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Foreign Interest Rates and the Islamic Stock Market Integration between Indonesia and Malaysia

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Abstract

This study aimed to examine the Islamic stock market integration between Indonesia and Malaysia, and the effect of foreign interest rates on both stock markets. This study used the monthly time series of Jakarta Islamic Index, Hijrah Syariah Index, and foreign interest rates within a period from August 2000 to January 2016. Result of cointegration test demonstrates that while there is a cointegration between Jakarta Islamic Index and Hijrah Shariah Index, no cointegration occurred between Jakarta Islamic Index, Hijrah Shariah Index, and foreign interest rates. Estimation result of the VAR model indicates that there is a long-run relationship between Jakarta Islamic Index and Hijrah Shariah Index, and that there is integration between Indonesian and Malaysian Islamic stock markets. Furthermore, estimation result of the VARX model reveals that foreign interest rates only affected Malaysian Islamic stock price index.

Keywords: Stock Market Integration, Foreign Interest Rate, VAR Model, VARX Model.

JEL Classification: F33, F36, G150, E440.

1. Introduction

A number of literatures have attempted to provide a definition of stock market integration, both from an asset pricing perspective and a statistical perspective. From the perspective of assets pricing, stock market integration is defined as a situation where investors in a country can buy and sell shares of another country without any

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restrictions, and where similar shares have the same price when the stock prices are valued by the exchange rate of two countries' currencies (Pieper & Vogel, 1997; Dorodnykh, 2014). In terms of profit and investment risk, these stocks have the same risk and return (Jorion & Schwart, 1986; Korajczyk, 1996). As far as the statistical perspective is concerned, two stock markets are said to be integrated if they have a long-run equilibrium relationship and if the trend of their prices moves toward the same direction (Karim & Karim, 2012).

In theory, a relationship between the share prices of two countries has been demonstrated by Ma and Kao (1990) who used their formulation of portfolio model, where a portfolio is assumed to consist of only two types of stocks, i.e. domestic stock and foreign stock. This model was developed to expound the relationship between stock prices and exchange rates. However, given its formulation, the model can also be used to explain the positive relationship between the prices of foreign and domestic stocks. Meanwhile, the extent to which an exchange rate affects domestic stock prices is contingency upon how dominant are exports or imports. When exports are more dominant, an appreciation of exchange rate will reduce the competitiveness of export market, and in turn will lower the prices of domestic shares. Conversely, if imports are more dominant, the appreciation of the exchange rate will lower import costs, and this in turn will increase the prices of domestic shares.

In the integrated world economy, the real interest rate equalization is a measure of financial integration (Fakhr & Tayebi, 2009). Therefore, stock market integration can be influenced by the monetary policy of both domestic and foreign countries, especially one that is related to changes in interest rates, although the effect of foreign interest rates on stock prices usually occurs through the channel of domestic interest rates. According to the theory of interest rate parity, a country's nominal interest rate is the sum of foreign interest rate, exchange rate, and risks premium. Thus, an increase in foreign interest rate (assuming other factors are unchanged) can lead to a rise in domestic interest rates (Levi, 2009). If foreign interest rate increases higher than domestic interest rate, an outflow of capital may occur, causing the domestic exchange rate to be depreciated. The depreciation of the exchange rate can increase exports, and supply of goods in the

domestic country can decrease, causing the prices of domestically produced goods to go up. A continual increase in the prices of goods is an indication of impending inflation, and this will encourage a country's central bank to raise domestic interest rates so that price stability can be maintained (Celik & Denis, 2009; Adam, 2016). Furthermore, the rise in domestic interest rates may cause investment or loan costs to become more expensive, ultimately causing investment to decrease. Higher investment costs will depress corporate earnings and may affect the performance of the company, so the company's share price may fall.

Empirically speaking, many studies have been conducted to investigate the integration of stock markets. Among the researchers who pursued this issue were Arouri and Jawadi (2009), Syllignakis and Kouretas (2010), and Rahim and Masih (2016). Additionally, the effect of foreign interest on the integration of stock markets has been examined by previous researchers, for example: Bracker et al. (1999), Stoica et al. (2014), and Guesmi and Teulon (2014). Despite this growing body of literature, however, no consensus has been achieved. Some researchers, e.g. Phylaktis and Ravazzolo (2005), Syriopoulos (2006), and Chang et al. (2017) reported that there was a relationship between share price or stock return of two countries. Others, such as Roca and Selvanathan (2001), Gilmore and Mc Manus (2002), and Egert and Kocenda (2005), found no relationship between stock prices of two countries which they investigated. Such differences may be attributed to the changes in economic condition of the country under investigation, causing different researchers to analyze data from different periods. Furthermore, most of the aforementionned studies focused their investigation on developed countries, and only very few looked into developing countries. In addition, the majority of the studies used composite stock price index as the variable of stock price; only very few studies used specific stock price index as their variable. On top of this, the effect of foreign interest rates on the integration of Islamic stock market is still less investigated.

This study used a specific stock price index, i.e. the Islamic stock price index, as its variable. Islamic stock price index is an indicator of common shares in Islamic stock price market, in which instruments of shares being traded in the market are issued only by companies whose

only produce and sell of goods in accordance the Islamic shari'a. This study used two Islamic stock indexes, i.e. Jakarta Islamic Index issued by Bursa Efek Indonesia (BEI) and Hijrah Shariah Index issued by Bursa Malaysia (BM), as its variables. All shares listed in BEI and BM are stocks that have been liberalized by the government of the respective country (Tiwari et al., 2013), so as to allow foreign investors to buy and sell the shares instruments. The implementation of stocks liberalization policies has caused some external factors to affect the prices of such shares. For these reasons, this study was set out to examine the long-run relationship between the prices of Indonesian Islamic stock and those of Malaysian Islamic stock, as well as to investigate the effect of foreign interest rates on both Islamic stock prices. In this case, the long-term relationship between the two stock prices and price trends in the same direction have been defined as the integration between Indonesian and Malaysian Islamic stock markets. To examine this relationship, we used vector autoregression models (VAR), while to test the effect of foreign interest rates on stock prices, we used a VAR model with exogenous variables, called VARX model. We analyzed time series data of Islamic stock index and foreign interest rates within a period from August 2000 to January 2016.

2. Review of Literature

In the introduction section, we discuss the theoretical aspects related to the relationship between stock prices of two countries and the influence of foreign interest rates on the stock prices. In this section, we review some results of empirical research which investigated the integration of stock markets, and some studies looking into the effect of foreign interest rates on the integration of stock markets. Yeoh et al. (2010), for example, investigated the integration between Malaysian and Singaporean stock markets. Result of a test run by the International Capital Asset Pricing Model (ICAPM) on the weekly data spanning from February 1988 to September 2009 indicated that there was no integration between Malaysian and Singaporean stock markets. Furthermore, studies on European countries have been carried out by, among others, Horvath and Petrovski (2013). Using time series data in the period 2006- 2011, they examined the co-

movement between international stock markets and stock markets in several Western European countries (Czech Republic, Hungary, and Poland) and South Eastern European countries (Croatia, Macedonia and Serbia). Results of a test using GARCH multivariate model indicated that the degree of co-movement in Western Europe was higher than it was in other regions, and that there was no correlation between the stock markets in South Eastern European countries and those in developing countries (Western Europe). Ozlen (2015) examined the integration of stock markets between Turkey and three developed countries (US, UK, and Germany) from a perspective of sectorial stock price issued by the Istanbul Stock Exchange, which consisted of 11 sectors including electricity, food, communication, paper, chemistry, metal-main, metal-product, stone, textile, commerce, and transportation. Result of a test using VECM model indicated that there was integration between the stock market of Turkey and the stock markets of the three developed countries being studied. Al-Nasser and Hajilee (2016) examined the integration of stock markets among some countries with developed stock market (Brazil, China, Mexico, Russia, and Turkey) and developed countries (US, UK and Germany) using data spanning from January 2001 to December 2014. Result of a test using ARDL model showed that in a short term there was a relationship between the stock returns in countries with growing stock market and stock returns in developed countries. In a long term, however, only German stock returns was correlated to the stock returns of the countries with growing stock market.

Past researchers have also studied the integration of stock markets in relation to Asian financial crisis. Yang et al. (2003), for instance, investigated the integration of the stock markets between two developing countries (US and Japan) and ten Asian countries (Hong Kong, India, Indonesia, Malaysia, Korea, Pakistan, Philippines, Singapore, Thailand, and Taiwan). The study analyzed data of composite stock price, which were split into three periods: pre-crisis (January 2, 1995 to December 31, 1996), crisis (July 1, 1997 to June 30, 1998), and post-crisis (July 1, 1998 to May 15, 2001). It was discovered that there was integration between the stock markets of the developing countries and those of the Asian countries, and that Asian

financial crisis affected the integration of those stock markets.

The impact of foreign interest rates on the integration of stock markets has been investigated by Cheung (1997), where foreign interest rate was proxied by the US interest rate or the fund rate, and indicators of stock market were proxied by the US and Asia-Pacific stock returns, which spanned from 1993 to 1994. This period was divided into two sub-periods namely a sub-period of 1993 and a sub-period of 1994. Using the VAR model to examine the relationship, it was revealed that while in 1993 the US stock returns did not affect Asia Pacific stock returns, there was relationship between stock returns of the US and that of Asia-Pacific in 1994. It was further discovered that the US funds rate affected Asia Pacific stock returns. Kaminsky and Schmukler (1999) investigated the effect of foreign interest rates on the stock returns of some countries with unstable emerging markets (including Argentina, Brazil and Chile), by analyzing data which spanned from January 1990 to June 2000. Results of a test using a panel regression showed that foreign interest rates positively affected the stock returns of the countries under investigation. Using share price volatility as a major determinant, Pirovano (2012) looked into the effect of domestic and Euro area monetary policy on the stock price in countries which became the new members Central European. Monetary policy was proxied by interest rate, whereas the interest rate of Euro Area was proxied as the international interest rate. Result of a test using SVAR model indicated that both international and domestic interest rates affected stock prices, and that the stock price was more sensitive to international interest rate than it was to domestic interest rate. Furthermore, the exchange rate was found to affect the stock price. Stoica et al. (2014) investigated the response of capital markets of Central and Eastern European countries (Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, and Romania) to monetary policy through a shock of domestic interest rate and international interest rate. They used data from January 2003 to June 2012. The capital market was proxied by exchange rates (local currency per US dollar), index of production, and stock price index. The international interest rate was proxied by the three-month LIBOR interest rate. Result of the VECM test of the monthly data indicated

that there was a negative effect of international and domestic interest rates on the stock price index, as well as on the production index in Czech Republic, Hungary, Poland, and Romania. The relationship between the international interest rates and the stock price index and the production index was particularly negative in countries without a monetary policy (Bulgaria, Latvia, and Lithuania). Also, there was an effect of domestic interest rates and international interest rate on the exchange rate. Furthermore, the stock price index was found to be more sensitive to changes in the international interest rates than it was to changes in the domestic interest rate.

Buttner and Hayo (2011) conducted a study on the determinants of stock market integration. They investigated the determinants of stock market integration among the members of the European Union (EU) in period of 1999-2007. Among the economic variables that can possibly affect the integration of the stock market are: the spreads of interest rate, exchange rate risk, market capitalization, and business cycle synchronization. To examine the dynamics of the correlation between these economic variables and stock market integration, DCC-MGARCH model was used. To this end, they categorized the EU countries into two groups namely a group of old members of EU and a group of new members of EU. Result of their study showed that there was integration between the stock markets of the old and the new members of EU. Capitalization of stock market, foreign exchange risk, interest rate spreads, and business cycle synchronization were among the factors that affected the stock market integration. Guesmi and Teulon (2014) investigated the determinants of stock market integration in Middle East countries (Turkey, Israel, Jordan and Egypt) in the period 1996-2008. They used a model of International Capital Asset Pricing (ICAPM) to examine the dynamics of the changes in the degree of regional stock markets integration, global risk premium, risk premium rate, and risk premium of local market. Several factors had been identified to possibly affect the integration of the stock market, and they were categorized into: domestic factors (among others are inflation, rate of spread variation and exchange rate volatility), and global factors (global interest rate, world market returns, and world market dividend yields). Test results showed that while domestic factors were crucial in explaining the variation of regional return markets, none of the four countries demonstrated a strong

integration of stock market. It was further revealed that global factors did not affect the degree of the integration.

3. Data and Methodology

3.1 Data

This study used the time series of Indonesian Islamic stock price, Malaysian Islamic stock price, and foreign interest rate. The Indonesian Islamic stock price was proxied by Jakarta Islamic Index (INS^0), Malaysian Islamic stock price by Hijrah Shariah Index (MAS^0), and foreign interest rates by the US interest rate, i.e. fund rate (FIR^0). The fund rate had been selected as a proxy for foreign interest rates owing to the fact that the US is one of global financial markets beside the United Kingdom and Japan (Kim et al., 2006), and that the United States has a large, open economy that can affect other countries' economies in international commerce, finance, and macroeconomic coordination (Lee, 2002), in particular on countries to which it has trading relations, such as Indonesia and Malaysia. Data about share price index were obtained from the website of Fussion Media Limited (www.investing .com), whereas data about fund rate were taken from Bank of the United State. For analysis purposes, we used *INS*, *MAS*, and *FIR*, in which $INS = \ln(INS^0)$, $MAS = \ln(MAS^0)$, and $FIR = \ln(FIR^0)$. All of the time series data of Islamic stock price index and foreign interest rates were monthly time series within a period from August 2000 to January 2016.

3.2 Methodology

As mentioned in the introduction, the integration between Indonesian Islamic stock market and Malaysian Islamic stock market is defined as a long-run, co-moving relationship between the Islamic stock price indexes in the countries. To examine this long-run relationship, we used the vector auto regression model (VAR). If *INS* and *MAS* are integrated of order one, *I*(1), and not cointegrated, a formulation of the VAR(*p*) model without trend (Koop, 2006), as follows

$$D(INS_t) = \lambda_1 + \sum_{i=1}^{p} \emptyset_{1i} D(INS_{t-i}) + \sum_{i=1}^{p} \theta_{1i} D(MAS_{t-i}) + \varepsilon_{1t} \quad (1a)$$

$$D(MAS_t) = \lambda_2 + \sum_{i=1}^{p} \theta_{2i} D(MAS_{t-i}) + \sum_{i=1}^{p} \emptyset_{2i} D(INS_{t-i}) + \varepsilon_{2t} \quad (1b)$$

where λ_j, $\emptyset_{ji}$, θ_{ji}, φ_{ji} $(i = 1, 2, \dots, p; j = 1, 2)$ are the regression parameters and p is the length of time lag. Term ε_{jt} $(j = 1, 2)$ is white noise. D notation expresses a difference operator in which $D(INS_t) = INS_t - INS_{t-1}$ is the first difference of *INS*. The matrix form of equation (1a) and (1b), is

$$D(Y_t) = \lambda + \sum_{i=1}^{p} \Phi_i D(Y_{t-i}) + \varepsilon_t \quad (2)$$

where $D(Y_t) = (D(INS_t),\ D(MAS_t))'$ is the vector of endogenous variable, $\lambda = (\lambda_1, \lambda_2)'$ the coefficient vector, $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ the white noise vector, and $\Phi_i = \begin{pmatrix} \emptyset_{1i} & \theta_{1i} \\ \theta_{2i} & \emptyset_{2i} \end{pmatrix}, (i = 1, 2, \dots, p)$ is the coefficient matrix. Next, white noise vector fulfills $E(\varepsilon_t) = 0$, $E(\varepsilon_t \varepsilon_t') = \Sigma$, and $E(\varepsilon_t \varepsilon_s') = 0$ for $t \neq s$ where $\Sigma = \begin{pmatrix} \sigma_{\varepsilon 1 \varepsilon 1} & \sigma_{\varepsilon 1 \varepsilon 2} \\ \sigma_{\varepsilon 1 \varepsilon 2} & \sigma_{\varepsilon 2 \varepsilon 2} \end{pmatrix}$

If *INS* and *MAS* are integrated of order one, *I*(1) and they cointegrated, then the equation (2) can be expressed in a form of the vector error correction model (VECM), as follows

$$D(Y_t) = \lambda + \eta RES_{t-1} + \sum_{i=1}^{p} \Phi_i D(Y_{t-i}) + \varepsilon_t \quad (3)$$

where $\eta = (\eta_1, \eta_2)'$ is the coefficient vector of error correction RES_{t-1}. Time series RES_{t-1} is $RES1_{t-1}$ or $RES2_{t-1}$ obtained from equation

$$RES1_{t-1} = INS_{t-1} - a - bMAS_{t-1} \quad (4a)$$

$$\text{or } RES2_{t-1} = MAS_{t-1} - c - dINS_{t-1} \quad (4b)$$

where *a*, *b*, *c*, *d* are constanta regression obtained from a simple linear regression estimation of *INS* and *MAS*. We used model (3) to examine the long term, co-moving relationship between Indonesian Islamic stock price index (*INS*) and Malaysian Islamic stock price index (*MAS*).

To examine the effect of foreign interest rates on the Islamic stock market integration between Indonesia and Malaysia, we used a VAR model with exogenous variable, as proposed by Pesaran et al. (2000), Tsay (2014), and Ahn et al. (2015). The VAR model with exogenous variable is usually termed the VARX(*p*,*s*) model, where *p* is the length of time lag of endogenous variable, and *s* the length of time lag of exogenous variable. If *INS*, *MAS*, and *FIR* are stationary at level, or

I(0), then the VARX(*p*,*s*) model with *FIR* as the exogenous variable takes the following form:

$$Y_t = \delta + \sum_{i=1}^{p} \Phi_i Y_{t-i} + \sum_{i=0}^{s} B_i X_{t-i} + v_t \quad (5)$$

where $Y_t = (INS, MAS)'$ is a vector of endogenous variables, $X_t = FIR_t$ is exogenous variable, $\Phi_i\ (i = 1, 2, \dots, p)$ is a 2x2 coefficient matrix of endogenous variables, $B_i\ (i = 0, 1, 2, \dots, s)$ is a coefficient of exogenous variable, and $\delta = (\delta_1, \delta_2)'$ is a constant vector. Furthermore, $v_t = (v_{1t}, v_{2t})$ is a vector of white noise which has properties similar to those of ε_t in (2).

If *INS*, *MAS*, and *FIR* are stationary at the first difference or *I(*1), and the three variables are cointegrated, then equation (5) turns into:

$$D(Y_t) = \delta + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Phi_i^* D(Y_{t-i}) + \sum_{i=0}^{s} B_i D(X_{t-i}) + \varepsilon_t \quad (6)$$

where Π is a coefficient matrix, and $\Phi^*(L) = I_2 - \sum_{i=1}^{p-1} \Phi_i^* L^i$ with $L^i Y_t = Y_{t-i}$, $\Phi_i^* = -\sum_{j=i+1}^{p-1} \Phi_j,\ i = 1, 2, \dots, (p-1)$, and I_2 is a matrix unit with 2x2 dimension. Model (6) is the VECM model with *FIR* as exogenous variable (VECX). If the cointegration rank is rank(Π) = $r < 2$, then there will be matrix α and β having a 2xr dimension in such a way that $\Pi = \alpha\beta'$ where cointegrating vector β is sometimes called the long-run parameters. The number of cointegration equation between *INS*, *MAS*, and *FIR* is *r* = rank(Π). If *INS*, *MAS*, and *FIR* are not cointegrated, then the VARX model (5) in the form of first diference (SAS Institute Inc., 2008).

Following the requirements of the model, before analyzing the relationship or the effect, we first examined the integration order of each time series of *INS*, *MAS*, and *FIR* by using the Augmented Dickey-Fuller (ADF) test. The following is an example of the autoregressive (AR) model for univariate time series, *INS*, that is related to the ADF test of time series, *INS* :

$$D(INS_t) = \alpha + \beta t + \rho INS_{t-1} + \sum_{j=1}^{k} \varphi_j D(INS_{t-j}) + u_t \quad (7)$$

where α, β, ρ, and $\varphi_j (j = 1, 2, \dots, k)$ is the parameter, *k* is the length of time lag, *t* expresses trend, and u_t is white noise. Hypothesis $H_0 : \rho = 0$ means that *INS* time series has a unit root, whereas hypothesis $H_1 : -2 < \rho < 0$ indicates that *INS* is stationary at level or is

integrated of order 0, $I(0)$ (Koop, 2006). Hypothesis H_1 is accepted if the absolute value of test statistics associated with the ADF test is higher than the absolute value of critic value at a significance degree of 1%, 5% or 10%.

In the next stage, we examined the cointegration between *INS* and *MAS*, as well as the cointegration between *INS*, *MAS*, and *FIR*. To examine the cointegration between *INS* and *MAS*, we run the Engle-Granger cointegration test (Engle and Granger, 1987). In this case, we examine the integration order of the residual RES_t in equation (4a) or (4b) by conducting ADF test. Since, there are only two endogenous variables, only one cointegrating relationship can be developed out of the cointegrating relationship in (4a) or (4b). If RES_t is $I(0)$, we can say that there is a cointegration between *INS* and *MAS*, and said that there is a long-run relationship between *INS* and *MAS* with the long-run multiplier effect is b or d in (4a) or (4b) (Koop, 2006). Then, to examine the cointegration between *INS*, *MAS*, and *FIR*, we performed Johansen cointegration test (Johansen, 1992; Harbo et al., 1998). This type of cointegration test is related to the estimation of the VARX(p,s) or VECX (p,s) model, which has been developed by Pesaran and Shin (2000) and Ahn et al. (2015).

Before examining the long term relationship between Indonesian Islamic stock price index and Malaysian Islamic stock price index, and the effect of foreign interest rates on both stock price indexes, we first used the Akaike Information Criterion (AIC) to set the length of optimum time lag, using the smallest value of AIC. Based on this time lag, we estimated the regression parameters of the VAR(p) and VARX(p,s) models by using the ordinary least squared method. To test the significance of the regression parameters, we used the criteria of both p-value t-statistics and p-value F-statistics, in which a parameter is significant if the p-value is smaller than the significance degree of 1%, 5% or 10%. We also compared the value of the coefficient determination of R-square and Durbin Watson (DW) statistics to ensure that the estimation result of the model is a non-spurious regression model.

4 Results and Discussion

4.1 Results

Estimation results of test statistics related to ADF test are summarized in Table 1.

Table 1: Results of Estimation Related to ADF Test

Variable	t-statistics	1% critical value	5% critical value	Prob.*
INS	-2.071762	-4.009271	-3.434706	0.5576
D(*INS*)	-11.14084	-4.008706	-3.434433	0.0000
MAS	-3.920457	-4.010440	-3.435269	0.0131
D(*MAS*)	-11.68076	-4.008706	-3.434433	0.0000
FIR	-1.318975	-4.008706	-3.434433	0.8801
D(*FIR*)	-8.479225	-4.008706	-3.434433	0.0000

* MacKinnon (1996) one-sided p-values.

Resource: Own processing

Table 1 shows the estimated value of test statistics and the critic value related to ADF test. The time series of *INS*, *MAS* and *FIR* are nonstationary time series, since, the absolute value of the test statistics associated with the ADF test is smaller than the absolute value of the critic value at 1% significance level (or the value of the test statistics is greater than the critic value). The time series of *D*(*INS*), *D*(*MAS*) and *D*(*FIR*) are stationary because the absolute value of the test statistics of each time series is greater than the critic value. Thus, the each time series of *INS*, *MAS* and *FIR* is integrated of order one, *I*(1).

We test the integration order of residual $RES1_t$ and $RES2_t$ by using the AR(*k*) model in (7). Estimation results of ADF test is summarized in Table 2.

Table 2: Estimastion Results of ADF Test

Variable	t- stat.	1% critical value	5% critical value	10% critical value	Prob.*
$RES1_t$	-1.894780	-2.577660	-1.942574	-1.615547	0.0557
$RES2_t$	-1.756660	-2.577660	-1.942574	-1.615547	0.0750

*MacKinnon (1996) one-sided p-values.

Resource: Own processing

Based on the Table 2, the results of testing the integration order using ADF test shows that $RES1_t$ and $RES2_t$ are integrated of order

zero, *I*(0) at 10% significance level. Vogelvang (2005) suggests that the final result should not be considered conclusive, and it must be followed by estimating the error correction of each equation in (3). Result of calculating the length of time lag based on AIC criteria is p = 2. Based on this, the results of re-estimating the regression parameter by excluding insignificant variables (including $RES1_{t-1}$) in (3) are summarized in Table 3.

Table 3: Results of Estimating Regression Parameter by Excluding Insignificant Variables in (3)

Variable	Coefficient	t-statistic	Prob.	Others statistic	
Dependent Variable: $D(MAS_t)$					
C	0.005660	0.000464	0.0659	R-square	: 0.081323
$D(INS_{t-1})$	0.129817	3.057869	0.0026	Prob(F-Stat)	: 0.000464
$RES2_{t-1}$	-0.065902	-2.019312	0.0449	*DW*	: 1.949813
Dependent variable: $D(INS_t)$					
C	0.009439	1.797957	0.0738	R-squared	: 0.054379
$D(MAS_{t-1})$	0.392143	3.235125	0.0014	Prob(F-stat)	: 0.001444
				DW	: 1.879032

Resource: Own processing

Based on Table 3, the coefficient of residual $RES2_{t-1}$ is significant at 5%, therefore there is a cointegration between *INS* and *MAS*. Likewise, the intercept, coefficient of $D(INS_{t-1})$ and coefficient of $D(MAS_{t-1})$ are all significant. This indicates that in the long-run, there was a two-way relationship occurred between Indonesian Islamic stock price index and Malaysian Islamic stock price index. Furthermore, the cointegration between *INS* and *MAS* show that the trend of both the Islamic stock prices is co-moved, so, there is integration between Indonesian and Malaysian Islamic stock markets. This co-trend of Islamic stock price index is demonstrated by a coefficient of residual $RES2_{t-1}$ which is -0.065902. Furthermore, given the coefficient determination of R-square and Durbin Watson (DW) statistical value, the regression model resulted from the estimation turns out to be a non-spurious one.

To estimate the VARX model, we set a time lag $p = s = 2$ based on AIC. Furthermore, the estimation results of trace statistics, which is associated with Johansen cointegration test to measure the cointegration between *INS*, *MAS*, and *FIR* in the VARX(2) model, are

summarized in Table 4.

Table 4: Johansen Cointegration Test

$H_0(r)$	$H_1(r)$	Trace Statistic	5% -Critical Value	1 %-Critical Value
$r = 0$	$r = 1$	9.335917	15.41	20.04
$r \leq 1$	$r = 2$	3.186761	3.76	6.65

Resource: Own processing

It can be seen in the first row of Table 4 that the rank $r = 0$ is accepted (or rank r=1 is rejected) on a significance level of either 5% or 1%. Subsequently, the second row shows that rank $r = 1$ is accepted (or rank $r = 2$ is rejected). These two conflicting circumstances indicate that there is no significant cointegration equation. This means that there was no cointegration between *INS*, *MAS*, and *FIR*.

Results of estimating the parameters of the VARX(2) model with respect to the test on the effect of foreign interest rates on the integration between Islamic stock markets in Indonesia and Malaysia are summarized in Table 5. As can been seen on panel A in Table 5, $D(MAS_{t-1})$ is significant by 5%, while $D(FIR_{t-i}), (i = 0, 1, 2)$ is not significant, indicating that foreign interest rate has no effect on Indonesian Islamic stock price index, and Malaysian Islamic stock price index does have an effect on Indonesian Islamic stock price index. Furthermore, based on the p-value of F-statistics, intercept and coefficient of all independent variables (Malaysian Islamic stock price index, past Indonesian Islamic stock price index, and foreign interest rate) are significant by 10%. The contribution of the independent variable including the intercept is 6,6%. Next, it is obvious from panel B in Table 5 that the coefficients of $D(INS_{t-1})$ and $D(INS_{t-2})$ are significant by 1% and 5% respectively. Likewise, the coefficient of $D(FIR_{t-1})$ is significant by 9%, indicating there is a negative effect of foreign interest rates on Malaysian Islamic stock price index. Although the coefficient of $D(FIR_{t-1})$ is only significant by 9%, by considering the p-value of F-statistics, overall all of the coefficients of the independent variables and intercept are significant by 1%. Thus, altogether, Malaysian Islamic stock price index in the past, Indonesian Islamic stock price index, and foreign interest rates affect Malaysian Islamic stock price index. The contribution of this effect is 10.74%.

4.2 Discussion

It has been demonstrated in the previous section that in the long term, there was a co-moving relationship between Indonesian and Malaysian Islamic stock price indexes. This finding is similar to the findings reported by Phylaktis and Ravazzolo (2005). However, it is not in line with the result of research reported by Roca and Selvanatha (2001), Gilmore and Mc Manus (2002), and Egert and Kocenda (2005). This difference could be attributed to the economic condition of the countries, where different researchers took data from different periods. It could also be caused by the use of different research variables.

Table 5: Results of Estimating The VARX(2) Model and t-Statistics

Variable	Coefficient	t-statistic	Prob.	Others Statistics
A. Dependent variable : $D(INS_t)$				
C	0.010448	1.878720	0.0619	R-squared : 0.066020
$D(INS_{t-1})$	0.081992	0.883353	0.3783	F-stat : 1.767180
$D(INS_{t-2})$	-0.093854	-0.990258	0.3234	Prob(F-stat) : 0.096628
$D(MAS_{t-1})$	0.325399	2.130667	0.0345	DW-stat. : 0.096628
$D(MAS_{t-2})$	0.081859	0.541333	0.5890	
$D(FIR)$	0.009033	0.233961	0.8153	
$D(FIR_{t-1})$	-0.011321	-0.282402	0.7780	
$D(FIR_{t-2})$	0.034205	0.906760	0.3658	
B. Dependent variable : $D(MAS_t)$				
C	0.004144	1.289094	0.1991	R-squared : 0.107362
$D(MAS_{t-1})$	-0.002104	-0.023830	0.9810	F-stat : 3.006886
$D(MAS_{t-2})$	-0.098681	-1.129022	0.2604	Prob(F-stat) : 0.005243
$D(INS_{t-1})$	0.149897	2.793985	0.0058	DW-stat : 2.013509
$D(INS_{t-2})$	0.134033	2.446678	0.0154	
$D(FIR_t)$	-0.009830	-0.440517	0.6601	
$D(FIR_{t-1})$	-0.039575	-1.707939	0.0894	
$D(FIR_{t-2})$	0.028633	1.313232	0.1908	

Resource: Own processing

This study also shows that foreign interest rates affected Malaysian Islamic stock price index. This finding concurs with what was found by Kaminsky and Schmukler (1999), but contradicts the result of a research conducted by Guesmi and Teulon (2014). Furthermore, this study found that foreign interest rates did not affect Indonesian Islamic stock price index, a result that is in line with what was revealed by Guesmi and Teulon (2014), but is different from that of a

study by Kaminsky and Schmukler (1999). The different results found by study could be due to different implementation of monetary policy by the stakeholders in each country, and it is associated with changes in domestic interest rates in response to changes in foreign interest rates.

Another finding of this study is that Malaysian Islamic stock price index was significantly affected by foreign interest rates, Indonesian Islamic stock price index, and past Malaysian Islamic stock price index. The contribution of this effect was 10.74%. Thus, 89.26% of Malaysian Islamic stock price index was influenced by other factors. Similarly, 93.4% of Indonesian Islamic stock price index was influenced by other factors. Other factors that could affect Islamic stock market, are, among others: volatility or risk rate (Buttner & Hayo, 2010), exchange rate and inflation (Guesmi & Teulon, 2014), and capitalization of stock market (Buttner & Hayo, 2010), however, the effect of these macroeconomic variables on the integration between Indonesian and Malaysian Islamic stock markets needs to be further researched.

5. Conclusion

This study was set out to examine the Islamic stock market integration between Indonesia and Malaysia, and to reveal the effect of foreign interest rates on both stock markets. The indicator of Indonesian Islamic stock market is proxied by Jakarta Islamic Index, while that of Malaysian Islamic stock market is proxied by Hijrah Shariah Index. The US fund rate is chosen to represent the foreign interest rates. The three types of data refer to a time series within a period from August 2008 to January 2016. To test the Islamic stock market integration between Indonesia and Malaysia, we used the VAR model, while to test the effect of foreign interest rates on both Islamic stock markets, we used the VARX model.

The result of testing the integration order using ADF test shows that all of the time series of Indonesian Islamic stock price index, Malaysian Islamic stock price index, and foreign interest rate are integrated of order one, $I(1)$. Meanwhile, the result of cointegration test in the VAR model using the Engle-Granger test shows that there is a cointegration between Indonesian Islamic stock price index and

Malaysian Islamic stock price index. The result of cointegration test in the VARX using Johansen cointegration test demonstrates that there is no cointegration between Indonesian Islamic stock price index, Malaysian Islamic stock price index, and foreign interest rates.

The estimation result of the VAR model indicates that in the long term, there is a relationship between Indonesian Islamic stock price index and Malaysian Islamic stock price index, so, there is an integration of Islamic stock market between Indonesia and Malaysia. Finally, the result of estimation using the VARX model reveals that partially, foreign interest rates only negatively affect Malaysian Islamic stock price index.

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