



## Relationship between Islamic Stock Prices and Macroeconomic Variables: Evidence from Jakarta Stock Exchange Islamic Index

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**Abstract:** This paper attempts to analyze the relationship between Jakarta Stock Exchange Islamic Index (JII) and selected macroeconomic variables namely exchange rate, industrial production, inflation rate, and money supply. We used monthly data from January 2000 to December 2010. The methodology used in this paper is time series techniques of co-integration and vector autoregression (VAR). In the analysis, we rely on variance decompositions and impulse-response functions to capture the strength of interactions among variables. The results revealed that there is co-integration between Islamic stock prices and macroeconomic variables. Specifically, Indonesian Islamic stock market are driven more by domestic factors. These macroeconomic factors considered to be emphasized as the policy instruments by the governments in order to stabilize Islamic stock prices.

**Keywords:** Jakarta Stock Exchange Islamic Index (JII), Islamic Stock Prices, Macroeconomic Variables, Vector Autoregression (VAR)

### Introduction

Indonesia is one of the countries that is most resilience toward global financial crisis. Indonesia was the least exposed and has larger capacity to bring in stimulus measures should the world economy meltdown due to its large domestic economy. The impact of the crisis was much weaker than during 1997 financial crisis. Overall growth rate for 2008 was 6.2 percent, slightly decreased from 6.3 percent in 2007, and further declined to around 4.2 percent in 2009. For the recent GDP in year 2011, it was \$ 846.8 billion. In addition, the Indonesian economy strengthened in 2011 with real GDP expanding by 6.5%. The table below shows a clear picture of Indonesia economy from certain periods.

**Table 1:** Comparison of GDP, Exchange Rate, and Inflation by Years

Year	GDP (in million)	Exchange Rate (Rp/US\$)	CPI Index
2005	439,484	9,830	89.55
2006	466,101	9,020	95.46
2007	493,332	9,419	102.55
2008	519,392	10,950	113.78
2009	561,637	9,400	117.03
2010	585,812	8,891	125.17

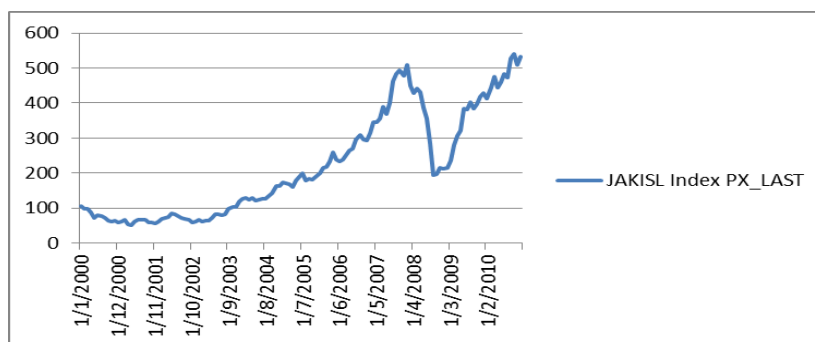
Source: *World Bank Database*

The economy was still showing some resilience toward the crisis; however, in the final quarter of 2008, Indonesia economic performance began to show signs of impact from global financial downturn. One of the institutions that affected was Indonesian stock market. The equity market plummeted reversing all gains that took place between 2005 and 2008. The exchange rate depreciated significantly. The market capitalization of Jakarta Stock Exchange Composite Index (JCI) fell by 54 percent in 2008. Market price index also fell by 10.38 percent. Furthermore, not only conventional capital market experienced this effect, Islamic capital market counterpart was also experienced the same condition. The market capitalization of Jakarta Stock Exchange Islamic Index (JII) fell by 61 percent in 2008, while the market price index declined by 22 percent during the same period (Source: *Bloomberg*).

Jakarta Stock Exchange Islamic Index (JII) is stock market index that consists of companies whereby their business activities in accordance with the provisions of Islamic stocks regulated by National Shariah Board. Companies involved in JII must do not engaged with *riba* (interest), *gharar* (speculation), and *maysir* (gambling) activities. Companies also required such filters criteria's, for instance leverage ratios, interest, and income from non-*halal* activities which is allowing JII differentiate as compared to conventional capital market counterparts. The JII may not list equities that produce or distribute food, drink, or morally harmful items that stand in contradiction with Islamic values. JII was established in year 2000 as a benchmark for Islamic stock market which would provide as an accurate performance indicator of the Islamic stock market of Indonesia as well as the country economy. It contains 30 companies which comprise of multi-sectors companies across the year 2000-2008.

Prior to global financial crisis happened in September 2008, the performance of JII was at the peak level. However, as we can see from the graph, the JII point declined substantially at 300 points from year 2007 to 2008 due to financial meltdown. There were some changes in the JII during the post crisis. The JII achieved 483 point at the final quarter of 2010 after the climbing up from the financial crisis. The rationale behind this, perhaps, due to the significant growth during the year as resulted in large domestic economy.

**Figure 1.** Trend of Jakarta Stock Exchange Islamic Index (JII)



Source: Bloomberg

The dynamic linkage between macroeconomic variables and stock returns is well established theory in financial economics literature. Based on the stock valuation model, macroeconomic forces might have systematic influences on stock prices via their influence on discounted future cash flows. Alternatively, the relationship between them might be triggered using the arbitrage pricing theory (APT) model developed by Ross (1976). Moreover, Friedman (1988) argued that the standard aggregate demand and aggregate supply framework also allows for the roles of equity markets in term of specification of money demand. Thus, these models

provide a basic for the short-run and long-run dynamic relationship among macroeconomic variables and stock returns.

There is growing efforts made by researchers to empirically proven these macroeconomic effects. However, most studies done are focused on the conventional developed market, for instance studies done by Fama (1981) for US market, and Poon and Taylor (1992) on the UK market. Hakim and Rashidian (2005) explore the risk and return of the Dow Jones Islamic Market Index (DIJMI) and its parallel conventional counterpart, Wilshire 5000 Index (W5000). They found that the DIJMI presents unique risks-returns characteristics compared to risk profile of W5000. Abdullah et al (2007) concluded that the conventional funds perform better than Islamic funds during good economic periods and *vice-versa* during bad economic periods. Unlike the studies on conventional equity market, less attention is being given to its Islamic counterpart. This study focused on emerging Islamic markets at which seem to have distinguished features as compared to conventional and developed markets counterpart. We try to address the question whether macroeconomic variables affect Islamic equity return on Jakarta Stock Exchange Islamic Index (JII).

The purpose of this paper is to contribute further to the literature on Islamic equity market and macroeconomic linkages for developing economies, specifically for the case of Indonesia Islamic equity market. The variables included are exchange rate, inflation, industrial production index, and money supply as being important in explaining Islamic equity returns. Our analysis, hence, might be further enriching our understanding of the Indonesian Islamic equity market behavior and its relations with various components of macroeconomic variables. To our knowledge, there are no studies conducted on macroeconomic variables and Islamic equity prices in the context of Islamic equity market of Indonesia. Therefore, this study attempts to fill this gap by exploring the effect of macroeconomic variables toward Islamic stock prices in Indonesia.

The rest of the paper is organized as follows; in section II, we provide literature review. Section III outlines the data methodology. Section IV details results and discussions. Finally, we conclude in section V with conclusion of main findings and their implications.

## Literature Review

In an efficient capital market, stock prices adjust rapidly according to the new information available, therefore, the stock price reflect all information about the stock. The efficient market hypotheses states that stock prices should contain all relevant information for both policy makers and stock brokers in respective industry. Stock prices also reflect expectations on the future performance of company and profits. As a result, it should be used as major indicator for the economic activities.

Dividend growth model had simplified the valuation of stock as follow:

$$P_0 = \frac{D_1}{(1+R)^1} + \frac{D_2}{(1+R)^2} + \dots + \frac{D_t}{(1+R)^t} + \frac{P_t}{(1+R)^t}$$

Where  $P_0$  is stock prices,  $D$  is dividend paid, and  $R$  is required return of equity. This model is useful for finding the stock value with the assumptions that dividend are assumed to continue growing at constant rate. From the model, we noticed that stock price positively correlated to the dividend but negatively correlated to the required rate of return. Therefore, required rate of return can be written as follow:

$$R = \frac{D_1}{P_0} + g$$

The rate of return for constant growth stock consists of two components which are dividend yield and capital gains yield. The former can be thought of as the rate of return for a stock whose dividend is constant, an investor who purchased a share of common stock for price  $P_0$ , and who received constant dividend of  $D_1$ , would be receiving a perpetuity whose yield is equal to  $D_1/P_0$ .

There have been many attempts in the past to figure out relationship between stock returns and macroeconomic variables. Maysami and Koh (2000) examine the dynamic relations between macroeconomic variables (exchange rate, long and short term interest rate, inflation, money supply, and industrial production) and Singapore stock markets using vector error correction model (VECM) which covered the period from 1988 to 1995. They found that all macroeconomic variables have cointegrating relations with the changes in Singapore stock market levels.

Ibrahim and Yusoff (2001) examined the Malaysian equity market and macroeconomic variables. Using cointegration and vector autoregression (VAR) method with monthly data of Malaysian stock market index from year 1978 to September 1992, they found that long-run relationship between macroeconomic variables and the stock prices and substantial short-run interactions among them. The exchange rate, however, is negatively associated with the stock prices. While Hakim and Rashidian (2005) explore the risk and return of the Dow Jones Islamic Market Index (DIJMI) and its parallel conventional counterpart, Wilshire 5000 Index (W5000). They found that the DJIMI presents unique risks-returns characteristics compared to risk profile of W5000.

Humpe and Macmillan (2007) study the influence of macroeconomic variables on stock prices in the context of US and Japan. They found that for US are consistent with single cointegrating vector, where stock prices are positively related to industrial production and money supply, yet negatively related to both consumer price index and long term interest. However for Japanese data, they found two cointegrating vectors. One vectors that stock prices are influenced positively by industrial production and negatively by the money supply. For the second cointegrating vector they found industrial production to be negatively influenced by consumer price index and a long term interest rate.

Asmy *et al* (2009) studied on effects of macroeconomic variables on stock prices in Malaysia. Selected macroeconomic variables are inflation, money supply, and nominal effective exchange rate during pre and post crisis from 1987 until 1995 and from 1999 until 2007 by using monthly data. They used time series econometric techniques, for instance, unit root test, cointegration test, error correction model (ECM), variance decomposition, and impulse response function. They found that there is cointegration between stock prices and macroeconomic variables. Inflation, money supply and exchange rate seem to significantly affect KLCI.

Shabri and Rosylin (2009) studied on long-run relationship between Islamic stock returns and macroeconomic variables using autoregressive distributed lag model (ARDL). The results suggest that real effective exchange rate, money supply M3, treasury bill rate (TBR), and federal fund rate (FFR) seem to be suitable target to focus on, in order to stabilize the Islamic stock market and to encourage more capital flows into the market. They also stated that when interest rate raised either domestically (TBR) or internationally (FFR), the Muslim investors will buy more Shariah compliant stocks, thereby escalating the Islamic stock prices.

From the discussion above, it seems that there are a number of studies on the macroeconomic variables and its impacts on stock return. However, there are few studies that try to explore relationship between Islamic equity return and macroeconomic variables. Therefore, we find interesting to investigate these effects and their relationship for Indonesian context. We analyze the relationship between macroeconomic variables and Islamic equity return on JII.

## Data and Methodology

This study investigates empirically the relationship between macroeconomic variables and Islamic equity returns on Jakarta Stock Exchange Islamic Index (JII). It is argued that there is causal relationship between macroeconomic variables and Islamic stock prices. The data retrieved from Bloomberg are Islamic stock prices (JII), exchange rates (ER), Consumer Price Index (CPI), industrial production index (IP), and M2 money supply (M2). We are using monthly time series data, covering 10 years period from January 2000 to December 2010. For JII, we use end of the month values of JII price index. For the inflation, we use CPI (consumer price index) as a proxy to inflation. Real output is measured by real industrial production index (IP). The M2 money supply is used as the money supply variable and is expressed in the domestic currency, Indonesian Rupiah. The ER represented by employing nominal effective exchange rate, the bilateral exchange rate with reference to US\$. The JII is used as it encompasses the Islamic stocks traded in Indonesia.

In this paper, time series analysis of co-integration and vector autoregression (VAR) will be utilized for assessment of macroeconomic variables and Islamic equity returns on Jakarta Stock Exchange Islamic Index (JII). The VAR model is well suited for the purposes of evaluating the strength and the direction of the transmission of shocks across the markets. This paper hypothesis to answer the following question: "Is Islamic stock prices driven by macroeconomic variables in case of Indonesia?" Therefore, hypotheses developed in this study are:

- H1 : Islamic stock prices on Jakarta Stock Exchange Islamic Index is determined by exchange rates; (ER);
- H2 : Islamic stock prices on Jakarta Stock Exchange Islamic Index is determined by real industrial production index (IP)
- H3 : Islamic stock prices on Jakarta Stock Exchange Islamic Index is determined by inflation;
- H4 : Islamic stock prices on Jakarta Stock Exchange Islamic Index is determined by M2 money supply;

Our model examines the impacts of macroeconomic variables on Islamic stock prices on Jakarta Stock Exchange Islamic Index. In the model, Islamic stock price is a function of its macroeconomic variables. First of all, we assume that Islamic stock price (JII) is a function of its macroeconomic variables expressed by equation (1):

$$JII = f(ER, IP, CPI, M2)$$

Secondly, the relationship between LRJII and its macroeconomic variables is expressed by following equation (2)

$$JII_t = \beta_0 + \beta_1 ER_t + \beta_2 IP_t + \beta_3 CPI_t + \beta_4 M2_t + \varepsilon_t$$

Where:

- JII<sub>t</sub> = Islamic stock prices on JII at time t
- ER<sub>t</sub> = Exchange rates against USD at time t
- IP<sub>t</sub> = industrial production index at time t
- CPI<sub>t</sub> = Consumer price index as a proxy for inflation at time t
- M2<sub>t</sub> = M2 money supply at time t
- ε<sub>t</sub> = Random error term

**Unit Root Test:** We test for the stationary of the variables in order to avoid the spurious results. Time series is considered as stationary if a series is mean-reverting, that is, the series repeatedly returns back to its mean and does not have tendency to drift. Therefore, if the mean and variance of the series are constant overtime, while the value of the covariance between the two periods

depends only on the gap between the periods and not on the actual time at which the covariance is considered, then the series is considered stationary. However, if one or more of the above mentioned conditions are not fulfilled, then the series is non-stationary.

There are several methods for testing the presence of unit roots. The most widely used is that Augmented Dickey-Fuller (ADF). ADF is applied when the error term  $\epsilon_t$  are correlated. ADF performed by adding the lagged values of the dependent variable  $\Delta Y_t$ . The null hypothesis for ADF test for unit root test is  $\alpha_1 = 0$ . The following regression for ADF test purpose is expressed by equation:

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

Where  $\epsilon_t$  is a white noise error term and  $\Delta Y_{t-1} = (Y_{t-1} - \Delta Y_{t-2})$  and so on are the number of lagged difference term which is empirically determined (Gujarati, 2010). Aside from that, Philips-Perron (PP) has developed a more comprehensive theory of unit root non-stationarity. The test looks like similar with ADF test; however, they incorporate an automatic correction to DF procedure to allow for auto-correlated residuals. To some extent, the test often gives the same conclusions as the ADF test (Brooks, 2008).

**Johansen Juselius Co-integration test:** Co-integration means that even though variables are not stationary individually; the linear combination between two or more variables might be stationary. In other words, this analysis is to determine whether the time series of these variables display a stationary process in a linear combination. In order to test the co-integration, Johansen co-integration method is employed. When two or more variables are co-integrated, they will show the existence of long term relationship if the variables contain mutual stochastic trend. If this is the case, there exist at least one Granger's causality either one or bi-directional (feedback effect).

The Johansen and Juselius method used to tests to determine the number of co-integrating vectors, namely "likelihood ratio trace test-LRT" and the "maximum eigen value-ME". The likelihood trace statistics expressed as:

$$LRT = -T \sum_{i=i+1}^n \ln(1 - \mu_i)$$

For this null hypotheses, it is said that the number of co-integrating vectors is less than or equal to  $r$ , in which  $r$  is 0, 1, 2, 3.....so on. The alternative hypothesis against this is that  $r=n$ . Meanwhile the maximum Eigen value can be expressed as:

$$ME = -T \ln(1 - \mu_r)$$

The null hypothesis is that the existence of  $r$  co-integrating vector and alternative hypothesis is  $r+1$  co-integrating vectors.

**Granger Causality Tests:** The short run relationships between dependent variable and each of the variables can be tested by using Granger causality tests. A test of causality is to know whether the lags of one variable enter into the equation for another variable. There are two important steps involved with Granger causality test. First, stationary data is needed rather than non-stationary data, the Granger methodology is somewhat sensitive to the length used. So for selecting the appropriate lag length for our purposes, there are various lag length criteria available. For our purpose we use Schwarz information criteria, final prediction error, Likelihood ratio test, etc.

**Vector autoregressions (VAR):** Our empirical method is based on recent standard method of cointegration and vector autoregressions (VAR). This approach is chosen because VAR modeling places no *a priori* structural restrictions and provides good approximation to the data generation process of vector time series variables when sufficient lags are included. Moreover, the model captures empirical regularities in the data in an unrestricted fashion. Lastly, from variance decomposition and impulse response function generated from VAR, we might have insight on the strength and direction of transmission of shocks in the system.

The VAR model may be written as:

$$A(L)X_t = U_t$$

Where;

A(L) = matrix of polynomials in the lag operators,

X = vector consisting of appropriately transformed variables,

U = vector of innovations to these variables.

**Variance Decomposition and Impulse Response Function:** Once the VAR model is estimated, then we employ the short run dynamic analysis called impulse response function and variance decomposition. Both analyses allow us to investigate the behavior of an error shock to each variable on its own future dynamics as well as on the future dynamics of the other variables in the VAR system. Meanwhile, variance decomposition is used to detect the causal relations among the variables. It explains the degree at which the variable is explained by the shocks in all variables in the VAR system. Response function is used to detect the dynamic interaction among variables. For computing impulse response function, it is necessary that variables in the system, are in ordered and that a moving average process represents the system.

## Results

### Unit Root Tests

Table 2 reports the results of the ADF and PP unit root test. Both test are conducted with trend and intercept. It appears in general, that all variables are non-stationary at test for unit root in level. Moreover, both ADF and PP tests confirmed that JII, ER, IP, CPI, and M2 contain one unit root test.

**Table 2.** Unit Root Test: ADF and PP Tests

Variables	ADF Test		PP Test	
	Level	First Difference	Level	First Difference
JII	0.8375 (-0.717888)	0.0000 (-9.033025)***	0.8161 (-0.797920)	0.0000 (-9.146794) ***
ER	0.8191 (-0.787271)	0.0000 (-11.38446) ***	0.8191 (-0.787271)	0.0000 (-11.38468) ***
IP	0.6585 (-1.233660)	0.0000 (-11.53217) ***	0.6296 (-1.297216)	0.0000 (-24.28099) ***
CPI	0.6794 (-1.185668)	0.0000 (-9.965357) ***	0.6596 (-1.231295)	0.0000 (-10.79819) ***
M2	0.9830 (0.416121)	0.0000 (-13.12649) ***	0.9993 (1.510500)	0.0000 (-16.83926) ***

Note: \*\*\* denotes significant at 1% alpha. Criteria used: Akaike Information Criteria

The ADF test suggests that all variables are stationary at first difference. On the other hand, PP test provides evidence more towards stationary of all variables in their first difference. Since the level of confidence is considered high (1%), PP test confirmed that all variables are

stationary at first difference. The unit root tests revealed that all variables observed, are seemly integrated of order of 1 or I(1). Since the level of confidence is considered high (1%), ADF and PP test confirmed that all variables are stationary at first difference. Thus, using the Johansen Juselius co-integration test is appropriate in this study.

### **Co-integration test**

Having concluded that each of the series is stationary, and then we go further to assess whether there exists a long-run equilibrium between variables selected. Table 3 provides the results of the Johansen co-integration test, as well as the trace and maximum eigenvalue tests. We set the lag length equal to 2 which using the Akaike Information Criterion (AIC) whereas we found sufficient to render the error term serially uncorrelated in conducting the test. An overview of the overall resulted is showed in table 3 below.

**Table 3.** Johansen-Juselius Cointegration Tests

<b>Null Hypothesis</b>	<b>Trace</b>	<b>Max.eigenvalue</b>	<b>Variables</b>	<b>Long run Coefficient</b>
$r = 0$	86.52473 **	38.88271**	JII	1.0000
$r \leq 1$	47.64202	23.51857	ER	0.191006
$r \leq 2$	24.12345	13.38711	IP	27.40417
$r \leq 3$	10.73634	10.62435	CPI	-2.961316
$r \leq 4$	0.111993	0.111993	M2	-0.000230

Notes: \*\* denote significant at 5% alpha

According to above co-integration results, we find enough evidence that all variables are co-integrated at 5% significance level. The trace statistic indicates the presence of one co-integrating vectors. While maximum eigenvalue statistics also indicates similar facts whereby there is one co-integrating vectors existed. From these results, we conclude that there is a unique co-integrating vector governing the long run association among variables. In other words, we might say that all macroeconomic factors and JII stock prices are co-integrated having tested by Johansen-Juselius tests. These variables are tied together in the long run and their deviations from the long run equilibrium path will be corrected. The presence of co-integration also rules out non-causality among the variables.

The long run relationship between JII and exchange rates are positive relationship. As for exchange rates, the result shows that currency depreciation seems to be associated with increase in JII. Theoretically, currency depreciation may have either positive or negative relationship with stock prices depend on the nature of economy. In the context of net-exporting economies, currency depreciation leads to an increase in net exports as domestic products become cheaper in the world market. Thus, the increase in the company profitability will be reflected in the value of stocks. For economy that depends heavily on imports, however, currency depreciation may lead to higher import prices that might be able causing a decline in company profit margin and also in turn the stock prices. In other words, the effect of currency depreciation will depend on which of these factors is more dominant. Our result shows that positive effect is dominant whereas creating upward pressure on Islamic equity prices. This results, also, consistent with Asmy (2003) on Malaysian stock market found that positive effects are more dominant in the pre-crisis period.

In the context of industrial production, the long run relationship between Islamic equity prices and industrial production is positive. This should be expected as the changes in stock prices reflect expectations of future economic conditions. Likewise, in Islamic stock prices counterpart, changes in Islamic stock prices also reflects the future economic condition of



Islamic economic activities. Current changes in the industrial production may influence the company expected future cash flows. Our finding is consistent with Ibrahim and Yusoff (2001), Maysamai and Koh (2000) proved that positive long run association between stock prices and industrial production for Malaysia and Singapore respectively.

In respect with inflation, the long run relationship between JII and CPI is negative relationship. As inflation high, it can actually squeeze profit margins of companies and influence stock prices to declining level. Moreover, when inflation is higher, the economy is sputtering and affected stock prices. When Islamic stock prices are low the company is reluctant to tap the capital market. Unless bank finance can substitute adequately for capital market, company investment would possible be hit and production would decline. This negative relationship between JII and CPI also supported results obtained by Bruno (1983) that stock prices movements signal negative revisions in inflationary expectations. As inflation expected increase, stock prices will be declined.

Finally, there is negative relationship between M2 and JII. Our finding is consistent with study done by Ibrahim and Yusoff (2001) which stated that there is negative long run relationship in the context of Malaysian equity prices. The increase in money supply results increase in inflation, therefore, it generates depreciation expectation and influence the declining on stock prices.

### *Granger Causality Tests*

**Table 4.** Results of Error-Correction/Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
ER does not Granger Cause LRJII	128	4.24318	0.0165
LRJII does not Granger Cause ER		4.71850	0.0106
LRIP does not Granger Cause LRJII	128	3.58922	0.0306
LRJII does not Granger Cause LRIP		1.19846	0.3052
LRCPI does not Granger Cause LRJII	128	4.21858	0.0169
LRJII does not Granger Cause LRCPI		1.21802	0.2994
LRM2 does not Granger Cause LRJII	128	1.31765	0.2715
LRJII does not Granger Cause LRM2		1.65368	0.1956
LRIP does not Granger Cause ER	128	0.27016	0.7637
ER does not Granger Cause LRIP		1.05501	0.3513
LRCPI does not Granger Cause ER	128	0.20312	0.8165
ER does not Granger Cause LRCPI		1.73285	0.1811
LRM2 does not Granger Cause ER	128	0.33876	0.7133
ER does not Granger Cause LRM2		2.90331	0.0586
LRCPI does not Granger Cause LRIP	128	20.6265	2.E-08
LRIP does not Granger Cause LRCPI		4.80143	0.0098
LRM2 does not Granger Cause LRIP	128	3.57861	0.0309
LRIP does not Granger Cause LRM2		3.34296	0.0386
LRM2 does not Granger Cause LRCPI	128	8.01745	0.0005
LRCPI does not Granger Cause LRM2		4.98605	0.0083

Table 4 reveals several findings from Granger causality test for all variables selected in this study. Each of them shows a different causal relationship in respect to macroeconomic variables changed and the degree of changes on Islamic equity prices. By looking out p-value or critical value, we can justify the presence of short run causality. The result indicate that there three bidirectional relationship in the system, namely from ER to LRJII, LRM2 to LRIP, and LRM2 to LRCPI, *vice versa*, whereby the respective p-values significant at 5% level. In other words, the presence of shocks on ER, LRJII, LRM2, and LRIP in the short run would cause the disequilibrium on LRM2 and LRCPI variables. Similarly, any shock occurred on LRM2 and LRCPI would trigger disequilibrium on ER, LRJII, LRM2, and LRIP variables.

### ***Variance Decomposition***

Variance decomposition measures the percentage of forecast error of variation that explained by another variable in the short-run dynamics and interactions. It does not provide information on how variable of interest responds to shocks or innovations in other variables. We explore variance decomposition and impulse response based on VAR specification for the purpose. In line with JJ test, we set the lag length of VAR in level to 2, which is sufficient to render the error term serially uncorrelated. The ordering chosen is IP, CPI, M2, ER, and JII which is consistent with the study done by Ibrahim and Yusof (2001). Table 5 below reports the results of variance decomposition.

**Table 5. Variance Decompositions**

Ordering: *IP, CPI, M2, ER, and JII*

Variable	Period	Innovation in (%)				
		JII	ER	IP	CPI	M2
JII	12	95.61296	3.354198	0.033454	0.491533	0.507859
	24	91.88017	4.722575	0.223489	0.424697	2.749072
ER	12	2.641658	1.595795	92.37859	3.011508	0.372449
	24	4.562389	2.345443	88.12882	4.532022	0.431325
IP	12	33.06628	64.01889	2.458769	0.055598	0.400471
	24	33.11446	63.89723	2.495120	0.059423	0.433768
CPI	12	7.698208	19.12849	11.42767	59.47329	2.272339
	24	26.31801	23.88748	9.037672	38.98644	1.770398
M2	12	1.666656	9.672541	1.834279	0.819872	86.00665
	24	5.124111	8.916917	4.100996	0.582897	81.27508

Table 5 above shows the results for variance decomposition at 12- and 24- month horizons. The findings suggest the presence of interaction among the variables. We observe that variations in JII are predominantly attributed to its own variations and ER variations, accounting for 95.61% and 3.35% respectively after 12 month. Innovations in IP, CPI, and M2, however, only explain small fractions of JII forecast error variance. They respectively account for 0.03%, 0.49%, and 0.51% after 12 month. The same things, also, happened for variance decomposition after 24 month on each variable. The variations in JII also predominantly attributed to its own variations and ER variations, accounting for 91.88% and 4.72%. Innovations in IP and CPI also explain small fractions of JII variations, account for 0.22% and 0.42% respectively. However, the fractions of M2 toward JII fractions have inclined to 2.75% after 24 month horizons. Thus, from these variance decompositions on JII, we might be able inferred that movements in Indonesian Islamic equity market are domestically driven. It responds more to monetary shock as compared to real shock.

On the other hand, JII shock also contributes significantly to variations in macroeconomic variables under alternative ordering. Innovation in JII explains quite significant variations about 33% of IP forecast error variance for both 12 and 24 month horizons. JII also explain 4% and 5% variations of ER and M2 respectively. For CPI, 26% of CPI variance after 24 month is attributed to JII shock. These results tend to suggest that Islamic equity market tends to incorporate information on macroeconomic variables such as industrial production index, exchange rate, inflation, and money supply. The significant effect of JII toward IP might be able suggest that Indonesia industrial activities react to changes in Islamic equity markets. The response of the exchange rate to JII shocks might be suggest that money inflows or outflows of portfolio investments.

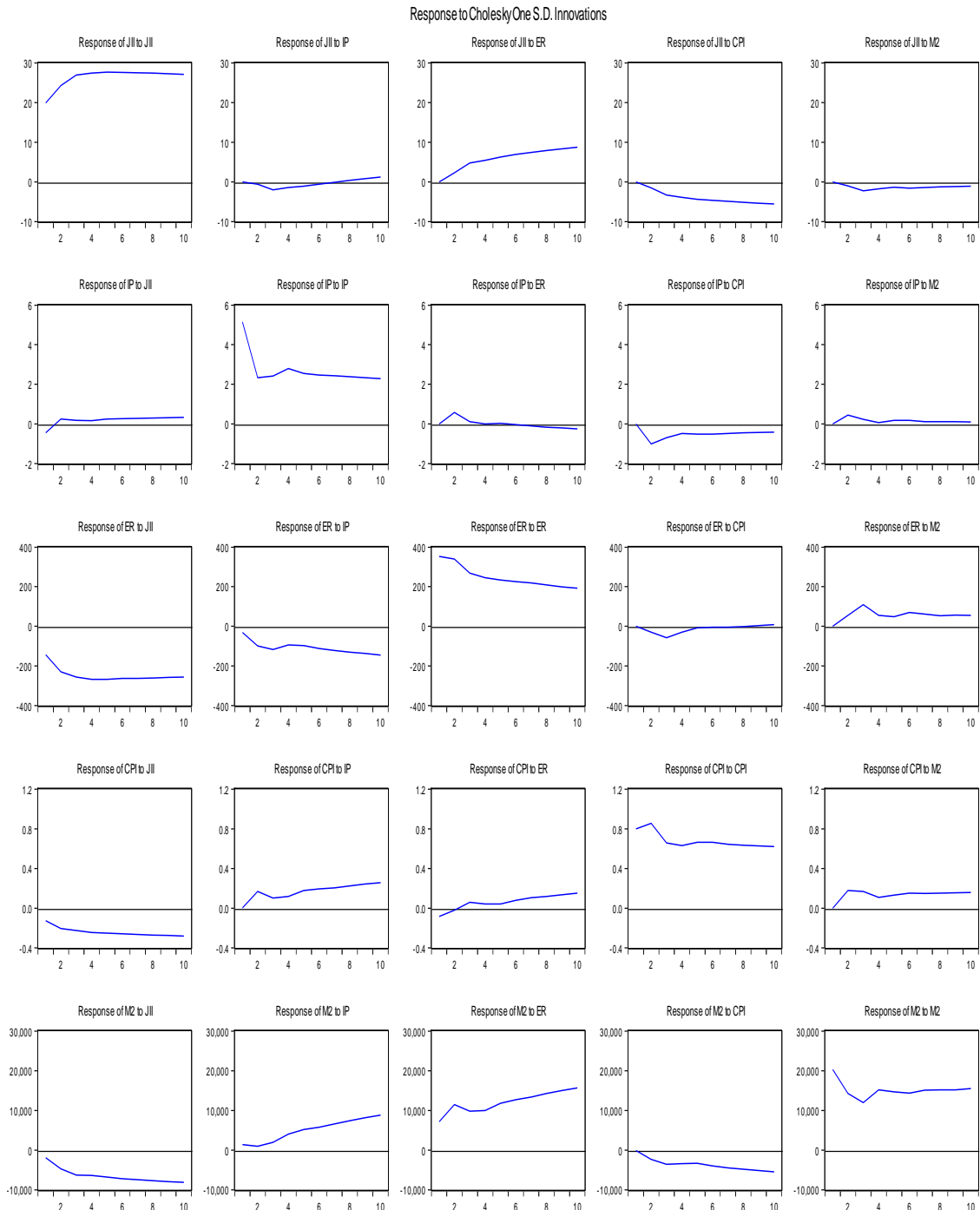
In term of interactions among the exchange rates and the macroeconomic variables, we notice that the importance of Indonesian exchange rate to variations in Indonesia macroeconomic performance. While M2 explains only small percentage of the variations in IP account for 0.4%, the exchange rates shock has substantially impact account for 63% to 64% of the variations in IP. The results shows that exchange rates fluctuation in Indonesia have significant effect to Industrial production index. The ER shocks also explain about 19% to 24% of the CPI variance. What we can inferred is that the importance of ER variations to real economic activity and inflation variance.

### ***Impulse Response Function***

In order to explore the further dynamic interactions among variables, after we discussed variance decomposition, we generate impulse response function based on estimated VAR. In line with variance decomposition, we try to look at the interactions between Islamic stock prices and macroeconomic variables. From figure 2 below, we may highlight several notable points. We can infer that the results are in line with the variance decomposition, whereas JII respond positively for shock in IP and ER. Innovation in IP results positive relationship on JII prices respond, however, there is negative respond at 2-3 month horizon after the shock and then increased gradually afterward. Thus, the relation between IP and JII is negative in the short run but becomes positive in the long run. The respond of JII to ER is increased gradually in the long run. Consistent with long run result, Islamic stock prices respond positively and significantly to Rupiah depreciation shocks at 2-4 month horizons. In contrast, the respond of ER to JII is negative both in the short run and the long run. Exchange rate respond negatively to JII declined at 2-4 months horizons and in the long run, also, decreased gradually afterward. Our result seems to suggest that the important of exercising causation in the implementation exchange rate policies because the depreciation shocks of ER decreased the JII.

Our result is also in line with the result of the CPI negative coefficient in the long run equation. Innovation in the JII affects CPI negatively both in the short run and long run, which affirm that stock prices movements signal negative revisions in inflationary expectations. As inflation expected increase, stock prices will be declined. Likewise, innovation in CPI lead to negative responds by the JII shocks. The respond of stock prices to M2 is negatively in the short run but positively in the long run. Thus, together with the long run results, the JII seems to have negative respond around 2-4 months horizons, but positive respond in the long run association with M2 innovations.

**Figure 2. Impulse-Response Function**



**Conclusion**

This paper analyzes the short-run and long-run relationship between Jakarta Stock Exchange Islamic Index (JII) and selected macroeconomic variables namely exchange rate, industrial production, inflation rate, and money supply from year 2000 to 2010. We use time series techniques of cointegration and vector autoregression (VAR). Some important findings are detailed as follow. These macroeconomic variables share a long run relationship, indicating

that deviations in the short run Islamic stock prices will be adjusted toward the long run value. The movement of Islamic equity market in Indonesia contains information on future information on future variations of these variables. Specifically, Indonesian Islamic stock market are driven more by domestic factors. It responds more to monetary shock as compared to real shock.

Furthermore, the long run equilibrium shows that there is positive relationship between JII and exchange rates. We note from the analysis that there is negative long run association between JII and exchange rates. In other words, in the long run currency depreciation seems to be associated with an increase in Islamic stock prices. In contrast, the respond of ER to JII is negative both in the short run and the long run. Our result seems to suggest that the important of exercising causation in the implementation exchange rate policies because the depreciation shocks of ER decreased the JII prices. The results also indicate that exchange rate have significant influence on the Indonesian economy. Thus, the Indonesian monetary authorities should consider on stabilizing the exchange rate.

On the other hand, the relationship between inflation rate (CPI) and Islamic stock price is negative association. Innovation in the JII affects CPI negatively both in the short run and long run, which affirm that stock prices movements signal negative revisions in inflationary expectations. As inflation expected increase, stock prices will be declined. Likewise, innovation in CPI also leads to negative responds by the JII shocks. This result indicates that once inflation is high, it can actually squeeze profit margins of companies and influence stock prices to declining level. Bruno (1983) stated that that stock prices movements signal negative revisions in inflationary expectations. As inflation expected increase, stock prices will be declined.

Lastly, there is negative relationship between money supply (M2) and Islamic stock prices. This negative association can be due to increase in inflation uncertainty that may lead to declined in Islamic stock prices. The results of variance decomposition and impulse response function indicate that JII respond to shock in money supply negatively in the short run, but the effects become positive in the long run. This findings help in giving input to the government of emerging markets in employing exchange rates policies since they may have repercussions on domestic equity markets (Abdulla and Murinde (1997), Ibrahim and Yusoff (2001)).

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