

**DYNAMIC EFFECTS OF MACROECONOMIC  
FACTORS ON SHARIAH COMPLIANT  
SECURITIES IN MALAYSIAN CAPITAL  
MARKET**

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### **Abstract**

This research has been conducted with an aim to investigate the dynamic relationship between the FTSE Bursa Malaysia EMAS Shariah Index, as a broad benchmark for the performance of Shariah-compliant securities in Malaysia, and a collection of internal factors including consumer price index, industrial production index, Islamic interbank rate, broad money supply, and foreign exchange rate. The analysis applied monthly data from March 2007 to May 2014 with a total of 87 observations per variable. This study used vector autoregressive (VAR) approach and Johansen cointegration test, vector error correction model (VECM) and its subsequent test of Granger causality and the short-run relationships among the variables were investigated. It was eventually found out that EMAS Shariah Index has significant long-run relationships with all the studied variables except Islamic interbank rate, industrial production index, and exchange rate.

**Keywords:** Shariah-compliant securities, Vector Autoregressive, Johansen Cointegration, Vector error correction model

## Introduction

Having been an important topic of interest for macro-economists, policy makers and finance scholars, the stock market's movement's relationship with macro-economic variables and external factors of influence has been studied widely, especially in the last few decades (Hussin, Muhammad, Abu & Awang, 2012). Despite the fact that numerous researchers have investigated the causal relationship among the stock returns, macroeconomic factors and external links, there has not yet been an agreement on the direction of the causality between the variables. More precisely, on one hand, many economists accept as true that large declines in stock prices can cause future recessions and significant increases in their prices can be deemed as a reflection of an expected growth in the economy. On the other hand, referring to the 1987 global stock market crash which was caused by the world recession and the 1997 Asian crisis, another group of economists believed that it was the economic growth which derived the stock market prices (Herve, Chanmalai & Shen, 2011).

The activation of Shariah-complaint stock indices in Malaysia dates back to April 1999 where the Kuala Lumpur Stock Exchange introduced the Kuala Lumpur Shariah Index (KLSI) in order to facilitate the process of investment and trade for the securities which are compatible with the Islamic guidelines. Moreover, the Shariah index was formed as a weighted average index consisting of 276 companies whose shares were approved to comply with Islamic religious- compliant requirements by the Shariah Advisory Council (SAC) at the Securities Commission (Sadeghi, 2008). However, after nine years of operation and nine months of

parallel run with EMAS Shariah Index, KLSI was deactivated on 1 November 2007 with an objective of providing investors with a broader benchmark for the performance of Shariah-compliant securities.

Moreover, being formed by the collaboration of Bursa Malaysia Berhad with the FTSE Group, EMAS Shariah Index is a free float weighted index and screened by the SAC for its 170 constituents' compliance with the Shariah rules. More precisely, the general criteria considered by SAC specify that the Shariah-compliant companies must not be involved in any forms of interest-based financial services (*riba*), gambling, production or trade of non-halal or tobacco-based products, conventional insurance policies, and broking of non-Shariah-complaint securities (Abdullah, Baharuddin, Shamsudin, Mahmud, & Sahudin, 2011).

Being one of the major Shariah-compliant indices in Malaysia beside the Hijrah Shariah Index, EMAS Shariah Index is capable of helping Islamic investors and Fund managers as a main reference in terms of monitoring the movements and development of the Islamic capital market. Moreover, being consisted of 170 Shariah-compliant constituents, the index has the potential of being served as a benchmark in terms of performance of the Islamic stocks.

In fact, there have been numerous researches on the internal and external factors influencing the movements of the Kuala Lumpur Composite Index (KLCI). However, after the deactivation of the Kuala Lumpur Shariah Index on November, 2007, there have not been any major studies investigating and identifying macro-economic and external factors that significantly impact the price movements of the Islamic stocks. In addition, the extent, time horizon and

direction of the impact caused by the variables of analysis; consumer price index, industrial production index, money supply (M3), foreign exchange rate, Islamic interbank rate, crude oil prices, gold prices and S&P 500 Shariah Index, have not reached a consensus by the researchers studying the factors affecting the stock market movements.

In effect, inflation is calculated based on the changes that occur in the consumer price index (CPI). Moreover, as the rate of inflation increases, the cost of living rises and consequently, the people shift resources by reducing investment levels and adding to the costs of consumption. This eventually leads to a decrease in the demand for securities and consequently the stocks' trade volume (Pantrik & Vina, n.d.).

Beside, a higher rate of inflation increases the cost of production and leads to a decrease in corporate profits (Friend & Hasbrouck, 1977). The resulting diminished dividends eventually cause the present value of the future cash flows and thus the stock prices to decrease too. Moreover, as the inflation eventually gets decoded through the nominal interest rate, the discount rates increase and reduce the present value of the future cash flows (Booth & Ciner, 2001). This, together with the above mentioned case of profit reduction contributes in the fall in the stock prices as the consumer prices increase.

In fact, proxied as the measure of the real sector growth, the industrial production index is used to demonstrate the level of the overall economic activity in the country and its effect on the Shariah-complaint stock prices. In fact, IPI is a quick responder to the upturns and downturns of the business cycles and has proven to have correlations with the

unemployment rate. Thus, it is generally deemed as a leading indicator for the growth and performance of the economy which can be used as a major tool for forecasting the future of the economy and the GDP.

It is generally believed that as the industrial production level increases, the present value of the future cash flows increases, giving rise to the stock prices. Moreover, this increase in the future cash flows is attributable to the expected growth in the profits of the industries and corporations. Subsequently, the dividend rises, increasing the share prices. Meanwhile, proxied as an internal macroeconomic variable indicating the broad money supply, M3 includes liquidity and instruments close to liquidity in circulation in the economy. In fact, the annual rate of growth of the stock prices of the Southeast Asian countries, combined, have shown to have a close correlation with the annual growth rate of the studies countries' money supply (Shostak, 2006). Moreover, while some researchers have confirmed a causality from money supply to the stock prices, others believe that it is the changes in the stock prices which lead to changes in the money supply.

Taking into consideration the efficient market hypothesis which leads to a conclusion that current market prices must reflect all information currently available (Fama, 1981), this variable has been selected for this research to both test the efficiency of the market as per reacting to money supply information and the direction of the causality between the money supply and the stock market movements. Regarding the interest rates, it is generally understood that as interest rates rise, the opportunity cost of holding stock increases due to the fact that interest-bearing securities generate a

better payoff with rising interest rates. Besides, as the interest rates increase, the present value of the future cash flows declines, decreasing the stock prices (Pantrik & Vina, n.d.).

However, considering the fact that interest (riba) is a forbidden term in Islamic financial contracts and that both the constituents and investors of the Shariah-compliant securities have shown concerns about the complete elimination of the element of riba in their contracts, the Islamic interbank rate is proxied as the Shariah-compliant substitute of the interest rates in this research.

Representing the bilateral real rate of exchange of the Malaysian Ringgit against each unit of US Dollar, the Dollar-Ringgit exchange rate has been considered as one of the macroeconomic factors inside Malaysia for the purpose of this research. Furthermore, this study adopts the US Dollar as the foreign currency whose exchange rate is investigated because the currency is obviously the prime mover of the international finance system and is the main currency reserve despite the fact that Euro is striving to increase its domination (Wilkinson, n.d.). It is generally believed that as the domestic currency, Malaysian Ringgit, depreciates, expectations about the inflation rate urge the stock prices to fall. However, considering whether a company is export or import oriented, the impact of the domestic currency depreciation can be different. More specifically, import-oriented companies' earnings reduce as a result of a weaker Ringgit while export-oriented firms profit increases.

Moreover, although a significant number of researches are dedicated to the topic of the factors affecting the stock

market, in both developed and emerging economies, researches on those relationship and the causalities have not been thoroughly conducted for Syariah indices in Malaysia. Therefore, it is the aim of this research paper to investigate the EMAS Syariah Index's relationship with internal factors such as industrial production index (IPI), consumer price index (CPI), money supply (M3), Islamic interbank rate (IIR) and the US Dollar- Malaysian Ringgit exchange rate.

## 2. Literature Review

Among all the studies done on this topic, Albaity & Ahmad (2008) study the long-run and short-run causality between the Kuala Lumpur Syariah Index (KLSI) and the Kuala Lumpur Composite Index (KLCI) from 1999 to 2005 and conclude that, for both long-term and short-term, KLCI is a good indicator to identify and forecast the movements of KLSI. Moreover, Muhammad, Hussin, Abu, & Awang (2012) study the relationship between the Kuala Lumpur Syariah Index and a number of macroeconomic factors, namely, industrial production index, consumer price index, aggregate money supply, exchange rate and the Islamic interbank rate from 1999 to 2007. The relationship was analyzed through a vector autoregressive (VAR) model estimation and demonstrated that the KLSI was positively and significantly related to industrial production index and consumer price index. However, they it was negatively related to the aggregate money supply and the exchange rate. Moreover, they proved that the relationship between the Islamic interbank rates and the KLSI was negative, yet insignificant. Also, they showed that the consumer price index, aggregate money supply and the exchange have been



the granger cause for KLSI. Meanwhile, KLSI is the granger cause to industrial production index, consumer price index and the exchange rate. In addition, Vejzagic & Zarafat (2013) analyze the long-run relationship between the FTSE Bursa Malaysia Hijrah Shariah Index and a selection of macroeconomic factors, namely the money supply, interest rate, consumer price index and exchange rate. The empirical results of the study show a significant relationship between the Hijrah Shariah index, money supply and the exchange rate. Moreover, the relationship between the index and interest rate and the exchange is negative while its relationship with money supply is statistically proven to be positive.

Furthermore, a study by Hancocks (2010) examines the effect of macroeconomic variables on Johannesburg Stock Exchange from 1996 to 2008. The empirical results of the study show that the studied indices were negatively related to inflation and short-run interest rates in the long run. However, they were positively affected by the money supply. Regarding the Karachi Stock Exchange, Saeed & Akhter (2012) perform diagnostics tests, such as the normality, heteroskedasticity, autocorrelation, and multicollinearity between the dependent variable; Banking index and the independent variables; money supply, industrial production, exchange rate, oil prices and short-term exchange rate. The results of the ordinary least squares regression reveal that there is a significant impact from the short term interest rate and the exchange rate on the banking index. Moreover, the researcher explains that the money supply, exchange rate, industrial production index, and interest rate show a

negative relationship with the banking index. However, the oil prices impact the index positively.

A study by Alam & Salahuddin (2009) examines the relationship between the interest rates and stock prices from 1988 to 2003 from fifteen developed and developing countries such as Australia, Canada, Chile, Germany, Bangladesh and etc. The study finds out that for all countries studied the interest rate has a significant negative relationship with the stock prices. Moreover, for six of the countries, it was concluded that change in interest rate has a significant negative relationship with the change in stock prices. Besides, Thang (2009) considers the impact of the interest rates on Malaysian stocks through Johansen-Juselius cointegration, vector error correction model and Granger causality. At the end of the analysis, the writer concludes that the interest rate has a negative impact on the studied stock index both in short-term and long-term.

Also, a study conducted by Martínez-moya & Escribano-sotos (2013) examines the effect of the interest rates on the Spanish stock market from an industrial point of view by decomposing the time series of the data based on various time scales and characterizing the structure of each of the time series according to a “scale-by-scale” basis. The results of the analysis provided that there exists a significant sensitivity in the overall stock market to interest rate fluctuations although the amount of the sensitivity varies across industries and different time horizons. Moreover, the study shows that the interest rate’s impact on the stock returns increases as the time horizon extends and concludes that interest rates are key determinants of the performance of the Spanish stock markets, but only in the long-run.

In a study on Dow Jones Islamic Market Index (DJIMI), Kuala Lumpur Composite Index (KLCI) and Kuala Lumpur Shariah Index (KLSI), Albaity (2008) uses GARCH analysis technique to find out that M1, M3, inflation rate and real growth in GDP have shown a significant relationship with KLCI. However, when it came to the Islamic indices of KLSI and DJIMI, inflation rate, M2 and M3 proved to have significant relationships. Moreover, when creating a multivariate model, DJIMI was significantly influenced by the interest rate. Considering the relationship between Consumer Price Index (CPI), Industrial Production Index (IPI) and the Greek stock market, Filis (2009) uses a VAR model to conclude that the CPI has a significant negative relationship with the stock returns in Greece. Moreover, he believes that, on average, 3 years are required by IPI and the stock prices to fully absorb the shocks made by CPI.

Moreover, Schwert (1981) examines the impact of new information about inflation (computed based on CPI) on the stock prices according to S&P's composite portfolio from 1935 to 1978. As a result, he concludes that stock prices have a negative relationship with inflation. However, the level of the impact is small and stock market tends to react to inflation, on average, one month after the CPI is announced by the Bureau of Labor Statistics. A study by Chaudhry, Khan, & Buldin (n.d.) examines the linkage between the Industrial production, inflation and stock prices in a number of South Asian and Southeast Asian countries. The study reveals that there a significant cointegration between the inflation and the stock returns in long-run for the South and South-eastern Asian countries studied.

Moreover, they conclude that there is a strong long-term linkage between the inflation and the industrial production in those countries too.

Furthermore, in a research by Rahman, Sidek, & Tafri (2009), a selection of macroeconomic variables including the money supply, interest rate, reserves, exchange rate and industrial production index and their relationships with Malaysian stock market returns are studied through a VAR framework. The study revealed that there is significance cointegration between the above mentioned variables and the stock returns. Moreover, they concluded that, based on a variance decomposition technique, the relationship between the stock markets and the reserves and IPI are more significant than the relationship it has with money supply, interest rate and exchange rates.

In fact, numerous amounts of research have been done in order to analyse the relationship between the foreign exchange rates and the stock return all over the world. Among which, Anlas (2012) studies the relationship between exchange rates between the Turkish Lira and seven foreign currencies and their impact on the main composite index at the Istanbul Stock Exchange. The study reveals that changes in the domestic value of US Dollar and the Canadian Dollar have a positive relationship with the movements in ISE 100. However, the Saudi Rial has proven to have a negative relationship with the previously mentioned index. Further, a study by Kasman (2003) considers four different indices in Turkey, namely, the ISE 100, ISE Finance, ISE Industry and ISE Services. The study concludes that there is a stable and long-run relationship between all four above mentioned indices and the exchange

rates. However, the causal relationship is only proven to exist from the exchange rate to the ISE Industry and none of the remaining three indices studied.

In another study, Rahman & Uddin (2009) observed the relationships between the exchange rates and the stock returns in three countries in the South Asia, namely, Bangladesh, India and Pakistan from 2003 to 2008. The empirical results of the analysis revealed that there is no cointegrating relationship between any of the stock market returns and the exchange rate. Moreover, the Granger causality test allowed them to conclude that that is no causal relationship between the above mentioned variables either. Also, another study by Bhattacharya, Basarbi, & Mukherjee (n.d.) confirmed the results achieved by Rahman & Uddin (2009) about the causal relationship between the Indian stock market and the exchange rates in another time frame, 1990 to 2000. The results of the study suggested that there exists no causality between the stock prices and the three variables of the study, namely, exchange rate, foreign exchange reserve and balance of trades.

Finally, Muhammad & Rasheed (n.d.) study both the long-run and short-run relationships between the exchange rates and stock prices in Pakistan, India, Bangladesh and Sri-Lanka from 1994 to 2000 through Johansen cointegration, Granger Causality and vector error correction model. The results imply that there exists no short-run relationship between the stock market movements and the exchange rates in any of the studied countries. However, except for India and Pakistan, a long-run relationship between the above mentioned variables exist.

A study by Habibullah (1998) investigates any possible relationship between the money supply and the stock market movements in Malaysia from 1984 to 1992 by looking for causal relationships between the above mentioned variables and vector error correction models. The study reveals that M3 is a Granger cause of stock market price movements but the inverse relation does not hold. The writer emphasizes that this result shows inconsistency with the efficient market hypothesis.

Further, Raymond (2009) uses a vector error correction model to study the relationship between the monetary indicators such as inflation rate, exchange rate, M2 and M3 with the stock prices in Jamaica via the Johansen cointegration test. The study reveals that the main index in Jamaica is significantly and positively influenced by the inflation and M3. However, it is negatively affected by exchange rate, interest rate and M2. Also, through Granger causality test, it is concluded that M2 is the only predictor of the stock prices from the above mentioned variables. Besides, Rogalski & Vinso (1977) investigate the relationship between the money supply and four indices; New York Stock Exchange Composite Index, S&P 500, Dow Jones Industrial Index and the Fisher Link Relative Index. The study reveals that the rate of money supply has a significant effect on the stock returns. Moreover, it shows that the stock market conforms to the efficient market hypothesis with respect to monetary information. Finally, the researchers suggest that there is bidirectional causality from money supply to stock market movements.

### 3. Methodology

In this research, the factors affecting the Emas Shariah Index movements are analyzed through a quantitative research whereby a series of numerical data are employed to test the study's hypotheses. Furthermore, to serve this purpose, 522 observations, contributing to six variables were collected from several online sources. The empirical results in the current research are developed based on both the accessibility to the data and the statistical criteria developed to select the variables of analysis which were based on the secondary researches. More specifically, the Emas Shariah Index has been used as a proxy of the Shariah-compliant stock return and considered as a measure of price movements in the Islamic securities market. Moreover, in order to address the objectives of this research, a dependent variable, the Emas Shariah Index and eight independent variables, namely, the consumer price index (CPI), industrial production index (IPI), broad money supply (M3), Islamic interbank rate (IIR), and Dollar-Ringgit exchange rate (ER).

Taking into consideration the pre-determined collection of objectives to be fulfilled in this research, various type of analysis techniques and statistical tests are deployed. More specifically, firstly, the descriptive statistics attributable to the nine variables of the study such as the mean, variance, median, etc are demonstrated in order to show the plain characteristics of each and anticipate the need for transforming the data sets using natural logarithm based on the nature of the series. Secondly, based on a criterion which identifies the variables whose series are either extreme cases of Skewness or demonstrate measurement units which are

greatly different from the other variables of the study, potential data sets are transformed using a natural logarithm technique. Thirdly, the stationarity of the variables at the level and the first-differenced form are tested through unit-root test in terms of both the Augmented Dickey Fuller (ADF) and Phillip-Peron test. Furthermore, the Engle-Granger and the Johansen cointegration tests are techniques used in this research to check the existence of any cointegration equation among the variables studied and the Granger Causality test is utilized to identify the direction of any causal relationships between them.

### 3.1. Model specification

#### Unit root test

In order to test the series for a unit root, this research adopts both the Augmented Dickey-Fuller (ADF) and Phillip- Perron (PP) tests. More precisely, the ADF test is a unit root test whose statistic is a negative number such that the more negative the statistic is, the stronger can the null hypothesis of having a unit root be rejected. In order to apply the ADF statistic, the below model is used, considering  $\beta$  as the time trend coefficient and  $p$  as the autoregressive model's lag order.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \dots + \delta_{p-1} \Delta y_{t-p-1} + \varepsilon_t$$

Later, in order to enforce the constraints of a random walk both  $\alpha$  and  $\beta$  must be set equal to zero. Consequently, the test can be applied by finding the test statistics from the



below formula and considering a null hypothesis of  $\gamma=0$  against the alternative hypothesis of  $\gamma<0$ .

$$DF_{\tau} = \frac{\hat{\gamma}}{SE(\hat{\gamma})}$$

In order to reassure the results of the ADF, the Phillip-Perron test is applied to the studied series. This is because PP test has shown more robustness with regards to heteroskedasticity and unstipulated autocorrelations than the ADF tests because of its ability in making non-parametric correction to its generated t-statistics (Davidson & MacKinnon, 2004). However, it is important to emphasize that both the ADF and PP tests are built on the Dickey-Fuller test and follow the same form of null and alternate hypothesis.

#### Johansen Cointegration test

After having established that the variables of study are all from the same order of integration  $I(1)$ , the Johansen Cointegration test can be used to find the number of cointegrating variables in the model. This procedure is used because the previously-used Engle-Granger cointegration tests only allows for one cointegrating relationship. However, Johansen test is not restricted in this manner. Meanwhile, the weakness of the Johansen cointegration tests is that it depends entirely on asymptotic properties of the model and that makes it sensitive to errors made in specifying the model, especially for limited samples (Sjö, 2008). Generally, there have been two methods of analysis for the Johansen test; the trace value and the eigenvalue.

More precisely, where the trace test has a null hypothesis of the number of cointegrating vectors being  $r \leq n$ , the eigenvalue tests a null hypothesis of  $r = n$  (Johansen, 1991).

In order to investigate a model using the Johansen cointegration tests, an empirical vector autoregressive model with lags and dummy variables is developed to ensure that the residuals of the series are of a white noise type. Moreover, if the variables show significance in terms of having a common stochastic trend and are found to be cointegrated, there will be enough evidence to conclude that there is a long-run equilibrium relationship between the studied variables. However, if the variables in the model are found to be cointegrated, an error correction model (ECM) must be used as an explanatory variable in order to measure the long-run dynamic relationship's error term and allow for the application of the Granger Causality test. The Vector Autoregressive model deployed is of the form,

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \alpha_2 \Delta y_{t-2} + \dots + \alpha_k \Delta y_{t-k} + \varepsilon_t$$

As previously mentioned, if the existence of cointegration between the variables is confirmed, then an error correction term can be included in the model. The term is added in order to relate the short-term relationship of the variables. That is, there are instance whereby there exists a long-term equilibrium relationship among the variables, however, they may be found to be in disequilibrium in the short-run and there is a need for an error correction term, as below, to correct for this short-run disequilibrium (Ashraf, Rajasekar & Deo, 2013).

$$\Delta Y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \phi_i^* \Delta y_{t-1} + \varepsilon_t$$

Moreover, this model has been used by Muhammad, Hussin, Abu, & Awang (2012), Prantick & Vina (n.d.), Thang (2009), Muhammad & Rasheed (n.d.), Habibullah (1998), Raymond (2009), Berument & Ince (2005), Toraman, Başarır, & Bayramoğlu (2011), and Jecheche (n.d.).

#### VECM Granger Causality test

Since the Johansen cointegration model only investigates the relationship and not the direction of the causal relationships, Granger causality test is used to study the causal effect of the variables on each other. Moreover, if, through the cointegration tests, it is approved that there is cointegration among the variables, it can be concluded that Granger causality must exist in at least one direction (Ashraf, Rajasekar & Deo, 2013). Further, the Granger causality test can test the extent by which the current value of the dependent variable is explained by the past values of itself and the current value of the independent variables in the short-run.

Moreover, since the test is sensitive to the selected lag length chosen, the Akaike Information Criterion (AIC) is deployed to select the most appropriate lag in order to ensure the stationarity of the variables. That is because the Granger causality test has proven to be inappropriate when analyzing the variables which are not stationary or have no cointegrating equations among them (Ibrahim, 1999). Finally, the below model tests causality from X, being the independent variable to Y, being the dependent variable.

$$Y_t = \sum_{j=1}^m \alpha_j Y_{t-j} + \sum_{i=1}^m \beta_i X_{t-i} + e_t$$

This method was used by Muhammad, Hussin, Abu, & Awang (2012), Thang (2009), Rahman & Uddin (2009), Alagidede, Panagiotidis, & Zhang (2010), Muhammad & Rasheed (n.d.), Habibullah (1998), Raymond (2009), Bilal et al. (2013), and Jecheche (n.d.).

4. Results and Discussions

4.1. Unit root test

Generally, the Augmented Dickey Fuller (ADF) test is deployed as a standard procedure for checking the stationarity of any data series. Yet, since the ADF test is repeatedly criticized for a relatively low accuracy, the Phillips-Perron (PP) test is used to compliment ADF statistics.

Table 1: Unit root test for internal variables

Variables	level		First Difference	
	ADF	PP	ADF	PP
LNESI	-0.710957	-1.001494	-7.763761*	-7.907684*
LNPI	-2.289306	-4.345985*	-16.23266*	-16.23266*
LNIIR	-2.097120	-1.811396	-4.931685*	-4.931685*
ER	-1.917345	-1.632573	-6.708986*	-6.455770*
LNMI3	-0.489161	-0.489161	-8.739620*	-8.739620*
LNCPI	-0.970740	-1.484892	-15.75156*	-15.57973*

\* shows significance at 1% level

The results of the above mentioned tests, both at the level and first differenced are demonstrated in above table. As a result of the two tests, it can be concluded that none of the seven variables are stationary at the level. Moreover, after a

first difference, all six have proven to reject the null hypothesis of having a unit root at 10%, 5% and 1% level and show stationarity. In summary, both ADF and PP tests indicate that all the studied series are individually integrated of the order  $I(1)$ .

#### 4.2. Lag Length Criterion

Having confirmed that the variables have reached stationarity and have the same order of integration,  $I(1)$ , one can proceed the analysis to check whether the variables are co-integrated by firstly using the Johansen Multivariate Cointegration test based on the VAR model. However, in order to identify the appropriate lag length for the proceeding VAR model, the Akaike information criterion (AIC) was used.

Table 2: Lag Order Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	816.7641	NA	1.37e-20	-20.19410	-19.92613	-20.08666
1	1557.042	1295.486	9.65e-28	-36.67605	-33.99627*	-35.60165
2	1638.459	124.1609	1.03e-27	-36.68647	-31.59489	-34.64511
3	1709.804	92.74832	1.59e-27	-36.44509	-28.94171	-33.43677
4	1821.459	120.0294	1.11e-27	-37.21147	-27.29629	-33.23619
5	1917.294	81.46007	1.63e-27	-37.58236	-25.25537	-32.64012
6	2045.469	80.10935	1.95e-27	-38.76173	-24.02294	-32.85253
7	2306.150	104.2723*	2.87e-28*	-43.25375*	-26.10316	-36.37759*

#### 4.3. Johansen Cointegration

The Johansen Cointegration was deployed to identify the number of cointegrating equations in the model. As prevailed, at 5% significance level, both the trace test and the Max Eigen value indicate that five cointegrating

equations are identified in the model. Based on the Johansen Cointegration test, the fifth normalised co-integrated vector towards the first differenced logarithm of EMAS Shariah Index, using the lag length suggested by the AIC criterion, indicates the long-run relationship between the five macroeconomic variables of IPI, IIR, ER, M3 and CPI.

Table 3: Johansen Cointegration test results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.774848	313.5912	83.93712	0.0000
At most 1 *	0.667287	198.7857	60.06141	0.0000
At most 2 *	0.545695	114.0492	40.17493	0.0000
At most 3 *	0.364435	53.29725	24.27596	0.0000
At most 4 *	0.206264	18.39773	12.32090	0.0043
At most 5	0.007896	0.610377	4.129906	0.4958

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

The long-run equation demonstrated in Table 4 indicates that, in the long-run, the Emas Shariah Index values have an insignificant positive relationship with the Islamic Interbank rates. In fact, because of Shariah regulations regarding the elimination of element of riba, Islamic interbank rate had been used in this research in order to substitute interest rates and it was expected that they form a significant negative relationship with EMAS Shariah Index similar to interest rates. However, the surprising positive and insignificant relationship is inconsistent with findings of Vejzagic & Zarafat (2013), Hancocks (2010), Prantick & Vina (n.d.),

Saeed & Akhter (2012), Humpe & Macmillan (2007), Alam & Salahuddin (2009), Thang (2009), Albaity (2008), and Raymond (2009). More precisely, the findings of the researchers who believe in a negative significant relationship between the interest rates and stock prices are justified by the fact that as interest rates increase the costs of borrowing increase for firms and therefore the corporate profits reduce. Further, as profits reduce future dividends decline, decreasing the present value of the future cash flows and therefore decreasing the stock prices. Also, the negative relationship is due to the fact that higher interest rates attract more investors to the interest-bearing securities market rather than the stock market. Thus, the decline in demand for the stocks reduces its prices. Moreover, as a result of higher interest rates the discounted cash flows decrease, decreasing the stock prices.

**Table 4:** Results of VAR analysis

Dependent variable (LNESI)	Independent variables				
	LNIIR	LNIPI	LNMI3	LNCPI	ER
Coefficient	0.222394	-1.003868	1.097404	-4.296285	-0.138557
Standard error	0.23008	0.60614	0.33254	0.69594	0.09439
t-statistic	0.96659	-1.65616	3.3000	-6.17335	-1.46792

However, although the empirical results on the relationship between the Islamic interbank rates and EMAS Shariah Index do not conform to previous findings about the stock market's relationship with interest rates, the positive sign of the relationship between the two analyzed factors can be deemed to be a result of co-movement of interest rates and

Islamic interbank rates. More specifically, Majid & Yusof (2009) believe that as interest rates increase, more Muslim investors are attracted to the Shariah-compliant stock market. Therefore, it can be concluded that the revealed positive sign of the relationship is due to the fact that Islamic interbank rates move together with interest rates and as interest rates increase, regardless of the Islamic interbank rate, more Muslim investors are attracted to EMAS Shariah index, increasing the demand for Shariah-based securities and therefore, increasing their prices.

Furthermore, the Table 4 shows an insignificant negative relationship between industrial production index and EMAS Shariah Index. While the insignificance of the relationship is in contradiction with finding of Muhammad, Hussin, Abu, & Awang (2012), Saeed & Akhter (2012), Filis (2009), Chaudhry, Khan & Buldin (n.d.), Rahman, Sidek, & Tafri (2009), Young (2006), Hong, Torous & Valkanov (2007), and Chen, Roll & Ross (1986) the negative sign is in contradiction with findings of Muhammad, Hussin, Abu, & Awang (2012) and in line with Saeed & Akhter (2012).

Moreover, when considering a positive relationship between IPI and stock prices, it is generally assumed that as the production level increases, corporate profits rise, increasing the future dividends and therefore increasing the discounted cash flows and the stock price. However, the empirical results of this research prove the contrary. This can be possibly caused by the fact that a significant weightage of the EMAS Shariah Index is constituted by service-based industries as compared with production-based ones. However, repetition of the same analysis on Bursa



Malaysia Hijrah Shariah Index in future researches can assist in finding an exact reason behind this result.

Besides, the results show a long-term, significant, positive relationship between EMAS Shariah Index and broad money supply (M3). This is in line with findings of Shostak (2006), Muhammad, Hussin, Abu, & Awang (2012), Vejzagic & Zarafat (2013), Hancocks (2010), Prantick & Vina (n.d.), Saeed & Akhter (2012), Habibullah (1998), Yusof, Majid & Razali (2006), Raymond (2009), and Rogalski & Vinso (n.d.). This is due to the fact that an increase in the money supply tends to increase the real economic activities and therefore lead to higher corporate profits (Dhakal et al, 1993). Accordingly, the present value of the future cash flows tends to increase and raise the stock prices.

In addition, there is a significant, negative, long-run relationship between EMAS Shariah index and consumer price index. This result is consistent with findings of Hancocks (2010), Schwert (1981), and Torrecillas & Jareño (2013). Moreover, the overall significance of the relationship is supported by Muhammad, Hussin, Abu, & Awang (2012), Filis (2009), Geetha, Mohidin, Chandran & Chong (2011), Torrecillas & Jareño (2013), Jecheche (n.d.), Hancocks (2010), Prantick & Vina (n.d.), Albaity (2008), Chaudhry, Khan & Buldin (n.d.), Raymond (2009), and Iqbal & Haider (2005). Moreover, the negative relationship is firstly justified by the fact that as prices increase, the cost of inputs of production rise, decreasing the corporate profits and therefore decreasing the future dividends. Secondly, higher rate of inflation creates the tendency in general public to save less in form of investments and spend more on necessities, decreasing the demand for stocks and therefore

reducing the stock prices. Thirdly, as inflation rate gets translated into nominal interest rate, the present value of the future cash flows reduces. Therefore, there exists a negative relationship between CPI and EMAS Shariah Index.

Finally, the relationship between EMAS Shariah Index and US Dollar-Malaysian Ringgit is insignificant and negative. Moreover, the insignificance of the relationship is in contrast with findings of Gençtürk & Binici (2012), Rafay, Naz, & Rubab (2014), Rahman, Sidek, & Tafri (2009), Rahman & Uddin (2009), Bhattacharya (n.d.), Zubair (2013), Alagidede, and Panagiotidis, & Zhang (2010). Meanwhile, the positive sign is in line with findings of Anlas (2012). In fact, the researches in favor of the positive sign of the relationship consider the fact that countries with high export value experience the depreciation of the domestic currency as a motive for more exports (Ibrahim & Wan, 2001). As the exports rise, corporate profits increase, rising the future dividends and therefore the present value of the future cash flows. However, the supporters of the negative sign in the relationship believe that a depreciating domestic currency decreases the corporate profits if imported inputs are being processed in the course of production, decreasing the future dividends and therefore the stock prices. Moreover, the negative sign of the relationship is also supported by the fact that investors view countries with a depreciating domestic currency in recession, thus withdraw their investments from the country's stock market, decreasing the demand for the stocks and therefore decreasing the stock prices (Hussin, Muhammad, Abu, & Awang, 2012).

#### 4.4. VECM Granger causal relationship

The previously identified number of cointegrating equations allows one to effectively run a vector Error Correction model based on five cointegrating vectors. Moreover, the Granger causal relationship based on Vector Error Correction model deployed, in form of Block Exogeneity Wald Test.

Table 5: Results of Granger causality test

Dependent variables	Independent variables						
	LESI	LIIR	LIPI	LM3	LCPI	ER	All
LESI		0.0099	0.0045	0.0006	0.0002	0.0279	0.000
LIIR	0.2671		0.8840	0.0969	0.2947	0.6366	0.0044
LIPI	0.1693	0.9823		0.2974	0.4384	0.4079	0.6254
LM3	0.0001	0.9222	0.6875		0.0007	0.2649	0.000
LCPI	0.2559	0.9460	0.7863	0.5442		0.3951	0.9452
ER	0.1514	0.1229	0.0100	0.2409	0.0698		0.0056

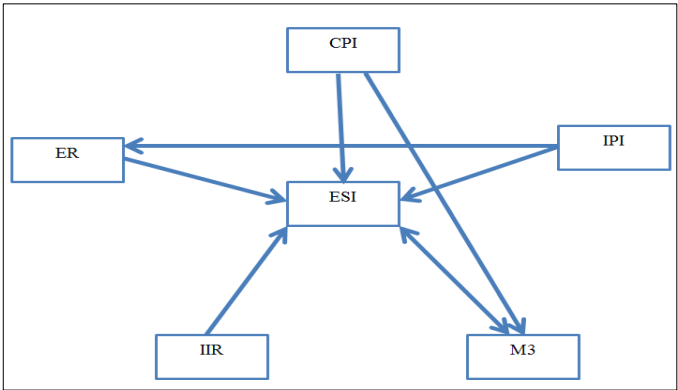
Until January 2014, there is enough evidence to reject the null hypothesis of having no short-run Granger Causality between the dependent variable D(LESI) and the independent variables D(LIIR), D(LIPI), D(LM3), D(LCPI), and D(ER) at 5% significance level. The causality from CPI to EMAS Shariah Index is supported by Jecheche (n.d.) and causality from M3 to the same independent variables is consistent with findings of Zubair, et al (2013), Habibullah (1998) Rogalski & Vinso (n.d.). Moreover, the causal relationship from exchange rate to EMAS Shariah Index is in line with findings of Kasman (2003) Dimitrova (2005) Alagidede, Panagiotidis, & Zhang (2010).

However, when considering the case whereby D (LIIR) is the dependant variable and the remaining 5 variables are

independent variables, the null hypothesis is not rejected for any of the variables. Also, the same scenario is true about D(LCPI) whereby, when considered as the dependent variable, the short-run Granger causality is not prevalent with any of the remaining five variables. Furthermore, it is proven that there is enough evidence for the null hypothesis to be rejected when D (LM3) is considered to be the dependent variable and D (LESI) and D (LCPI) are independent variables. Besides, when D (ER) is assumed to be the dependent variable, there is enough evidence to reject the null hypothesis of having no Granger Causality only for the case where D(LIPI) is the independent variable. To summarise, the results of the test and the attributed probabilities to each null hypothesis is presented in the above table.

To summarise, the pattern of the Granger Causal Relationship based on Vector Error Correction Model, based on the direction of causality is presented in Figure 1. To elaborate further, the figure demonstrates a single-headed arrow to show unidirectional causal relationship and a double-headed arrow to show bidirectional causal relationship.

Figure 1: Granger causal relationships



## 5. Conclusions and Implications of the Study

The results of this research bear implications for both local and foreign investors, regulators, and policy makers. The findings can be used by investors and analysts in forecasting stock prices and thus making profits. Meanwhile, the regulators of the Shariah-compliant indices can use the results to oversee the activities of the index's firms and prevent stock price manipulation. Besides, they can educate the general public in Malaysia about the Shariah-based securities market and motivate them to channel their investments into Shariah-compliant stocks. Furthermore, policy makers can deploy this research to enhance their awareness about the macroeconomic and external factors affecting the Shariah-based stocks in order to be able to make more effective and informed decisions.

Based on the results of the Johansen Cointegration test, all studied variables except Islamic interbank rate and US Dollar- Malaysian Ringgit have proven to have a long-term significant relationship with the studied index. Moreover, Whereas IPI, CPI, gold prices and S&P 500 Shariah Index share a negative relationship with EMAS Shariah Index, Islamic interbank rate, M3, exchange rate and crude oil prices have a positive relationship with it.

As for Industrial production index, the long-run relationship shows that industrial production level can assist in predicting the Shariah-based stock market's returns. However, while it is generally believed that an increase in the industrial production level should increase the stock prices, it is surprising that the empirical results of this research show the reverse. While this can be a result of the heavy weightage of services, rather than the production, in

the EMAS Shariah index, it can be implied that inclusion of more firms which are engaged in industrial production can help create a more direct link between the EMAS Shariah Index and IPI in the positive form expected.

Moreover, the insignificant relationship between the Islamic interbank rates and the EMAS Shariah Index implies the fact that Islamic interbank rate cannot be used as a perfect Shariah-compliant substitute for the conventionally used interest rate. That is because it is generally believed that there is a significant relationship between the interest rates and stock prices. However, the positive sign of the relationship implies the fact that as interest rates rise, Muslim investors tend to channel their investments more into the Shariah-based securities (Majid & Yusof, 2009). Besides, Islamic interbank rates move together with the interest rates in Malaysia (Ito, 2013). Therefore, a rise in the Islamic interbank rates which is in tandem with interest rates increases the Muslim investors' willingness to enter the Shariah-compliant securities market and the increased demand raise the stock prices.

Also, the US Dollar-Malaysian Ringgit has shown an insignificant relationship with EMAS Shariah Index which implies the fact that Shariah compliant securities can be an appropriate investment destination at the periods of exchange rate volatility since the Islamic stocks have shown no significant relationship with the changes in exchange rates. Furthermore, the expected positive and significant relationship between broad money supply and EMAS Shariah Index implies the fact that the participants in the Shariah-compliant securities must be mindful of information released about the money supply by the Ministry of Finance.

Generally, this can mean taking proper investment actions as expecting lower stock prices as contractionary monetary policies cause the money supply to decrease and expecting higher stock prices as expansionary policies cause the money supply to increase.

In addition, the negative relationship between the consumer price index and stock prices has a number of implications as inflation reduces the public's purchasing power. It is obvious that as cost of living increases, the nation will tend less to invest in stock market and will be more inclined to spend on necessary expenditures which results in less demand for stocks. Moreover, inflation causes the costs of production to increase and thus decrease the corporate profits. This consequently reduces the future dividends and therefore the present value of future cash flows. Besides, as the rate of inflation gets translated into the nominal interest rate the present value of the future cash flows decreases again. Therefore, that is why investors have to be mindful of the rate of inflation and its several effects on the stock market's movements. Meanwhile, policy makers should plan and implement fiscal and monetary policies which would assist them in controlling the inflation and thus preventing its negative impact on the stock market movements.

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