

GREEK CRISIS, CO-INTEGRATION, AND CONTAGION EFFECT OF SHARIA STOCK MARKETS IN INDONESIA MALAYSIA AND SINGAPORE: IS THERE A PROBLEM FOR INVESTORS?

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ABSTRACT

The purpose of this study is to obtain empirical evidence of whether or not there is a co-integration of the Islamic stock market in Indonesia, Malaysia and Singapore, both before and during the crisis of Greek. This study also wants to find out which country is the most influential on the volatility of Islamic stock prices in the Jakarta Islamic Index (JII). In this study secondary data applied during the observation period is using weekly closing stock price data from 2007 to 2013. Furthermore, the data is divided into two categories of observation: pre-crisis data and crisis period data. The pre-crisis period began in May 2007 to April 2010, and the crisis period began in May 2010 to January 2013. The analytical method used was Vector Error Correction Model (VECM) with innovation accounting in the form of Impulse Response Function (IRF) and Forecasting Error Variance Decomposition (FEVD). The result shows that there is no co-integration in the capital market in the research sample. However, the results of the study prove that there is a contagion effect on sharia stock price movements in these three countries. This study also shows that Singapore's sharia stock market dominates its influence on JII compared to Malaysia.

Keywords: Co-Integration, Contagion Effect, Greek Crisis, Jakarta Islamic Index, Dow Jones Islamic Market Malaysia.

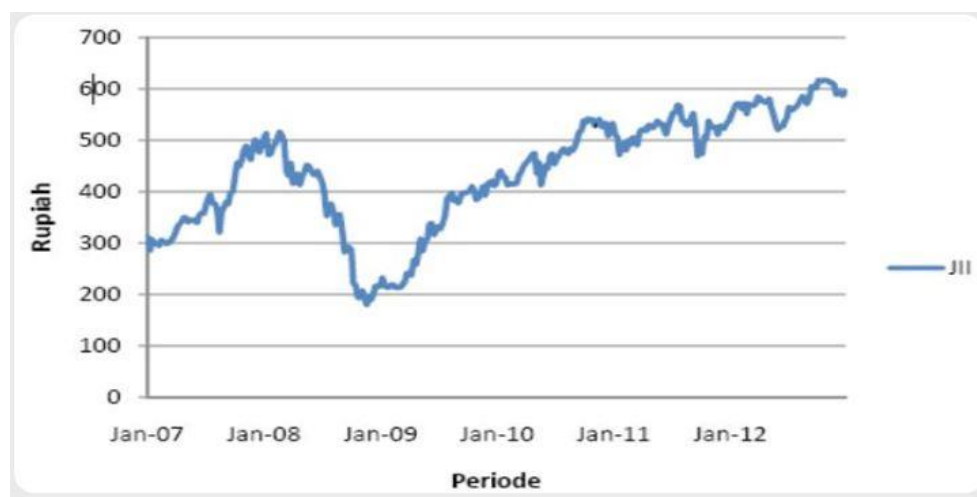
INTRODUCTION

The Greek crisis phenomenon not only caused a weakening of the economy in the Greek, however, several countries in the surrounding area were also affected by the crisis. Greece, which decided to change its currency from Drachma to Euro in 2002, became the trigger of the current crisis. At that time the Greek was willing to falsify a deficit budget that had never been below 3% in order to meet the conditions set by the Euro zone.

The Greek crisis began on May 2, 2010. This was marked by loan funds of 110 billion Euros for Greek and closing loan obligations until 2013 by declaring Bail Out agreed by the European finance minister. Towards the end of 2011 the Standard and Poor Index (S&P) stated that Greece officially holds a CC rating which invites anxiety on the world stock market. As a result of the Greek debt crisis, there is a panic in the world stock market again. The Dow Jones Industrial Average (DJIA) which acts as the benchmark index even experienced a very sharp decline. The panic of capital market players was marked by the number of investors who sold their shares; this triggered the collapse of the stock price at that time. The panic in the stock

market was also triggered by fears of a domino effect on the stock markets of other countries around the world.

Figure 1 shows that in the January 2008 the JII index fluctuated positively to break the 500 rupiah. Not long after, the crisis that occurred in America or better known as the subprime mortgage crisis forced almost all the stock markets in the world to decrease. The impact of the JII subprime mortgage crisis has decreased and is at its lowest point, reaching 200 rupiah. After the crisis, Islamic stock prices began to rise again. But it was a little stagnant with the new shock due to the crisis in Greece.



Source: Processed Data.

FIGURE 1
FLUCTUATIONS IN JII DURING THE PERIOD OF JANUARY 2007-JANUARY 2012

Based on Figure 1 there is clear differences in the effects of each crisis. In the period of the subprime mortgage crisis, JII was directly affected, resulting in a very sharp decline in a relatively short period of time. In the period during the Greek Crisis, the effects are in the form of relatively low index fluctuations and over a long period.

In the Islamic stock market, there are several researchers who are pioneers in research related to the conditions of the Islamic stock market (Karim et al., 2010). Until now there have not been many studies discussing the state of the Islamic stock market at the time of the Greek crisis. Does the Islamic stock market during the Greek crisis also co-integrate? And what is the condition of the Islamic stock market in Indonesia, Malaysia and Singapore.

THEORETICAL REVIEW

Definition of Sharia Stocks

Darmadji & Fakhruddin (2012) argue about what is meant by Stock. Stock “*is a sign of the ownership of a person or entity in a company or limited liability company. A tangible stock of a piece of paper explaining that the owner of the paper is the owner of the company that issued the securities*”.

Sutedi (2011) stated that the issuance of Sharia Shares is securities that have the concept of equity participation in companies with business sharing rights that do not conflict with sharia principles. Furthermore, it is explained according to the mixing theory, that Islam knows the

term *syirkah* or *musyarakah* agreement, which is a cooperation between two or more parties to do business that each party deposits a number of funds, goods or services (Sutedi, 2011). Then he explained about the types of *syirkah* known in jurisprudence: (i) *inan*, (ii) *mufawadhah*, (iii) *wujuh*, (iv) *abdan*, and (v) *mudharabah*. The division is based on the type of deposit each party and the party who manage the business activities. The fatwa has determined how to choose stocks in accordance with Islamic teachings.

The Shariah compliant stocks market is a part of the Islamic Financial system as well as global financial system which has drawn an extra attention not only to Muslim investor but also to Non-Muslim investor due to its rapid and phenomenal growth. Islamic financial market is the novelty of global financial market which moves together with their conventional as well as sectorial counterpart. As the fastest growing component of the global financial system, Shariah compliant stocks market has picked up positive momentum and now is attracting diverse investor and issue's attention as a variable alternative (Riavi & Arshad, 2017) .

The Financial Services Authority of Indonesia (Kasi & Muhammad, 2016) categorizes stocks as shariah compliant if the issuer company declares that its business activities as well as its business management are conducted based on the shariah principles and it is not involved in any of the following businesses:

1. Gambling.
2. Trading with non-deliverance of goods or service.
3. Trading with counterfeit offering/demand.
4. Conventional banks.
5. Conventional leasing companies.
6. Trading of risk that contain uncertainly (*gharar*) and/or gambling (*maisir*), e.g. conventional insurance.

Producing, distributing, trading and/or providing products or services that are forbidden because of its contents; products or services that are forbidden not because of its contents but because they are tarted forbidden by the National shariah Board MUI; and/or products services that can dgrade one's morals and are purposeless. Doing transactions that contain bribe substance

Jakarta Islamic Index (JII)

The first step in the development of the Islamic capital market in Indonesia began with the issuance of Islamic mutual funds on June 25, 1997, followed by the issuance of Islamic bonds at the end of 2002. It was also followed by the presence of the Jakarta Islamic Index (JII) on July 3, 2000. Sharia investment then progressed in line with the growth of national banks that opened sharia units or sharia "*windows*". The criteria set for the Islamic index based on the Fatwa of National Sharia Council No. 20 are as follows: (i) Businesses of issuers is not gambling businesses and games classified as gambling or prohibited trading; (ii) Not a usury financial institution, including banks and conventional insurance; (iii) Not including the business of producing, distributing and trading non-halal food and beverages; (iv) Not including businesses that produce, distribute and or provide goods or services that are morally destructive and harmful.

JII stocks are expected to be favored by investors due to sharia screening based on Islamic principles. Additionally, there is Sharia agreement that the buying and selling of

corporate stocks do not violate Islamic norms because stocks represent real asset (Hassen et al., 2005).

JII stocks are liquid blue chip stocks. Unlike other investments where ethical stocks are smaller, illiquid and volatile, an Indonesian ethical investing via JII is unlikely to hurt investment performance. Due to their liquidity, it is expected that JII stocks are more attractive to the investor. Additionally, JII stocks are expected to be easily thrown into the market due to many devotees. The index value of JII during 2004 to 2008 increased. However, from 2008 until 2009 the index value of JII decreased because of the global financial crisis subsequently from 2009 to 2011 experienced a sharp rise. In increasing trend although it experienced a decrease in 2008 due to the global financial crisis.

Dow Jones Islamic Market (DJIM)

The Dow Jones Islamic Market Index (DJIM) launched the Islamic index market in February 1999, the first Islamic index in the Muslim world. Based on the information cited from Syafiq (2011), DJIM was first launched in 1999 in Bahrain as an answer and implementation of the large number of Muslim investors' wishes both in the United States and in other parts of the world, with the control of the Sharia Supervisory Board independent. Currently, in the Dow Jones Islamic Market Index there are sharia-based stocks of 34 countries. Some of the indices include the Dow Jones Islamic Market United States Index, the Dow Jones Islamic Market United Kingdom Index, the Dow Jones Islamic Market Europe Index, and the Dow Jones Islamic Market Malaysia. In its implementation, to determine the feasibility of a company to be able to join DJIM, set standards that meet sharia requirements such as product type, business activities, and level of debt, income, and interest expenses. Syafiq (2011), a Sharia Supervisory Board (SSB) from the Dow Jones Islamic Market Index (DJIM), filter halal shares based on business and financial ratios.

Nazlioglu et al. (2013) examine the risk of transmission between the Dow Jones Islamic Index (DJIM) and the three main conventional global equity markets (US, Europe, and Asia) over a period before, during and after the crisis of 2007. They use a causality test to explore the transmission of risk developed by Hafner & Herwartz (2006) and they use impulse response functions to compare how Islamic and conventional stocks markets react to temporary shocks in the short term. They find that the variance causality test indicates that while there is no risk transmission among oil and agricultural commodity markets in the pre-crisis period, oil market volatility spills into agricultural markets with the exception of sugar in the post crisis period. The impulse response analysis also shows that the dynamics of volatility transmission changes significantly following the food price crisis. Finally, after the crisis, risk transmission emerges as another dimension of the dynamic interrelationship among energy and agricultural markets.

FTSE SGX Asia Sharia 100 Index (SGS100)

The FTSE SGX Sharia Index Series was launched by FTSE Group and Singapore Exchange (SGX), reflecting the company's stock performance in the Asia Pacific region whose business activities are in accordance with Islamic Sharia Law. Independent screening is carried out by Yasaar Ltd, an organization with a global network of Islamic scholars. The FTSE SGX Asia Sharia 100 index consists of a combination of the 50 largest Japanese companies and the 50 largest companies from Singapore, Taiwan, Korea and Hong Kong (SAR). Screening Business Activities Initially, companies involved in one of the following activities will be screened as

non-compliant Sharia: conventional finance (non-Islamic banking, finance and insurance, etc.); Alcohol; Pork-related products and non-halal food production, packaging and processing or other activities related to pork and non-halal food; Casino entertainment, gambling and pornography and also tobacco; weaponry, weapons and defense.

Financial Ratio Screening

The remaining companies are then further filtered based on financial ratios. The following financial ratios must be met so that the company is considered to comply with sharia: Debt is less than 33.33% of total assets; Cash and interest items are less than 33.33% of total assets; Receivables and cash are less than 50% of total assets; and also the total interest and income that does not match must not exceed 5% of the total income.

Capital Market Integration

The concept of the International Capital Market is said to be fully integrated (fully Integrated International Capital Market) when it is capable of producing capital costs that are relatively more efficient compared to the not-integrated capital market (Husnan, 2004). Furthermore, the study conducted by Brook & Negro (2002) states that the more integrated world capital markets are indicated by the higher correlation between stock returns and stock exchanges. There are some contributing factors: the lower volatility in portfolio choices; more and more choices of sales and funding sources of the company, and industrial convergence and policy coordination between countries that are increasingly high in intensity.

Moreover, the study conducted by Onay (2007) states that the correlation between exchanges varies from time to time. The results of this study are also consistent with Bodie et al. (2005) findings, even though the correlation of returns between exchanges is important in portfolio diversification decisions, the calculation of correlation returns that use midpoint and variety only provides a short-term indication and does not provide a clue to financial market movements in the long run. Furthermore, Onay (2007) relates to the short-term nature of correlation, so that for long-term forecasting, a more accurate measure of mutual dependence and general direction of movement together from the prices of shares on various exchanges are needed.

Contagion Theory

Dornbusch et al. (2000) in their research stated that contagion is indicated by the significance increasing of the relationship between several financial markets after a shock which is then transmitted to several countries or groups of countries. Furthermore, studies conducted by Rigobon (1999) have classified contagion into three groups. First, contagion can be interpreted as increasing speculative action in a country as a result of crises that occur in other countries. Second, volatility in stock returns increased significantly in countries experiencing crisis and transmitted volatility to other countries. Third, contagion is defined as a shock transmitted to various countries. Thus there is more than one definition that can explain the contagion effect.

Furthermore, the study conducted by Yang (2002) states that the World Bank classifies the contagion effects into three categories. First, contagion that occurs extensively and the occurrence of mutually influential relationships between countries, according to this category contagion can occur under normal conditions or crisis. Second, the shock transmitted across

national borders indicated a significant correlation between countries that occurred outside some fundamental channels. Third, Bank of Indonesia (BI) categorizes the contagion effect as when the correlation between the more closely related countries is related to a different phenomenon compared to normal conditions.

Co-integration Theory

Engle & Granger (1987) were the first researchers to propose a long-term relationship co-integration from diversification based on the occurrence of stock price volatility. Next they mentioned that if there is a linear combination of two or more series that are not stationary integrated on the first stationary order, then this series is said to be co-integration series which means having a long-term relationship. In general, it can be said that in time series data, the dependent variable and the independent variable are not stationary at the level, but become stationary at the same level of differentiation, the dependent variable is $I(d)$, where " d " is the same level of differentiation, then the variable dependent and independent variables are co-integrated.

Greek Crisis

According to Tulus (2012), towards the end of the global economic crisis in the period 2008-2009, the condition of the euro zone economy had actually begun to show symptoms of a major crisis due to the unpaid problems of Greek government debt. This crisis tends to escalate around 2011, and even worse conditions will threaten the continuity of the euro single currency system. The integrated Islamic stock market is likely to have a relationship, both long term and short term, to other Islamic stock markets. The integrated world Islamic capital market is also expected to experience Contagion Effect if one market experiences a crisis. This study was conducted to find out whether there is co-integration and the effects of transmission in the period before and during the crisis. In addition, an analysis was also conducted to see whether there were any effects arising from the crisis in Greece on the Islamic stock market in Indonesia, Malaysia and Singapore and to see which stock market was the most influential between the sharia stock market in Indonesia, Malaysia and Singapore in volatility of movement Islamic sharia stock prices in Indonesia during the period of the Greek crisis.

Hypothesis

Based on the theoretical basis and previous research, the writer can draw hypotheses in the form of:

H₁: There is co-integration between Islamic stocks in Indonesia, Malaysia and Singapore in the period of the Greek crisis.

H₂: Volatility of Islamic stock prices in Indonesia is influenced by the Islamic stock market in Malaysia and Singapore at the time of the Greek crisis.

H₃: There are contagion effects between Islamic stocks in Malaysia, Indonesia and Singapore at the time of the Greek crisis.

RESEARCH METHODOLOGY

This research is a quantitative descriptive study, with the aim to reveal events or facts, variables and circumstances that occurred when the study took place. The data used is secondary data in the form of closing weekly stock prices during the observation period from 2007 to 2013. The data is divided into two groups, pre-crisis and crisis period. In other words, the data used is time series data.

Data Analysis Technique

In this study, Vector Auto Regression (VAR) model analysis was used. Then, if the data used is stationary at the first differencing level, then the VAR model will be combined with the Vector Error Correction Model (VECM), Impulse Response Function (IRF). Furthermore, Forecasting Error Variance Decomposition (FEVD) technique is chosen to detect whether there is a contagion effect in the period before and during the crisis through the level of speed of response. If the speed of response increases, it can be concluded that there is a contagion effect and vice versa. While to test the effect of causality between one stocks with another stock, granger causality test was used. These results will then be compared between the before the crisis period with the time when the crisis occurred. The comparison is intended to see whether in the pre-crisis period with the crisis period there were significant differences or not in the three Islamic capital markets (SGS100; JII and DJIM).

RESULTS AND DISCUSSION

Stationary Test

To test the stationary of the data, researchers used the Augmented Dickey Fuller (ADF) test by applying a 5% real level. The rule is if the t-ADF value is greater than the critical value of MacKinnon (5%) in absolute terms, it can be concluded that the data used is stationary. In the opposite condition, the roots will be tested by carrying out at the up level of the first difference.

Table 1				
STATIONARY TEST				
Greek Pre-Crisis Period (January 2008-April 2010)				
Variable	ADF Value		5% MacKinnon Critical Value	
	Level	1 st Difference	Level	1 st Difference
JII	-0.928643	-10.55126	-2.885863	-2.886074
DJIMY	-2.258662	-10.0305	-2.885863	-2.886074
SGS100	-1.406358	-9.864257	-2.885863	-2.886074
Greek Crisis Period (May 2010-October 2013)				
Variable	ADF Value		5% MacKinnon Critical Value	
	Level	1 st Difference	Level	1 st Difference
JII	-1.916616	-17.28055	-2.877363	-2.877363
DJIMY	-0.905846	-13.3862	-2.877274	-2.877363
SGS100	-2.009728	-14.02294	-2.877274	-2.877363

Source: Data Processed.

Table 1 shows that the variables used in the study are not stationary at the level. The stationary data can be seen from the absolute t-ADF value which is smaller than the MacKinnon critical value at the 5% level. Therefore, testing the unit roots needs to be continued at the first difference level. After that, all stationary data at the real level of 5%, it means that the data used in this study is integrated in order one (1). Furthermore, a study conducted by Acarya (2009) states that to analyze long-term information it is used in levels so that VAR capital will be combined with an error correction model, VECM.

Optimum Lag Test

The next test is determining the optimal lag, this test is important in VAR detection because the lag of the endogenous variable in the equation variable will be used as an exogenous variable, as stated by Ender (2004). This optimal lag-length test is very useful for eliminating autocorrelation problems. Determination of optimal lag used in this study is based on the shortest lag using the Akaike Information Criterion (AIC) (Table 2).

Table 2						
UJI LAG-OPTIMUM						
Greek Pre-Crisis Period (January 2008-April 2010)						
Lag	Log L	LR	FPE	AIC	CX	HQ
0	-1979.972	NA	4.80 E+11	35.41022	35.48304	35.43976
1	-1599.881	733.0339	6.36 E+08	28.78358	29.07485*	28.90176*
2	-1588.929	20.53339	6.14 E+08	28.74874	29.25846	28.95555
3	-1581.33	13.841	6.30 E+08	28.77376	29.50193	29.0692
4	-1570.046	19.94908	6.06 E+08	28.73297	29.67959	29.11704
5	-1559.883	17.42213	5.95E +08*	28.71220*	29.87727	29.18491
6	-1554.654	8.684963	6.39 E+08	28.77953	30.16305	29.34087
7	-1542.584	19.39798*	6.09 E+08	28.72471	30.32668	29.37468
8	-1535.507	10.99385	6.35 E+08	28.75906	30.57948	29.49766
Greek Crisis Period (May 2010-October 2013)						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-3078.306	NA	3.95 E+11	35.21492	35.26918	35.23693
1	-2434.155	1258.854*	2.78 E+08*	27.95606*	28.17307*	28.04408*
2	-2427.446	12.88185	2.85 E+08	27.98224	28.36201	28.13628
3	-2423.183	8.038317	3.01 E+08	28.03638	28.57891	28.25644
4	-2415.021	15.11159	3.04 E+08	28.04595	28.75125	28.33204
5	-2410.91	7.470656	3.22 E+08	28.10183	28.96988	28.45393
6	-2403.133	13.86429	3.27 E+08	28.11581	29.14662	28.53394
7	-2399.294	6.712377	3.47 E+08	28.17479	29.36837	28.65894
8	-2397.112	3.740703	3.76 E+08	28.25271	29.60905	28.80288

Note: *indicates lag order selected by the criterion.

Source: Data Processed.

Based on the calculation of the Akaike Information Criterion (AIC) value, the optimal lag is at a lag of 5 (five) during pre-crisis, while testing during the lag-optimal crisis is in lag 1 (27.95606). This result is consistent, from the next test (test co-integration) shows that in pre-crisis, there is a co-integration equation in the 5 (five) lags while in the crisis there is no single equation that is co-integrated (Table 4).

VAR Model Stability Test

A VAR system is said to be stable if all of its roots have modulus smaller than one and all are located in unit circles or more than 1 (Lutkepohl in Eviews 4 User's Guide, 2002). Based on the VAR stability test, it can be concluded that the VAR estimation that will be used for IRF and FEVD analysis is stable both pre-crisis and at the time of the Greek crisis.

Table 3	
VAR STABILITY TEST RESULTS	
Greek Pre-Crisis Period (January 2008-April 2010)	
Modulus Range: 0.151728-0.969445	
Greek Crisis Period (May 2010-October 2013)	
Modulus Range: 0.006205-0.977857	

Source: Data Processed.

From Table 3 it can be explained that the modulus value of the sharia stock index in Indonesia, Malaysia and Singapore at the time of the Greek pre-crisis in this study ranged 0.151728 to 0.969445. Then it can be said that the VAR model is stable at each hose length. Likewise at the time of the Greek crisis, the modulus value of the Islamic stock index in Indonesia, Malaysia and Singapore ranged 0.006205 to 0.977857, so it can be concluded that the VAR is stable at each hose length.

Co-integration Test

Co-integration testing itself can be done with three types of testing, (i) co-integration test of Engle-Granger, (ii) Johansen, and (iii) Durbin-Watson. One of the co-integration tests conducted in this study is the Johansen co-integration test. If the trace statistical value is greater than the critical value, the equation is co-integrated, with H_0 equal to non-co integration and H_1 equal to co-integration. In this context, when the trace statistic value is greater than the critical value, then reject H_0 and accept H_1 which means that the equation is co-integrated.

Table 4				
JOHANSEN CO-INTEGRATION TEST RESULTS				
Greek Pre-Crisis Period (January 2008-April 2010)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob**
None*	0.165925	31.6272	29.79707	0.0304
At most 1	0.074991	10.39968	15.49471	0.2512
At most 2	0.010875	1.27929	3.841466	0.258
Greek Crisis Period (May 2010-October 2013)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob**

None	0.063034	17.29316	29.79707	0.6183
At most 1	0.016022	5.573727	15.49471	0.7452
At most 2	0.014705	2.666501	3.841466	0.1025
Trace test indicates 1 co-integrating eqn.(s) at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.				

From Table 4 it appears that during pre-crisis there is one rank co-integration at the real level of 5%, this means that there is a co-integration equation. Furthermore, the Johansen Test results show that during the crisis period there is no co-integration because all trace statistical values are smaller than critical values. For information, the number of these ranks will be used as an Error Correction Model or ECM which will be entered into the VAR model into a Vector Error Correction Model (VECM).

VECM Estimation

VECM is an estimated VAR form, this additional restriction is done due to non-stationary but stationary data at VECM. VECM is able to see the long-term relationship of endogenous variables in order to converge into its co-integration relationship, but still allow the existence of short-term dynamics. VECM estimation results for both long and short term. VECM estimation results during the period before and during the Greek crisis in the long or short term can be seen in Table 5.

Table 5			
GRANGER CAUSALITY TEST RESULTS			
Greek Pre-Crisis Period (January 2008–April 2010)			
Null Hypothesis	Obs.	F-Statistic	Prob.
DJIMY does not Granger Cause JII	115	2.65716	0.0266**
JII does not Granger Cause DJIMY		2.2528	0.0545***
SGS100 does not Granger Cause JII	115	4.6878	0.0007*
JII does not Granger Cause SGS100		2.5885	0.0300**
SGS100 does not Granger Cause DJIMY	115	3.2654	0.0089*
DJIMY does not Granger Cause SGS100		1.9612	0.0906***
Greek Crisis Period (May 2010-October 2013)			
Null Hypothesis	Obs.	F-Statistic	Prob.
DJIMY does not Granger Cause JII	182	4.70699	0.0314*
JII does not Granger Cause DJIMY		0.02386	0.8774
SGS100 does not Granger Cause JII	182	0.0714	0.7896
JII does not Granger Cause SGS100		0.04251	0.8369
SGS100 does not Granger Cause DJIMY	182	0.61673	0.4333
DJIMY does not Granger Cause SGS100		1.67405	0.1974
Note: *sig 1%, **sig 5%, ***sig 10%.			

Source: Data Processed.

The results of the Granger causality test are presented in Table 5; the results show that during the Greek pre-crisis there is a two-way relationship between all the variables of this study, both DJIMY, SGS100 and JII which varied between 1% to 10% significant levels.

VECM Testing

VECM estimates are carried out to see the existence of short-term and long-term relationships, both the analysis of the pre-crisis period and at the time of the Greek crisis.

Table 6		
VECM TESTING		
Greek Pre-Crisis Period (January 2008-April 2010)		
Short Term		
Variable	Coefficient	t-Statistic
CointEq1	-0.050427	-2.87339*
D (JII (-1))	-0.398276	-3.04158*
D (JII (-2))	-0.233681	-1.78818
D (DJIMY (-1))	-0.11648	1.1242
D (DJIMY (-2))	-0.000968	-0.00955
D (SGS100 (-1))	0.0442	3.56554*
D (SGS100 (-2))	0.024049	1.83111
C	0.493218	0.34228
Long Term		
DJIMY (-1)	-0.2.806916	-6.26015*
SGS100 (-1)	0.28646	-4.56242*
Greek Crisis Period (May 2010-October 2013)		
Short Term		
Variable	Coefficient	t-Statistic
CointEq1	-0.088592	-3.03378*
D (JII (-1))	-0.323539	-3.58281*
D (JII (-2))	-0.088814	-0.99524
D (DJIMY (-1))	0.062562	0.57235
D (DJIMY (-2))	-0.099658	-0.91163
D (SGS100 (-1))	0.025867	2.12807*
D (SGS100 (-2))	0.029004	2.36359*
C	1.214401	1.06042
Long Term		
DJIMY (-1)	-0.675226	-3.90028*
SGS100 (-1)	0.090847	2.18352*
Note: *significant value 5%.		

Table 6 shows that during the pre-crisis there is a correction of -0.050427, which is the rate of speed in the adjustment to occur at lag(-1) to lead to the long-term trend. Furthermore, the

error correction is statistically significant because the t-statistic value is $-2.87339 < t_{table} (-1.96)$ at the 5% alpha level. While in times of crisis, the level of adjustment is relatively faster with an adjustment level of -0.088592 to the long-term conditions that occur in lag(-1). Furthermore, the error correction is statistically significant due to the value of t-statistics $(-3.03378) < t_{table} (-1.96)$ at the alpha level of 5%.

Impulse Response Function (IRF) Analysis

VAR is a method that will determine its own dynamic structure from a model. After the VAR test is carried out, it is necessary to have a method that can clearly characterize the dynamic VAR structure. IRF is used to identify a surprise on an endogenous variable so that it can determine how an unexpected change in a variable affects another variable. IRF is used to see the contemporary influence of a dependent variable if it gets a shock or innovation from an independent variable equal to one standard deviation. A summary of the results of the IRF analysis for the JII model before and during the crisis can be seen in Table 7 below.

Table 7 RESPONSE SUMMARY OF JII AGAINST DJIMY SHOCKS, SGS100 GREEK PRE-CRISIS AND CRISIS	
Greek Pre-Crisis Period (January 2008-April 2010)	
Variable	JII Response
DJIMY Shocks	Positive, relatively slowly increasing after the 20 th period of 14.29
SGS100 Shocks	Negative, relatively slowing down after the 20 th period of -3.64
Greek Crisis Period (May 2010-October 2013)	
Variable	JII Response
DJIMY Shocks	Shocks began to occur in the 2 nd period from 2.16 and then declined in the 3 rd period and continued to increase slowly until the 19 th period and experienced a slow decline in the 20 th period and beyond.
SGS100 Shocks	Shocks begin in period 2 of 1.64, continue to decline to point 0 in period 4 and show negative shocks and continue to decline from the 5 th period onwards.

Source: Data Processed.

It appears that the crisis phenomenon of Greek is slow responded by JII, the shocks that occurred in both the Malaysian capital market (DJIMY) and the Singapore sharia capital market (SGS100) were just starting to move on lag or on the 20th day with different direction of movement. JII responds more positively to the movements and shocks that occur in the Malaysian stock market, while JII responds otherwise to shocks that occur in the Singapore stock market. The opposite condition occurs during a crisis. The Indonesian Islamic capital market responded more quickly in the face of shocks with a dynamic direction towards stock movements in DJIMY, while JII responded negatively to shocks that occurred in the Islamic stock market in Singapore with a downward trend. In the event of a crisis, both the Malaysian and Singapore capital markets were responded to in the second period.

Forecasting Error Variance Decomposition (FEVD) Analysis

After analyzing the shock behavior through impulse response, the next step is to predict the contribution of each research variable to shocks or changes in certain variables by looking at the model through the Forecast Error Variance Decomposition, the results can be seen in Table 8 below.

Table 8	
CONTRIBUTION OF RESEARCH VARIABLE SHOCKS TO JII VARIABLES	
GREEK PRE-CRISIS AND CRISIS	
Greek Pre-Crisis Period (January 2008-April 2010)	
Variable	Contribution (%)
DJIMY	41.37061
SGS100	2.825755
Forecasting in the 40 th period	
Greek Crisis Period (May 2010-October 2013)	
Variable	Contribution (%)
DJIMY	12.46707
SGS100	9.98064

Table 8 shows that the JII Islamic stock price index at pre-crisis period is more dominantly influenced by DJIMY (41.37%) and SGS100 (2.83%) variable shocks. Whereas in times of crisis the JII sharia stock price index was sequentially more dominantly influenced by the DJIMMY variable shock (12.47%), followed by the contribution of allowances in the Singapore capital market (SGS100) of 9.98%. The unique thing can be seen that the amount of dominance decreases or is smaller when compared to pre-crisis for DJIMY variable, but the opposite condition occurs in SGS100 variable whose contribution is greater/dominant when compared to pre-crisis.

Impulse Response Function Test

Figure 2 shows the results of the response to the JII from the movement of DJMY and SGS100. When it comes to more deeply examination about the movement of each capital market to the volatility occurs in the Indonesian Islamic capital market (JII), it can be explained as follows: When there was a shock in the Malaysian capital market (DJIMY), the Indonesian Islamic capital market (JII) responded initially positively, but later relatively changed to the fourth period slowly after the 20th period of 14.29. Furthermore, when there was a shock to the sharia capital market, Singapore affected the Indonesian capital market to respond negatively, relatively slowing down after the 20th period of -3.64.

In times of crisis, shocks that occur in the Malaysian capital market (DJIMY), indicated in the second period, decreased in the third period, and continued to increase slowly until the 19th period and experienced a slow decline until the 20th period onwards. At the time of the shock in Singapore's sharia capital market (SGS100), shocks began to occur in the 2nd period from 1.64, continuing to decline to point 0 in the 4th period and showing a negative shock and continuing to decline from the 5th period onwards showing a stable level.

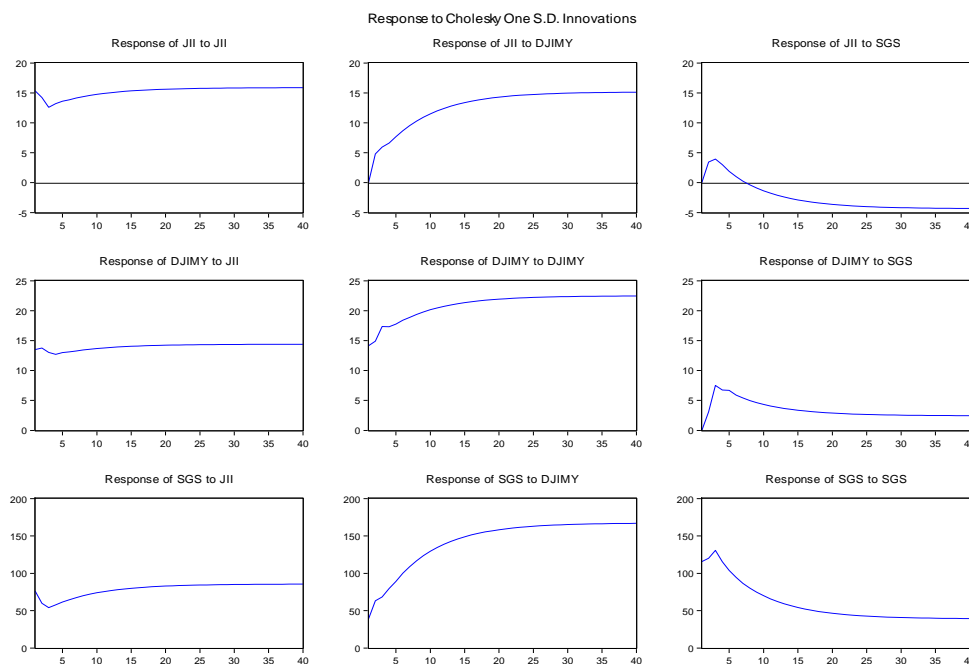


FIGURE 2
IMPULSE RESPONSE FUNCTION

Discussion

Viewed from the output of the study as shown in Table 4, the sharia capital market in the three countries (Indonesia-Malaysia and Singapore) was not proven to be co-integrated at the level of alpha 5%, where the trace statistic value (17.29316) was less than the critical value in level of 5% (29.79707) using the Johansson co-integration method. However, this condition is different from pre-crisis where it appears that there is one rank co-integration at the real level of 5%. The results of this study are different from previous studies. The unproven of the long-term influence of the Greek crisis on the company's sample shows that for investors the consideration of international portfolios formed in the sharia market is less effective. The results of this study are in line with Harjum's (2014) research which explains that the Greek Crisis has no effect on Islamic stock price movements in Malaysia, Indonesia. However, this research is not in line with the results of the empirical study Siskawati (2011), Moldovan & Medrega (2011), and empirical studies of Hengchao & Zarinah (2012).

From this explanation it can be concluded that the hypothesis which states there is co-integration between Islamic stocks in Indonesia, Malaysia, and Singapore at the time of the Greek crisis is rejected or unacceptable. At the time of the long term Greek pre-crisis there was integration between the sharia stock market in Indonesia, Malaysia and Singapore but was not found at the time of the Greek crisis. Through this empirical study it can be said that the Greek crisis is not in a critical condition and tends to be lower compared to other global crises.

The discussion of the results of the analysis of the effect of Islamic stock price volatility in Indonesia is reflected in the Impulse Response Function (IRF) pattern. Furthermore, the contribution of each variable to the volatility of Islamic stock prices in Indonesia is reflected in the results of the Forecast Error Variance Decomposition (FEVD) analysis.

From the results of the JII response to shocks that occurred in Malaysia's sharia capital market (DJIMY) and Singapore's sharia capital market (SGS100), it can be concluded that during the pre-crisis period the JII response in the face of negative shocks is the Singapore SGS100 sharia stock index. Meanwhile, the Malaysian sharia stock index is responded positively by JII when there was a shock in the country.

At the time of the crisis, the response of JII in the face of negative shocks is the Singapore sharia stock index. While Malaysia's sharia stock index, JII responded positively when there was a shock in the country. The time needed by JII in responding to shocks during the Greek pre-crisis from the countries sampled in this study (Malaysia and Singapore) was relatively long on average on the 20th day compared to the time of the Greek crisis which was responded more quickly, on average on the 2nd day. Perhaps this is because at the time before the Greek crisis there were still effects of the global financial crisis, thus requiring a longer recovery time than during the Greek crisis where the impact of the global financial crisis had begun to weaken so that recovery was relatively faster.

The JII sharia stock price index in the pre-crisis period is more dominantly influenced by DJIMY (41.37%) and SGS100 (2.83%) variable shocks. Whereas in times of crisis the JII sharia stock price index was sequentially more dominantly influenced by the DJIMMY variable shock (12.47%), followed by the contribution of allowances in the Singapore capital market (SGS100) of 9.98%. The unique thing is that the amount of dominance decreases or smaller when compared to pre-crisis for DJIMY variables, but the opposite condition occurs in SGS100 variable whose contribution is greater or dominant when compared to pre-crisis.

When there was a shock in the Malaysian capital market (DJIMY), the Indonesian Islamic capital market (JII) responded positively, and then relatively increased from the 4th period slowly after the 20th period of 14.29. Furthermore, when there was a shock in the Singapore sharia capital market, the Indonesian capital market responded negatively, relatively slowing down after the 20th period of -3.64. Meanwhile in times of crisis, in the Malaysian capital market (DJIMY), shocks begin to occur in the second period of 2.16 and then decline in the third quarter and continue to increase slowly until the 19th period and experience a slow decline in the 20th period and so on. Meanwhile, in Singapore's sharia capital market (SGS100), shocks began to occur in the 2nd period from 1.64, continuing to decline to point 0 in the 4th period and showing a negative shock and continuing to decline from the 5th period onwards showing a stable level.

So it can be concluded that the hypothesis of the volatility of Islamic stock prices in Indonesia is influenced by the Islamic stock market in Malaysia and Singapore when the Greek crisis is acceptable.

Granger causality test results are presented in Table 5; the results of this test indicate that during the Greek pre-crisis there is a two-way relationship between variables. DJIMY affects JII and vice versa, SGS100 and JII influence each other. SGS influences DJIMY as well as DJIMY influences the significant SGS100 varying at an alpha level of 1% to 10%. However, the opposite condition occurs at the time of the Greek crisis, where only DJIMY affects JII at an alpha level of 1% and does not occur otherwise. Furthermore, there was no effect of Malaysian and Singapore capital markets on the Indonesian Islamic capital market (JII). This means that at the time before the Greek crisis there was a contagion effect on all variables used in this study when a shock occurred.

Whereas in times of crisis, in the short term there is a short-term to long-term error correction value of -0.088592 which can be seen from the (-) mark on the Error Correction Term

(ECT) coefficient. The ECT coefficient of -0.088592 is the value of the speed in the adjustment to the long-term trend of 8.86% in lag(-1). From these results it can be explained that in the period of the crisis the speed to adjust in the long term seems fast. This is evidenced by the high percentage of 8.86%. This condition may occur because in the period of the crisis there were still effects of the global financial crisis but had begun to weaken, so that the adjustment time to go towards the long-term trend was faster than the period before the Greek crisis (5.47%). Furthermore, the error correction is statistically significant due to the value of $t_{\text{statistics}} (-3.03378) < t_{\text{table}} (-1.96)$ at the alpha level of 5%. The results of the analysis showed that both in the pre-crisis and during the crisis, all the variables used in this study in the long term had a significant effect on the Indonesian Islamic stock index (JII) at lag 1. The Dow Jones Islamic Market Malaysia (DJIMY), SGS 100 sharia index has a significant effect on the volatility of the Indonesian Islamic stock index (JII).

From this explanation it can be said that the hypothesis states that there are contagion effects between Islamic stocks in Malaysia, Indonesia and Singapore at the time of the Greek crisis is acceptable.

CONCLUSION

Based on the analysis that has been done, the authors conclude that:

In the Greek pre-crisis period in the long term there was an integration between the sharia stock market in Indonesia, Malaysia and Singapore, although in a slow response and occurred in the 5th period or lag. In the opposite condition, co-integration during the Greek crisis period did not occur. Through in-depth observation by looking at the effects of shocks, the Greek crisis phenomenon is not in a critical condition and tends to be lower compared to the global crisis.

During the pre-crisis period, Greece had the most influence on Malaysia (JII) and Singapore (DJIMY) and Singapore (SGS100) stock price volatility, with a percentage of 41.37% and 2.83%. Whereas, in the period of the Greek crisis, the most affected volatility of Indonesian Islamic stock prices (JII) was Malaysia with a percentage of 12.47%, and Singapore was 9.98%. At the time of the Greek pre-crisis, the Islamic stock index in Indonesia was influenced by the Islamic stock index in Malaysia and Singapore. This means that during the Greek pre-crisis there was a contagion effect on all variables used in this study at the time a shock occurred. While during the Greek crisis, the sharia stock index in Indonesia was influenced by the sharia stock index in Malaysia and Singapore with a smaller percentage but with a higher degree of long-term adjustment.

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