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The Sensitivity of the Indonesian Islamic Stock Prices to Macroeconomic Variables: An Asymmetric Approach*

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Abstract

This paper empirically examines the asymmetric response of the Indonesian Islamic stock market to macroeconomic variables encompassing money supply, domestic output, exchange rate, and Federal Reserve rate. Our study employs the Jakarta Islamic Index (JII) after the financial crisis in the Southeast Asian country using monthly data from January 2000 to December 2019. Non-linear Autoregressive Distributed lag (NARDL) is applied. Our study considers two models consisting of the model without the Federal Reserve rate and the model with it. Our findings confirm the long-run link between Jakarta Islamic Index and macroeconomic factors being studied. Furthermore, the Jakarta Islamic Index asymmetrically responds to broad money supply and exchange rate, but not to domestic output and Federal Reserve rate. A reduction in the money supply has a worse effect on Islamic stock prices as compared to an increase in the money supply. The Jakarta Islamic Index responds differently to depreciation and appreciation. The transmission of the exchange rate to Islamic stock prices occurs only for appreciation. Our study finds an absence of transmission mechanism from the domestic output and the interest rate to Islamic stock prices. Our results imply that the easy money policy and stabilizing currency are key to supporting Indonesian Islamic stock prices.

Keywords: Macroeconomic Variables, Islamic Stock Prices, Asymmetric Link, Indonesia

JEL Classification Code: C22, G12, G15

1. Introduction

Islamic finance sectors have been proliferating recently to which Islamic finance assets grew by 6% from 2012 to 2107. Accordingly, based on the Islamic finance development report in 2018, total Islamic finance assets were US$2.44 trillion in 2017, consisting of 1,389 Islamic financial institutions. Among the Islamic finance sector, the Islamic banking sector is the biggest Islamic financial sector with US$1.72 trillion in 2017, which contributes to 71% of Islamic financial assets in 2017. In addition, the development of the capital market, which is based on sharia principles, has also grown rapidly. This Islamic capital market guarantees that the companies do not sell prohibited goods (haram) and activities such as alcoholic beverages, pork products, tobacco, intoxicating drugs, defense products, gambling activities, adult entertainment, interest-based financial services (Siddiqui, 2007). Islamic stock market also forbids any transactions that produce excessive risk-taking behavior (gharar) since they generate highly risky payoffs. The Dow Jones in the mid-1990s assisted and facilitated investment in Islamic equities by constructing Islamic equity indices as well known as Islamic Dow Jones Index.

Macroeconomic variables are claimed to influence stock market behavior based on well-known financial economic theories. Several studies have tried to prove the truth of this claim about the impact of macroeconomics variables on stock price returns. This research was initially

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conducted on conventional stock prices in advanced countries such as the United States, the United Kingdom, and Japan. However, the conventional capital market is clearly different from the Islamic capital market, so that the behavior and the risks that arise are also obviously distinguished. Our study enhances the previous studies to answer the query of whether macroeconomic factors influence Islamic stock prices in emerging markets such as Indonesia. Islamic stock markets in the emerging market face different characteristics from the conventional stock market, both advanced and emerging markets.

The Islamic capital market in Indonesia began on July 3, 1997, with the issuance of Sharia mutual fund instruments conducted by Danareksa Investment Management (DIM). Furthermore, on July 3, 2000, the DIM developed the Indonesian Islamic stock price index known as Jakarta Islamic Index, which is intended as a guideline for investors who wish to invest their capital with Sharia principles. Before the global financial crisis occurred in September 2008, Jakarta Islamic Index (JII) peaked performance at 500, but then decreased quite drastically and dropped to 200 in 2009. However, JII has rebounded since 2010 and reached 700 recently.

The Islamic stock prices are strongly influenced by macroeconomic conditions (K. K. Kumar & Sahu, 2017). Several economic theories explain the dynamic link between stock prices and macroeconomic factors. The stock value model proposes that macroeconomic factors are the power in explaining stock prices through discounted future cash flows. The transmission mechanism of macroeconomic factors to stock prices is also explained through the arbitrage pricing theory. In addition, Freidman explained that aggregate demand and aggregate supply could describe the behavior of stock prices through the money demand theory. These three theories are the basic models of the short-run and long-run dynamic link between the stock market and macroeconomic factors.

Numerous existing studies have investigated the link between stock prices and macroeconomic factors both conventional stock markets such as Ratanapakorn and Sharma (2007) for the US, Nguyen and Nguyen (2019) for Vietnam, Alshammari, Ismail, Al-Wadi, Saleh, and Jaber (2020) for Saudi Arabia, and Islamic stock markets such as Majid and Yusof (2009) for Malaysia, Wahyudi and Sani (2014) for Indonesia and Kumar and Sahu (2017) for India. However, those studies assume the symmetrical relationship between stock prices and macroeconomic factors. Several studies show that the behavior of macro variables is asymmetrical with conventional stock prices (Raza, Shahzad, Tiwari, & Shahbaz, 2016; Ajaz, Nain, Kamaiah, & Sharma, 2017; Chang & Rajput, 2018; Sheikh, Asad, Ahmed, & Mukhtar, 2020).

Our study empirically analyzes the asymmetric effect of macroeconomic factors on Indonesian Islamic stock prices as an emerging market. Indeed, several studies conducted an asymmetric response of Islamic stock prices to macroeconomic variables such as Cevik and Bugan (2018), employing Markov Switching Vector Autoregression (MS-VAR). However, our study employs the Nonlinear Autoregressive Distributed Lag model (NARDL) to analyze the asymmetric response of Indonesian Islamic stock prices to the selected macroeconomic variables.

2. Literature Review

Majid and Yusof (2009) examined the link between Malaysian Islamic stock prices (KLSI–Kuala Lumpur Sharia Index) and macroeconomic factors. The findings showed that the money supply, exchange rate, the Treasury bill rate (TBR), and the federal funds rate (FFR) influence the Kuala Lumpur Shariah Index. The results also show that interest rates both domestically (TBR) and internationally (FFR) have no impact on Islamic stock return, implying as interest rates rise, they have no effect on KLSI. Accordingly, Muslim investors will buy more shares that are in accordance with Sharia principles. The study by Rashid, Hassan, and Yein (2014) also found that several macroeconomic factors such as money supply, interest rates, currency index, consumer price index, and industrial production influence the Malaysian Islamic Stock Price Index.

Wahyudi and Sani (2014) examine the causality test between Indonesian Islamic financial markets and macroeconomic factors. Their results showed that the Islamic money market index (SBIS) has less information content than the Jakarta Islamic Index (JII). The exchange rate and the global risk index considerably affect the JII, but only the global risk index significantly influences SBIS. The analysis of multivariate also showed that SBIS JII has less information content (SBI rate, inflation rate, and global risk index) than JII (exchange rates, world oil prices, the global risk index, and Chinese economic growth). Their results imply the existence of the link between macroeconomic variables, the link between financial markets and macroeconomic factors, and the link between Islamic capital markets and money markets. Accordingly, JII is more appropriate for fiscal policy, and SBIS is more applicable for monetary policy in Indonesia. Sakti and Harun (2015) investigated the link between the Jakarta Islamic Index and macroeconomic factors employing the VAR method and using monthly data from January 2000 to December 2010. The macro variables consist of the money supply, inflation, the industrial production index, and the exchange rate. The findings show that the JII is strongly influenced by domestic factors comprising inflation, the money supply, and the industrial production index.

Kumar and Sahu (2017) examined the dynamic relationship between macroeconomic factors and Indian Islamic stock. They employed the Dow Jones Islamic India market index using monthly data from January 2006

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to June 2015. The macroeconomic variables encompass money supply, interest rates, inflation, and exchange rates. The results showed that the macroeconomic variables, consisting of money supply, interest rates, inflation, and exchange rate, negatively affect the Dow Jones Islamic India index. Habib and Islam (2017), using the arbitrage pricing theory, examine the link between stock prices and macroeconomic factors. The macro variables studied were interest rates, money supply, inflation, exchange rates, and the industrial production index. The results demonstrate that the interest rates and exchange rate affect the Indian Islamic stock prices.

Bahloul, Mroua, and Naifar (2017) empirically tested the impact of returns and volatility of conventional stock markets and some selected macroeconomic variables consisting of money supply, inflation, short-term interest rates, and yield curve on Islamic stock market returns for twenty developed and emerging markets using monthly data from June 2002 to June 2014. The findings using the Markov switching regression model demonstrate that the Islamic stock index is influenced by the return of the conventional stock index and the money supply for low and high volatility systems. Yet, other macroeconomic factors may not clarify the dynamic movement of the Islamic stock index for high volatility regimes.

Cevik and Bugan (2018), employing the Markov Switching Vector Autoregression, examined the regime-dependent dynamic relationship between Islamic and conventional financial markets. Their findings provide a fact supporting the nature of regime shifts across all series of returns. These results give strong evidence that the non-linear link between conventional and Islamic stock markets exists. The Granger causality test depending on the regime and the impulse analysis shows that the Islamic stock markets are influenced by conventional stock markets in bull and bear market systems. This study indicates that Islamic financial markets give diversification payoffs and they are riskier assets during periods of financial shock.

3. Methodology and Data

3.1. Asymmetric Cointegration: NARDL

The basis of this research hypothesis is the relationship among the several markets encompassing the money market, the goods market, the securities market, and the labor market. Based on the literature in securities market, our study does not include the labor market because it permits us to exclude the labor market based on the Walras's law (Wongbangpo & Sharma, 2002). Following previous research, the goods market variable is proxied by the Industrial Production Index (IPI). The money market is the broad money supply (M3). As a measure of external competitiveness, this study uses the exchange rate (real

exchange rate). In addition, the Indonesian economy is an open economy, so it is necessary to include the influence of international variables so that this study includes the variable of federal reserve rate (Majid & Yusof, 2009). Thus, this study explores the long-term and short-term link between the stock market and macroeconomic factors by considering the following models:

$$LJII_t = \alpha_0 + \alpha_1 LBM_t + \alpha_2 LIPI_t + \alpha_3 LEXC_t \qquad (1)$$
$$+ \alpha_4 FRR_t + e_t$$

where JII is Jakarta Islamic Index, BM is broad money, IPI stands for industrial Production index, EXC stands for the nominal exchange rate, and FRR is Federal Reserve rate. Except for FRR, all variables are expressed by logarithm natural.

The stock valuation model deals with the variables that influence the mean stock prices. Based on the valuation model, a rise in the money supply generates higher dividends and, furthermore, assuming the interest rate is constant, raising the stock prices. The money supply can have either a negative or positive effect on stock prices. A rise in the money supply can generate an increase in the discount rate and reduce share prices because an increase in the money supply increases the rate of inflation (Fama, 1981). The negative impact, however, can be offset by the existence of an economic stimulus originating from an increase in money growth, which is expected to raise cash and stock prices (Mukherjee & Naka, 1995).

The domestic output, which represents real economic activity, affects the profitability of the company. The increase in domestic output will increase the company's profits, thereby increasing the stock prices. By contrast, a decrease in domestic output will reduce the company's profits and further reduce the share price. Thus, the study expects that output proxied by the Industrial Production Index (IPI) has a positive effect on stock prices (Wongbangpo & Sharma, 2002). For countries that rely on imported raw materials for domestic products such as Indonesia, depreciation of the domestic currency increases the price of goods, thereby reducing company profits and subsequently lowering stock prices. Conversely, currency appreciation increases the company's profits and, in turn, raises the stock prices (Mukherjee & Naka, 1995). Any Muslim investor invests his or her funds in interest-free based securities so that the relationship between interest rates, which is proxied to the Federal Reserve rate (FRR) and the Islamic stock prices are independent (Majid & Yusof, 2009).

Many empirical studies show that there is an asymmetrical link between economic variables, such as oil and consumer prices (Widarjono & Hakim, 2019; Widarjono, Susantun, Ruchba, & Rudatin, 2020), oil and stock prices (Raza, Shahzad,

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Tiwari, & Shahbaz, 2016; Kumar, 2019), and between time deposit and interest rate (Nguyen & Islam, 2010; Zulkhibri, 2012; Apergis & Cooray, 2015; Holmes, Iregui & Otero, 2015). Accordingly, our study empirically investigates the asymmetric effect of macro variables on Islamic stock prices. Equation (1) can be rewritten to consider the asymmetric effects of macroeconomic variables on Indonesian Islamic stock prices (Shin, Yu, & Greenwood-nimmo, 2014) as:

$$LJII_t = \delta_0 + \delta_1 LBM_t^+ + \delta_2 LBM_t^- + \delta_3 LIPI_t^+ + \delta_4 LIPI_t^- \\ + \delta_5 LEXC_t^+ + \delta_6 LEXC_t^- + \delta_7 FRR_t^+ + \delta_8 FRR_t^- + \varepsilon_t \quad (2)$$

If all the macroeconomic variables are represented as variable *X*, and then the partial amounts of increase and decrease in the macroeconomic variables are represented by X_t^+ and X_t^- respectively. X_t^+ and X_t^- and are calculated using the following formulas (Shin, Yu, & Greenwood-nimmo, 2014):

$$X_t^+ = \sum_{t=1}^m \Delta X_{t-1}^+ = \sum_{t=1}^m \max(X_t, 0) \quad (3)$$

$$X_t^- = \sum_{t=1}^m \Delta X_{t-1}^- = \sum_{t=1}^m \min(X_t, 0) \quad (4)$$

The Non-linear Autoregressive Distributed Lag (NARDL) model is employed to empirically investigate the asymmetric effects of macroeconomics variables on Indonesian Islamic stock prices following Shin, Yu, and Greenwood-nimmo (2014). The NARDL model in equation (2) can be formulated as

$$\Delta LJII_t = \rho_0 + \rho_1 LJII_{t-1} + \rho_2 LBM_{t-1}^+ + \rho_3 LBM_{t-1}^- \\ + \rho_4 LIPI_{t-1}^+ + \rho_5 LIPI_{t-1}^- + \rho_6 LEXC_{t-1}^+ \\ + \rho_7 LEXC_{t-1}^- + \rho_8 FRR_{t-1}^+ + \rho_9 FRR_{t-1}^- \\ + \sum_{i=1}^l \varphi_{1i} \Delta LJII_{t-1} \\ + \sum_{i=0}^p (\varphi_{2i} \Delta LBM_{t-1}^+ + \varphi_{3i} \Delta LBM_{t-1}^-) \\ + \sum_{i=0}^p (\varphi_{4i} \Delta LIPI_{t-1}^+ + \varphi_{5i} \Delta LIPI_{t-1}^-) \\ + \sum_{i=0}^p (\varphi_{6i} \Delta LEXC_{t-1}^+ + \varphi_{7i} \Delta LEXC_{t-1}^-) \\ + \sum_{i=0}^p (\varphi_{8i} \Delta FFR_{t-1}^+ + \varphi_{9i} \Delta FFR_{t-1}^-) + \mu_t \quad (5)$$

NARDL in equation (5) can measure the effect of asymmetric macroeconomic variables on Islamic stock prices both in the short and long term. The asymmetric effect of a rising and falling the macroeconomic variables in the short term can be calculated by $\pi_1 = \sum_{i=0}^m \theta_{1i} \Delta LBM_{t-1}^+$,

$\pi_2 = \sum_{i=0}^m \theta_{2i} \Delta LBM_{t-1}^-$ for broad money supply $\pi_1 = \sum_{i=0}^m \theta_{3i} \Delta LIPI_{t-1}^+$, $\pi_2 = \sum_{i=0}^m \theta_{4i} \Delta LIPI_{t-1}^-$ for Industrial Production Index (IPI) $\pi_1 = \sum_{i=0}^m \theta_{3i} \Delta EXC_{t-1}^+$, $\pi_2 = \sum_{i=0}^m \theta_{4i} \Delta EXC_{t-1}^-$ for the exchange rate $\pi_1 = \sum_{i=0}^m \theta_{3i} \Delta FRR_{t-1}^+$, $\pi_2 = \sum_{i=0}^m \theta_{4i} \Delta FRR_{t-1}^-$ for the federal reserve rate. While the asymmetric effect of increasing and decreasing in macroeconomic variables on Islamic stock prices in the long term is measured by $\vartheta_1 = -\dfrac{\rho_2}{\rho_1}$, $\vartheta_2 = -\dfrac{\rho_3}{\rho_1}$, $\vartheta_3 = -\dfrac{\rho_4}{\rho_1}$, $\vartheta_4 = -\dfrac{\rho_5}{\rho_1}$, $\vartheta_5 = -\dfrac{\rho_6}{\rho_1}$, $\vartheta_6 = -\dfrac{\rho_7}{\rho_1}$, $\vartheta_7 = -\dfrac{\rho_8}{\rho_1}$, $\vartheta_8 = -\dfrac{\rho_8}{\rho_1}$.

Several steps proceed to estimate equation (5) following Shin, Yu, and Greenwood-nimmo (2014). Initially, the equation (5) is estimated using the OLS method employing the general to a specific method to find the best model by eliminating lags that are not statistically significant. In the second step, this study checks a cointegration to check the long-term relationship between the dependent and independent variables employing two approaches. The first approach is to test whether $\rho_1 = 0$ using t_{BDM} statistic (Banerjee, Dolado, & Mestre, 1998). The second involves a cointegration approach with a bound testing approach following the Wald *F* test (Pesaran, Shin, & Smith, 2001). The null hypothesis of no long-run relationship or no cointegration is $\rho_1 = \rho_2 = \rho_3 = \rho_4 = 0$. In the next steps, our research examines the long-term asymmetric impact of macroeconomic factors on Islamic stock prices. The null hypothesis of the long-run asymmetric effect of macroeconomic variables on the Islamic stock prices is $\vartheta_i = \vartheta_j$. As the null hypothesis is rejected, an increase (decrease) in macroeconomic variable affects Islamic stock prices. In the last step, we calculate the asymmetric coefficients of macroeconomic variables both an increase in the variable ($\vartheta_1, \vartheta_3, \vartheta_5, \vartheta_7$) and a decrease in the variable ($\vartheta_2, \vartheta_4, \vartheta_6, \vartheta_8$).

The last step is to measure the asymmetric cumulative dynamic multiplier effect for any change in the macroeconomic variable (*X*) on the Jakarta Islamic Index (JII). The asymmetric cumulative dynamic multiplier effect is a change X_{t-1}^+ and X_{t-1}^- in JII_t and is computed using the following method (Shin, Yu, & Greenwood-nimmo, 2014):

$$\pi_k^+ = \sum_{j=0}^k \frac{\partial JII_{t+j}}{\partial X_{t-1}^+}, \ \pi_k^+ = \sum_{j=0}^k \frac{\partial JII_{t+j}}{\partial X_{t-1}^-} \cdots k = 0, 1, 2, \ldots \quad (6)$$

Where as $k \to \infty$, $\omega_k^+ \to \pi_1$ and $\omega_k^- \to \pi_2$

3.3. Data

This study analyzes the Indonesian Islamic Index after the economic crisis in 1998. This study uses monthly data from January 2001 to December 2019. The Indonesian Islamic stock price index is the Jakarta Islamic Index (JII) and macroeconomic variables consist of broad money supply, Industrial Production Index, exchange rate, and Federal Reserve rate. Jakarta Islamic Index is obtained from the Indonesian financial service authority. The broad money supply is from the Indonesian Central Bank. The exchange rate and Industrial Production Index are from International Financial Statistics, and the Federal Reserve rate is obtained from the Federal reserve of St. Louis.

4. Results and Discussion

Before estimating NARDL, our study proceeds with the unit root test to check stationary data. The NARDL requires all data are not stationary at order two or I(2). The standard unit root tests, both the Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) tests, are employed to determine the variable's integration order. The findings of the stationary test using both the ADF and PP are displayed in Table 1. The test results indicate that some such as LIPI and FRR data are stationary at level data and the rest of the data are not stationary at level. However, all variables are stationary at the first difference level data and none of them is to be integrated into level two I(2). Because none of them is found to integrated on I(2), these tests of the order of integration prove that the NARDL is an applicable model to estimate the dynamic link between the Indonesian Islamic stock Index and macroeconomic variables.

Our study employs the ordinary least squares (OLS) to estimate the NARDL model in equation (5) by choosing a maximum lag order up to 12 lags. Our study estimates two models consisting of model 1 as a closed economy model and model 2 as an open economy model by including the Federal Reserve rate. Table 2 presents the results of both model (1) and model (2). Table 2 at the upper part exhibits the NARDL estimation for long-run and short-run variables, including the coefficient of determination (R^2) for measuring the goodness of fit. In model (1), 3 of the seven long-run variables are significant, while all short-run variables are significant. In model (2), 4 of the seven long-run variables are significant and all short-run variables are significant.

We carry on some diagnostic tests to ensure the specification adequacy of the NARDL model before drawing inferences based on various diagnostic statistics. These diagnostic statistic tests comprise the error normality using the Jarque-Bera (J–B), autocorrelation employing Langrage Multiplier (LM), heteroskedasticity using Conditional Heteroskedasticity (ARCH), and stability using CUSUM test. The results of diagnostic tests are presented in the bottom part of the table. All models are in the absence of autocorrelation and pass the stability test but the presence of heteroskedastcy in both models.

Next, we check the cointegration using t_{BDM} statistic and the F_{PSS} test statistics. Both cointegration results are exhibited in Table 2 at the bottom part. The results of the cointegration test indicate that the null hypotheses no cointegration are rejected at $\alpha = 10\%$ or lower level of significance for both models using the t test and the Wald F test. The results confirm that the long-run relationship among Indonesian Islamic stock prices, Industrial Production Index, nominal exchange rate, and Federal Reserve rate is found. The results prove that the error correction model is a suitable model to investigate the asymmetric effect of macroeconomics variables on Islamic stock prices in emerging countries such as Indonesia.

Table 1: Unit Root Test

	ADF				PP			
	Level		First-difference		Level		First-difference	
	No trend	**Trend**	**No trend**	**Trend**	**No trend**	**Trend**	**No trend**	**Trend**
LJII	−1.79	−1.56	−12.17***	−12.25***	−1.87	−1.53	−12.23***	−12.26***
LBM	−0.66	−1.49	−5.48***	−5.51***	−0.65	−0.99	−17.11***	−17.10***
LIPI	0.62	−1.34	−7.98***	−8.00***	−1.48	−9.97***	−52.23***	−51.82***
LEXC	−1.11	−2.68	−11.80***	−11.80***	−0.83	−2.25	−11.47***	−11.47***
FRR	−2.55	−3.37*	−6.70***	−6.75***	−2.77	−2.40	−6.56***	−6.65***

Note: ***, **, and * stand for statistically significant at $\alpha = 1\%$, $\alpha = 5\%$, and $\alpha = 10\%$, respectively.

Table 2: NARDL Estimation

Variable	Model 1		Model 2	
	Coef.	Std. Err.	Coef.	Std. Err.
Cons	0.2879***	0.0882	0.3983***	0.0916
$LJJI_{t-1}$	−0.0817***	0.0218	−0.0916***	0.0207
LBM_{t-1}^{+}	0.1020	0.0745	0.1403**	0.0694
LBM_{t-1}^{-}	1.6633***	0.4680	1.3068***	0.4278
$LIPI_{t-1}^{+}$	−0.0686	0.0685	−0.0787	0.0682
$LIPI_{t-1}^{-}$	−0.1234	0.0760	−0.0853	0.0753
$LEXC_{t-1}^{+}$	0.0000	0.0715	−0.0515	0.0669
$LEXC_{t-1}^{-}$	−0.3387***	0.0850	−0.2982***	0.1085
FRR_{t-1}^{+}	–	–	0.0081	0.0068
FRR_{t-1}^{-}	–	–	0.0014	0.0063
$LIJI_{t-6}$	0.1345*	0.0698	–	–
$LIJI_{t-7}$	–	–	0.2061***	0.0631
ΔLBM_{t}^{-}	2.1414***	0.7978	1.9916***	0.7244
ΔLBM_{t-8}^{-}	–	–	−1.1864*	0.6389
ΔLBM_{t-9}^{-}	1.4189**	0.7011	–	–
$LIPI_{t-10}^{+}$	–	–	−0.2233**	0.1099
$LIPI_{t-8}^{-}$	–	–	0.1893**	0.0826
$LEXC_{t}^{+}$	−1.1788***	0.2470	−1.6065***	0.2547
$LEXC_{t-1}^{+}$	–	–	1.0102***	0.2400
$LEXC_{t-5}^{+}$	0.9582***	0.2652	0.5469**	0.2236
$LEXC_{t-6}^{+}$	–	–	0.4898*	0.2634
$LEXC_{t-7}^{+}$	–	–	0.8867***	0.2379
$LEXC_{t-11}^{+}$	−0.5281**	0.2088	–	–
$LEXC_{t}^{-}$	−1.4104***	0.3559	−1.0118***	0.3593
$LEXC_{t-10}^{-}$	0.5426**	0.2126	0.6027***	0.1972
FRR_{t-7}^{-}	–	–	0.0805**	0.0399
FRR_{t-8}^{-}	–	–	0.1770***	0.0422
FRR_{t-9}^{-}	–	–	−0.2426***	0.0421
FRR_{t-10}^{-}	–	–	0.1870***	0.0382
R^2	0.3743		0.5330	
Diagnostic test				
LM	0.01	0.9194	0.219	0.6398
ARCH	35.719	0.0000	3.920	0.0477
CUMSUM	Stable		Stable	
Cointegration test				
t_{BDM}	3.7568*		4.4243**	
F_{PSS}	4.2917*		5.1871***	

Note: ***, **, and * stand for statistically significant at α = 1%, α = 5%, and α = 10%, respectively. t_{BDM} and F_{PSS} stand for the test of cointegration.

Consequently, our study then can examine the asymmetric effect of macroeconomic variables on Indonesian Islamic stock prices to test whether an upturn and downturn macroeconomic variables asymmetrically affect Indonesian Islamic stock prices. The asymmetric tests of each variable, both model 1 and model 2, following the Wald F test are presented in Table 3. The long-run asymmetry effect of the macroeconomic variable on Islamic stock prices is found for all variables in model 1, but it exists for the broad money supply and exchange rate in model 2. Our study concludes that upturn and downturn macroeconomic variables differently affect Islamic stock prices in Indonesia. Our results confirm with the existing empirical studies for the conventional stock market in some emerging market (Ajaz, Nain, Kamaiah & Sharma, 2017; Chang & Rajput, 2018; Sheikh, Asad, Ahmed, & Mukhtar, 2020; Dang, Le, Nguyen, & Tran, 2020).

We, in turn, estimate the long-run coefficient for each macroeconomic variable to examine the asymmetric effect of macroeconomic variables on Islamic stock prices and its sub-from the estimated coefficient of NARDL estimation. Table 4 shows the coefficients of positive and negative for each macroeconomic variable in the long run. We begin with model 1. The positive and negative coefficients of the broad money supply are significant. The negative coefficient of the Industrial Production Index is significant and the negative coefficient of the exchange rate is significant. For model 2, both the positive and negative coefficients of the broad money supply are also significant and the negative coefficient of the exchange rate is also significant.

The long-run coefficients of positive broad money supply for model 1 and model 2 are 1.2480 and 1.5310, respectively. Our results predict that an increase in money supply by 1% leads to a rise in Jakarta Islamic Index roughly by 1.235% and 1.5310% for model 1 and 2, respectively. However, the impact of a reduction in money supply results in a worse impact on the Jakarta Islamic Index by −20.35% and −13.26% as the money supply decrease by 1%. The decrease in the money supply has a bigger negative impact than the increase in the money supply on the Jakarta Islamic index. The plausible reason is that a decrease in the money supply causes an economic downturn and a falling stock prices and an increase in the money supply causes an economic upturn and raises the Islamic stock prices. However, several studies have shown that economic downturn has a worse impact than economic upturn (Tang & Bethencourt, 2017; Widarjono, 2020), so a reduction in money supply leads to a sharp falling in Islamic stock prices. Our results support the existing empirical study such as Ajaz, Nain, Kamaiah, and Sharma. (2017) for Indian conventional stock prices

and Chang and Rajput (2018) for Pakistani conventional stock prices.

The depreciation of the rupiah against the dollar does not affect the Jakarta Islamic Index, but appreciation had a significant effect on the Jakarta Islamic Index. The long-run coefficients of negative exchange rate are 4.2480 and 3.2540 for models 1 and 2, respectively, meaning that an appreciation of rupiah by 1% leads to an increase in Jakarta Islamic Index roughly by 4.248% and 3.254% for the model 1 and 2 respectively. As a country that relies heavily on imported raw materials in domestic production, appreciation of the rupiah is able to reduce production costs so as to increase company profits and increase the value of company stock (Mukherjee & Naka, 1995; Wongbangpo & Sharma, 2002). This study clearly confirms the previous empirical research that the effect of exchange rates on stock prices is asymmetric. Dang, Le, Nguyen, and Tran (2020) found that currency appreciation affects a stronger transmission of stock prices as compared to the long-run currency depreciation for the stock prices in Vietnam. Conversely, Cheah, Yiew, and Ng (2017) documented that Malaysian stock prices respond asymmetrically against currency depreciation and appreciation but its transmission to the stock price is only for depreciation instead of appreciation.

Domestic output affects the Jakarta Islamic Index as domestic output falls in model 1, but the results are not expected. The Federal Reserve rate has no effect on the Jakarta Islamic Index, which means that there is no interest rate transmission to the Jakarta Islamic Index as expected from the theory. Based on the tenet of Islamic principles, every Muslim has to invest his or her money only in interest-free bearing securities instead of the interest rate. Accordingly, the link between Islamic stock prices and interest rate are independent. Majid and Yusof (2009) also found that there is an absence of interest rate transmission to the Malaysian Islamic stock prices.

Finally, we present asymmetric cumulative dynamic multipliers for both model 1 and model. Figures 1 and 2 present graphically temporal evolution of the Jakarta Islamic Index in response to an increase and a decrease in each macroeconomic variable employing bootstrapping method with a 90% confidence interval based on 100 replications over the 80-month horizon. Those graphs clearly demonstrate that Jakarta Islamic Index responds to the macroeconomic variable for both model 1 and model 2. An increase (a decrease) in the money supply is responded to the increase (the decrease) in the Jakarta Islamic Index. Jakarta Islamic Index asymmetrically responds to exchange rate to which appreciation increases Jakarta Islamic index and depreciation lowers Jakarta Islamic Index.

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Table 3: Asymmetric Test

Variable	Model 1		Model 2	
	F-statistic	Prob	*F*-statistic	Prob
LBM	10.3300***	0.0020	8.5250***	0.0040
LIPI	5.8320**	0.0170	0.0405	0.8410
LEXC	6.9170***	0.0090	3.6790*	0.0570
FRR			0.4249	0.5150

Note: ***, **, and * stand for statistically significant at $\alpha = 1\%$, $\alpha = 5\%$, and $\alpha = 10\%$, respectively.
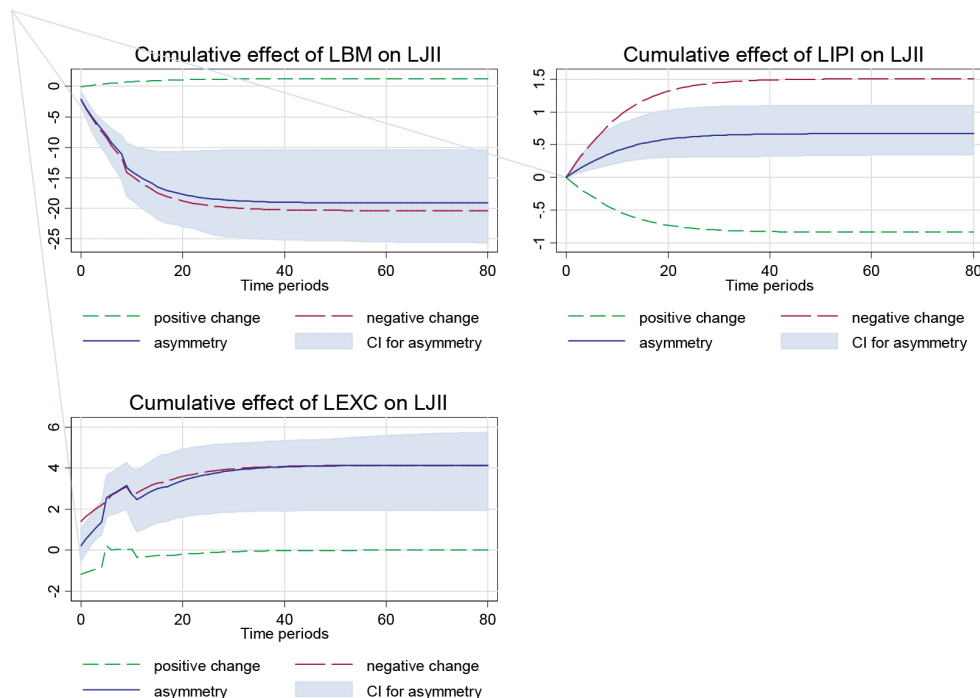
Table 4: Long-run Coefficient

Variable	Model 1		Model 2	
	Coeff.	Prob.	Coeff.	Prob.
LBM_t^+	1.2480*	0.1380	1.5310***	0.0250
LBM_t^-	−20.3510***	0.0020	−14.2620***	0.0030
LIP_t^+	−0.8400	0.3190	−0.8580	0.2620
LIP_t^-	1.5100**	0.0830	0.9310	0.2520
$LEXC_t^+$	0.0000	1.0000	−0.5620	0.4060
$LEXC_t^-$	4.1440***	0.0000	3.2540***	0.0070
FRR_t^+			0.0880	0.2120
FRR_t^-			−0.0150	0.8260

Note: ***, **, and * stand for statistically significant at $\alpha = 1\%$, $\alpha = 5\%$, and $\alpha = 10\%$, respectively.

5. Conclusions

It is interesting to test empirically the asymmetric impact of macroeconomic variables on Islamic stock prices for those emerging markets that apply dual stock price systems both Islamic and conventional stock such as Indonesia. Our study shows some important results of the relationship between the Islamic stock prices and macroeconomic factors. First, the co-movement between the Indonesian Islamic stock market and macroeconomic factors exists in the long run. Second, a decrease in money supply has a worse effect on Islamic stock prices as compared to an increase in money supply, meaning that transmission of tight money policy is stronger than those of easy money policy. Third, the currency appreciation significantly contributes to the increase in Islamic stock prices, while depreciation has no effect on Islamic stock prices. The transmissions of the industrial production index and Federal Reserve rate to the Indonesian Islamic stock prices are not found.

Our empirical study provides some policy implications for policymakers in supporting the Jakarta Islamic Index. First, the easy money policy such as the reserve requirement (RR) policy and Indonesian Sharia bank certificate rate is essential in supporting the performance of the Jakarta Islamic Index. This easy monetary policy can encourage economic growth and subsequently can boost the performance of the Jakarta Islamic Index. Second, the Jakarta Islamic Index is also heavily affected by the exchange rate.

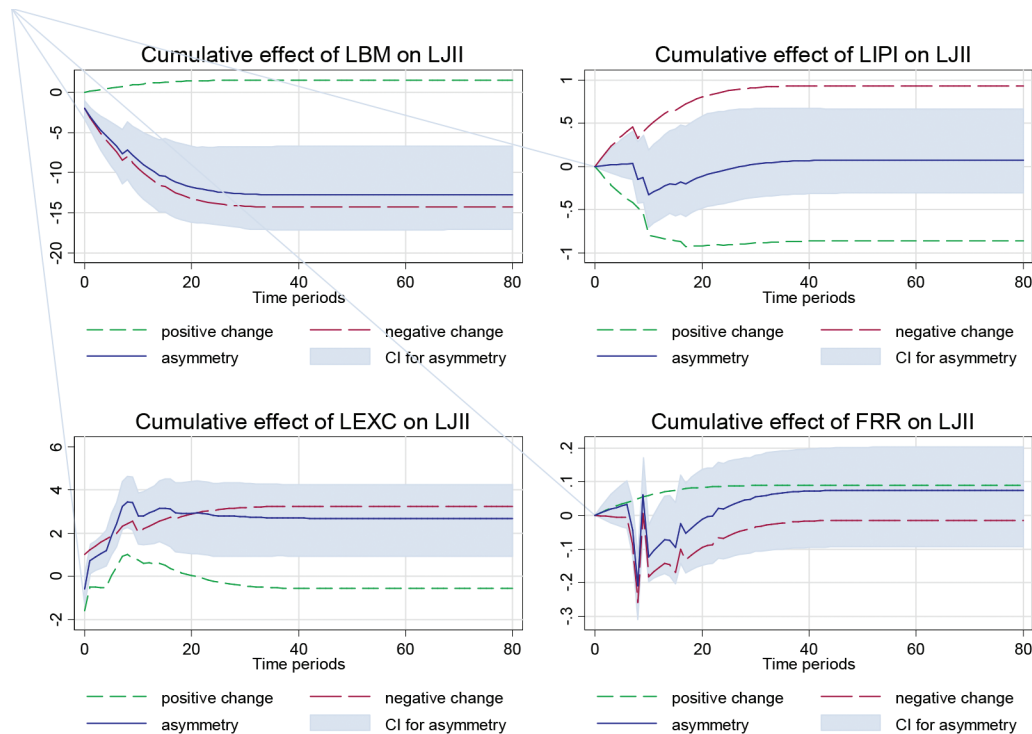**Figure 1:** The Dynamic Multipliers of Model 1

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Figure 2: Dynamic Multipliers of Model 2

Indonesia, a country that has a weak currency, is very vulnerable to fluctuations in the exchange rate. Therefore, policymakers must formulate the appropriate economic policies in maintaining the stability of the exchange rate so that these policies are able to maintain the stability of the Jakarta Islamic Index.

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