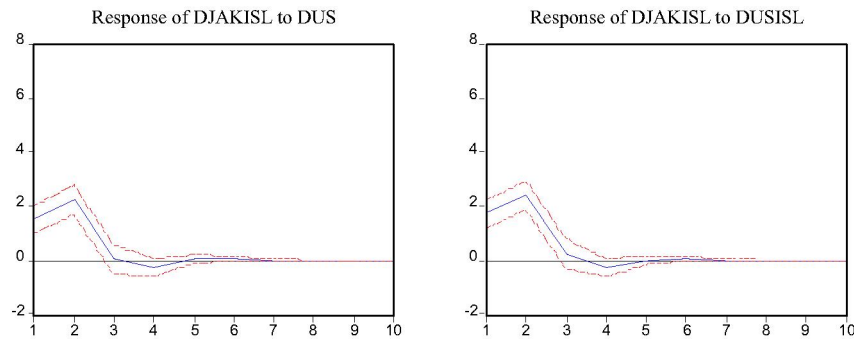
Based on the results, hence, it can be concluded that the capital market of Indonesia is not integrated with Malaysia's as well as US markets in the long run. This will open the room for investors to diversify their investment portfolios, which put Indonesia as one of their investment destination. Since there is no cointegration, we proceed to assess interaction among the variables by using impulse response function technique.

**General Impulse Response Function**

Figure 1 below depicts short run relationship between Jakarta Islamic Index and the other five markets.

**Response to Generalized One S.D. Innovations  $\pm 2$  S.E**





**Figure 1:** Impulse Response

Source: Authors' own

The Jakarta Islamic Index (JII) as can be seen from the Figure 1 above is affected by the shock taking place in the Jakarta Composite Index (JCI) for around 2 days before it stable again. It can be understood since the stocks listed in JII are also listed in JCI. Therefore, when JCI was closed as the impact of subprime crisis in the US market in October 2008 due to investors' panic selling, JII was also suffering the impact of that situation.

Similarly when there is a shock disturbing Kuala Lumpur Stock Market, the JII is also affected for around 2 days. This indicates that in the short run there is a contagion effect between these neighboring markets. Similar condition also happens between JII and Dow Jones Islamic Index of Malaysia. If external shock influences the Dow Jones Islamic Index of Malaysia, then as the implication the JII will be distressed for 2 days too.

What has happened in the United States market is also causing disturbance on JII in the short run. The result above suggests that the impact of the shock occurring in Dow Jones of the US takes place for about 3 days before it starts normal again. On the other hand, the disturbance on Dow Jones Islamic Index of the US also has the same effect on JII. The JII is significantly affected for about 3 days.

In general, it can be observed that there are short run relationship between Jakarta Islamic Index and the other five markets. Any shock or disturbance on these five markets will give significant impact to the JII market in the short term. However, volatility of the JII market is the lowest compared to the other markets. It can be taken as evidence proving that the JII can be the best alternative for investment.

If all six markets are compared, we find that the Jakarta Islamic Index is a relatively stable market compared to others<sup>4</sup>. It may be due to the market capitalization of JII which is still small in number. However, this result can also be taken as a signal showing that the rules implemented by the government in the market is quite success. This good market endurance should convince investors to invest their fund in Jakarta Islamic Index.

Given this result, therefore, the government of Indonesia should take more momentous steps in promoting Jakarta Islamic Index in particular and the country's Islamic financial market in general as investment gate for investors. Various product innovation and policies supporting development of Islamic finance should become top agenda of the nation's policy makers.

<sup>4</sup> This can be observed from the value of standard deviation which shows market volatility. The JII's standard deviation is the lowest one compared to others. Please see the appendix for further information.

## 5. CONCLUSION

The primary focus of this study is to analyze the relationship between Jakarta Islamic Index, which is Indonesia's Islamic stock market, and other markets including both Islamic and conventional markets in Malaysia and the United States of America. After conducting cointegration tests, it can be concluded that in the long run there is no relationship between Indonesia's market and both Malaysia and the US markets. From investors' perspective, Indonesia can be their investment destination which is needed for their portfolio diversification, while from Indonesia's perspective this should be a good opportunity to promote the country's capital market.

In the short run, any shock or external disturbance will significantly affect the Jakarta Islamic Index (JII). Jakarta Composite Index affects JII for around 2 days. Likewise, both Kuala Lumpur Composite Index and the Dow Jones Islamic Index of Malaysia affect the JII for 2 days, while Dow Jones and Dow Jones Islamic Index of the US give 3 days effect on JII.

Nevertheless, the JII is the least volatile market compared to the other markets. This should be utilized by the government of Indonesia to attract more investment in this market. It can only be done if the policy makers, along with all stakeholders, make a more serious and well-planned effort.

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## APPENDIX

	JAKISL	JCI	KLCI	KLISL	US	USISL
Mean	329.6166	1901.406	1138.633	1267.268	11950.00	2137.847
Median	309.4600	1832.550	1139.810	1237.240	12192.45	2170.690
Maximum	517.8140	2830.263	1507.040	1949.110	14164.53	2508.060
Minimum	173.6870	1113.624	829.4100	858.0600	7552.290	1369.940
Std. Dev.	92.31181	489.9792	188.5743	304.8443	1315.642	230.2810
Skewness	0.331349	0.129543	0.041557	0.263245	-0.892683	-0.837730
Kurtosis	1.931082	1.718578	1.527673	1.694160	3.815317	3.435048
Jarque-Bera	45.14592	48.78253	62.06824	56.58126	109.9504	85.52325
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	225787.3	1302463.	779963.8	868078.8	8185749.	1464425.
Sum Sq. Dev.	5828686.	1.64E+08	24323213	63564141	1.18E+09	36272080
Observations	685	685	685	685	685	685