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The Dynamic Interaction between Macroeconomic and Stock Market in Indonesia

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Abstract: The study of the determinants of the stock market has emerged recently. The literature focused on the effect of macroeconomic variables on the stock market volatility as well as the impact shock of each macroeconomic variable o the stock market. This study attempts to analyze the dynamic relationship between macroeconomic variables on the stock market volatility in Indonesia. We apply structural vector autoregression (SVAR) include the long-run and the impulse response function. The result shows that risk premium shock, first demand shock, and foreign shock have a positive effect on the stock market before the fifth period. The second demand shock, supply shock, and the aggregate demand shock have different effects for all of the long horizon.

Keywords: stock market, macroeconomic variables, SVAR, impulse response, Indonesia

I. Introduction

The capital market, which is a financial industry, has a significant influence and a high sensitivity to economic globalization. The globalization of the financial business includes the foreign exchange business as well as direct and indirect investments (Effiong and Bassey 2019; Lai et al. 2013; Owiredu, Oppong, and Asomaning 2016; Rudzkis and Valkavience 2014). El-Nader and Alraimony (2013) investment through the capital market as a form of indirect investment is carried out in any market throughout the world. It means that the capital market with financial liberalization, anyone can play in it, and foreign investors are no exception.

Information about the difficult to predict stock price index is fundamental for investors to make investment decisions in the capital market (Lai et al. 2013; Mohammed and Abu Rumman 2018; Osamwonyi and Evbayiro-Osagie 2012; Pal and Garg 2019; Parab and Reddy 2019). Because the factors that influence the Composite Stock Price Index are very diverse, including the exchange rate (i.e., IDR vis-à-vis USD), inflation, the interest rate, the effect can be positive or negative on the level of the Stock Exchange.

Macroeconomic changes in the State of Indonesia will undoubtedly affect the national economy and the entire industry. For example, high inflation and the weakening of the rupiah will cause many industries to experience a shock, a decline in production due to rising raw material prices resulting in a decline in profitability. He (2017), with the decline in the rate of profit, will undoubtedly have an impact on the decline in share prices in the industry because the dividends to be received by shareholders will decrease so that many investors will withdraw their investment. Rising interest rates will make investors more interested in investing in savings in banks than investing in the capital market (Osamwonyi and Evbayiro-Osagie 2012; Sukruoglu and Temel Nalin 2014; Yang et al. 2018; Zheng, Jiang, and Long 2019). Thus, the decline in stock prices in the industry will also have an impact on the decline in the value of the composite stock price index on the Indonesia Stock Exchange (IDX). Besides, the interest rate set is higher than that of the rate of return expected by investors, then investors tend to shift their investment in money market instruments. The transfer of investment funds will reduce the level of the stock price (Apergis, Christou, and Payne 2014; Hsing 2011; Hsing and Hsieh 2012). Nevertheless, on the contrary, the stock price will increase if the specified interest rate is lower

than the rate of return expected by investors. Investors will tend to save money in the form of shares rather than in the form of deposits or savings.

Inflation influences the stock market (Khan et al. 2015; Ntshangase, Mingiri, and Palesa, 2016; Yang et al. 2018). If inflation increases, the price of goods will tend to increase, and the company's burden will also increase due to rising raw material costs, operational costs, and other costs. Thus, it will impact the company's revenue decline. It will cause investors to divert their funds to more risk-free instruments, which will cause a decrease in the Jakarta Composite Index (JCI). The macroeconomic environment is an environment that affects the daily operations of a company. The ability of investors to understand and predict future macroeconomic conditions will be instrumental in making profitable investment decisions (Owiredu, Oppong, and Asomaning 2016; Pal and Garg 2019; Sukruoglu and Temel Nalin 2014). For this reason, an investor must consider several macroeconomic indicators that can assist investors in making their investment decisions. Macroeconomic indicators that are often associated with capital markets are fluctuations in interest rates, inflation, the rupiah exchange rate, and GDP growth.

The result shows that all of the macroeconomic variables have a significant effect on the stock market in Indonesia. Moreover, to this end of this section, we introduce the next section is the literature review. In section 3, we present the analysis method. The empirical result and discussions are provided in section 4. Finally, we conclude the result in section 5.

II. Literature Review

The studies of the dynamic relationship between macroeconomic variables and the stock market return improved due to the development of the financial market. The stock market has linkages to the volatility of other macroeconomic variables. The good news of macroeconomic variables would encourage the public's expectation of the stock market to increase, while shock will decrease it. Hsing (2011) studied the relationship between macroeconomic variables and the stock market in Croatia. The study applies the GARCH model to estimate quarterly data from 1997.III to 2010.I for his 51 observations. The result shows that the Croatian stock market index has a positive and significant relationship with real GDP, money supply, German stock market index, and Euro area government bond yield. However, the Government deficit to GDP ratio the real domestic interest rate, the HRK vis-à-vis USD, and the expected inflation rate has a negative and significant Croatian stock market index.

Osamwonyi and Evbayiro-Osagie (2012) estimate the long-run and short-run dynamic relationship between macroeconomic and stock market index in Nigeria. They applied the vector error correction model (VECM) to regress the data from 1975 to 2005. The result shows that the interest rate and money supply have negative and significant both in the short-run and long-run. The consumer price index as a proxy of the inflation rate is positively related to the stock market index both in the short-run and long-run. The exchange rate has a positive effect in the short-run but negative effect in the long-run. However, Fiscal deficit is positively related to the stock market in the short-run, and GDP in the short-run and long-run have not significant effect on the stock market index.

Lai et al. (2013) compare the dynamic interaction among macroeconomic variables and the stock market in Taiwan, Hong Kong, and China. They used the Johansen cointegration test and VECM to analyze the monthly data from 1991 to 2008. The result reveals that in the long-run, stationary linear combination of the stock prices index for China, Hong Kong, and Taiwan exists. The Granger causality test shows that only stock return in Hong Kong influences macroeconomic variables. The result of the VECM model explains that three economies mutually affect each other. They suggest that policymakers need to consider not only macroeconomic variables but also market integration effects.

Khan et al. (2015) studied the relationship between stock returns and macroeconomic variables in South Asia. They used vector autoregressive (VAR) to estimate the monthly data for 15 years period from January 1998 to December 2012. The result shows that local economic factors affect the Bangladeshi, Sri Lankan, and Pakistani stock market returns. However, it cannot affect the volatility of the Indian stock market returns. The important macroeconomic variables for Bangladeshi stock market returns are the real interest rate, while the trade balance and the real exchange rate are influence factors for Pakistani stock market returns. Moreover, the real exchange rate and the real interest rate have a significant effect on the Sri Lankan equity market.

Ntshangase, Mingiri, and Palesa (2016) analyze the interaction between the stock market and macroeconomic policy variables in South Africa. They employed the Johansen cointegration test and the restricted VAR model to test the quarterly data from 1994 to 2012. The result shows a long-term relationship between the macroeconomic indicators and the measure of the stock market. The money supply, inflation rate, interest rate, exchange rate, and government expenditure hurt the volatility of the stock market in South Africa.

Yang et al. (2018) test the relationship between macroeconomic shocks and stock market returns in Korea. They employed the structural vector autoregression (SVAR) model to estimate the monthly data from January 2003 to September 2015 and sub-period that excludes the global financial crisis period. The result shows that demand shock has

a positive effect on returns, while in the long-run shows a positive effect. The risk premium shocks have a negative relation with the inflation rate and strongly positive relation with the real output growth. According to the implementation of the sub-period of the global financial crisis that has a little correlation between market fluctuation and the Korean stock market.

Pal and Garg (2019) analyze the effect of macroeconomic surprises on the Indian stock market responses. They applied the capital asset pricing model (CAPM) that used the vector autoregression (VAR) to estimate data from April 1st, 2004 to July 31st, 2016. They compare the impulse response function with that of an event study. The result shows that the GDP, WPI, CAD, IIP, and CPI have a significant impact on DGP, WPI, CAD, and CIIP surprises have a significant influence on the stock returns. However, CPI has less impact on the volatility of the stock market in India. They conclude that both the event study and VAR analysis successfully show the heterogeneous response of stock indices against monetary policy and macroeconomic surprises.

III. Research Method

III.1. Data Source

The following analysis used data includes quarterly data from 2002: I to 2017: I due to the availability of the data. The original dataset is mainly obtained from the official site of the Organization for Economic Co-operation and Development (OECD), the International Monetary Fund (IMF), and yahoo finance. The dependent variable is the stock market. The independent variables are money supply which represented by M2, consumer price index to represent the inflation rate, the interest rate, the exchange rate between Indonesia and the US, namely Indonesian Rupiah (IDR) vis-à-vis US dollar (USD) and GDP growth as a proxy of the business cycle in Indonesia. To ensure the stationary of the data, we applied a logarithmic form for all macroeconomic variables except the money supply, inflation rate, and interest rate.

III.2. Empirical Model

The main purpose of this study is to examine the effect of money supply, inflation, interest rate, exchange rate, and the business cycle on the stock market in Indonesia. We adapted the previous macroeconomic model from the study of Lai et al. (2013). The original model of this study is outlined by equation (1):

$$logSM_t = \propto + \beta_1 MS_t + \beta_2 INF_t + \beta_3 IR_t + \beta_4 logER_t + \beta_5 logGDP_t + \varepsilon_t, \quad (1)$$

Where $logSM_t$represents the stock market in Indonesia, and the$MS_t$is broad money (M2) to represent the money supply. The INF_trepresents the inflation rate in Indonesia. IR_trepresents the interest rate volatility. $LogER_t$is the value of IDR vis-à-vis USD to represent the exchange rate. The$logGDP_t$is the GDP growth rate to represent the business cycle in Indonesia, and ϵ_t is the disturbance term.

Table 1. Summary of Data Sources and Measurement

Variable	Data	Description	Source
$logSM_t$	Jakarta Composite Index (^JKSE)	Indicator of the stock market in Indonesia	Yahoo Finance
MS_t	Broad money (M2)	Money supply	Organization for Economic Co-operation and Development (OECD)
INF_t	Consumer price index	Indicator of the inflation rate	International Financial Statistic of the International Monetary Fund (IMF)
IR_t	The interest rate of the money market	Indicator of the rate of return in ASEAN-5 countries	International Financial Statistic of the International Monetary Fund (IMF)
$logER_{i,j,t}$	the Indonesian Rupiah vis-á-vis the US dollar	Indicator of the type of the US bank reaction to response the liability shock in the home country	International Financial Statistic of the International Monetary Fund (IMF)
$logGDP_t$	Real GDP	The indicator of the business cycle in Indonesia	World Bank

The Jakarta composite index represents the stock market in Indonesia measured in local currency that gained from Yahoo Finance. Broad money using M2 of Indonesia to represent the money supply, and we gained this data from the Organization for Economic Co-operation and Development (OECD). The consumer price index as a proxy of the inflation rate gained from the International Financial Statistic of the International Monetary Fund (IMF). The interest rate is represented by the interest rate of the money market in percent per annum is obtained from the official site of the International Financial Statistic of the International Monetary Fund (IMF). The exchange rate of the Indonesian Rupiah *vis-á-vis* the US dollar has also obtained from the official site of the International Monetary Fund (IMF). The real gross domestic product (GDP) variables are measured in the current US dollar in which obtained from the official site of the World Bank. Since the data provided in yearly frequency, we employed the linear interpolation method. This data used to explain the business growth cycle in both home and host countries.

III.3. Estimation Strategy

The estimation begins with a descriptive statistical analysis of the data used in this study. We estimate the model of equation (1) use the structural vector auto-regression (SVAR). The estimation also reports the result of the Johansen co-integration test and summary statistic. We also apply for the time series properties for each macroeconomic variable.

We begin with the SVAR specification as follows:

$$Ay_t = A_1^s y_{t-1} + \ldots + A_p^s y_{t-p} + C^s x_t + Bu_t, \qquad (2)$$

Where A, all of the A_i^s, and C^s are the structural coefficients, and the u_t is the orthonormal unobserved structural innovations with $E(u_t u_t^{'}) = I_k$. In order to see the relationship between the SVAR specification and the corresponding reduced-form of VAR, we assume that A is invertible and expand to the following equation:

$$y_t = A^{-1}A_1^s y_{t-1} + \ldots + A^{-1}A_p^s y_{t-p} + A^{-1}C^s x_t + A^{-1}Bu_t, \qquad (2)$$

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + Cx_t + \epsilon_t, \qquad (4)$$

Therefore, the reduced-form lag matrices are $A_1 = A^{-1}A_i^s$ and $C = A^{-1}C^s$, and the reduced form error structure is as follows:

$$\epsilon_t = A^{-1}Bu_t = Su_t, \qquad (5)$$

$$E(\epsilon_t \epsilon_t^{'}) = \Sigma_{\epsilon} = A^{-1}BB^{'}A^{-1'} = SS^{'}, \qquad (6)$$

Where $S = A^{-1}B$. SVAR estimation uses $\sum\epsilon$ is obtained from the reduced form of VAR in equation (6). The challenge of SVAR estimation is that there are only $k(k+1)/2$ moments in $\epsilon\, t$ and more than $k(k+1)/2$ elements in A, B, and S. Thus, the matrices are not identified unless additional restrictions are provided.

Finally, to arrange the six variables and ten long-run restrictions in the matrix of long-run multipliers, we derived the form as follows:

$$\left(logSM_t\ MS_t\ INF_t\ IR_t\ logER_{i,j,t}\ logGDP_t\right) = D\epsilon_t = (d_{11}\ 0\ 0\ d_{21}\ d_{22}\ 0\ d_{31}\ d_{32}\ d_{33} \quad d_{(7)}$$

Where ϵ_t^1, ϵ_t^2, ϵ_t^3, ϵ_t^4, ϵ_t^5, ϵ_t^6 are risk premium shock, first demand shock, second demand shock, supply shock, foreign shock, and aggregate spending shock. To identify the structural shocks, we impose a long-run restriction. First, in the first line, we assume that $d_{12} = d_{13} = d_{14} = d_{15} = d_{16} = 0$. It indicates that first demand shock, second demand shock, supply shock, foreign shock, and aggregate spending shock have no long-run effect on the stock market in Indonesia. The stock market is only affected by risk premium shock. Secondly, $d_{23} = d_{24} = d_{25} = d_{26} = 0$, indicates that only risk premium shock, first demand shock have an impact on the money supply. Thirdly, we assume that $d_{34} = d_{35} = d_{36} = 0$. It indicates that risk premium shock, first demand shock, second demand shock affect the inflation rate. Fourthly, the assumption of $d_{45} = d_{46} = 0$ indicates that foreign shock and aggregate spending shock do not impact the interest rate in the long-run. Finally, the assumption of $d_{56} = 0$ indicates that there is no impact on the aggregate spending shock on the business cycle.

IV. Result and Discussion

IV.1. Cointegration test

The analysis begins from the cointegration test of the structural VAR (SVAR) model explained above. Table 2 shows the result of the Johansen (1988) test. The statistics indicate that there is no cointegration at the 5 percent critical level for all of the variables. The result indicates that both of the maximum eigenvalue and the trace statistic rejects the null hypothesis of no cointegration at 5 percent significance level for none, at most 1, and most 2. However, at most 3, 4, and 5 accept the null hypothesis. Therefore, there is statistical evidence that the level variables have a long-run association in the SVAR model.

Table 2. Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.664962	141.2126	95.75366	0.0000
At most 1 *	0.446907	82.16298	69.81889	0.0038
At most 2 *	0.378702	50.18262	47.85613	0.0297
At most 3	0.285234	24.48158	29.79707	0.1808
At most 4	0.109936	6.348402	15.49471	0.6543
At most 5	0.001101	0.059488	3.841466	0.8073

Johansen (1988) cointegration test based on the result of the maximum eigenvalue and trace statistics. (*) denotes rejection of the hypothesis at the 0.05 level. The probability used Mackinnon, Haug, and Michelis (1999) (Source: Author's Computation Using E-views 10).

IV.2. Statistic Descriptive Analysis

Generally, we employed the same number of observations for every five variables. However, the lag of interest rate is generated from the dependent variable. Some of the variables are converted into the logarithmic due to the different high spreads. The summary statistic of each variable is presented in Table 2.

Table 3. Summary Statistic of Variable

	logSM	*MS*	*INF*	*IR*	*logER*	*logGDP*
Mean	19.13829	107.1651	6.854737	13.60895	9.210476	14.53211
Median	19.29239	92.49828	6.380000	13.13000	9.135002	14.50995
Maximum	20.02790	218.9887	17.78000	18.42000	9.536104	14.97554
Minimum	17.37117	39.25586	2.590000	11.44000	9.040888	14.04646
Std. Dev.	0.592892	57.18097	3.277933	1.721448	0.148500	0.265530
Skewness	-0.992067	0.511186	1.666071	1.018885	0.984490	-0.113834
Kurtosis	3.528896	1.920409	5.840239	3.476770	2.574848	1.977401
Jarque-Bera	10.01424	5.250558	45.52905	10.40206	9.636882	2.606662
Probability	0.006690	0.072420	0.000000	0.005511	0.008079	0.271625

Source: Author's Computation Using E-views 10).

According to table 3 above, the data spread among variables are quite high. The minimum value of interest rate and other macroeconomic variables have different spreads. The mean of each variable is quite far from each other, especially for the money supply. Table 3 above also reports the standard deviation for each variable that has high spread, especially between the inflation rate exchange rate variables. Thus, we decided to apply the logarithmic terms for the high spread variables such as money supply, exchange rate, and gross domestic product, to decrease the enormous difference spread among variables estimated.

Table 4. Correlation Coefficients

	logSM	*MS*	*INF*	*IR*	*logER*	*logGDP*
logSM	1	0.447270	-0.2082210	-0.2313960	0.223680	0.513125
MS	0.447270	1	-0.417358	-0.726029	0.820726	0.966118
INF	-0.208221	-0.417358	1	0.513895	-0.157251	-0.384393

IR	-0.231396	-0.726029	0.513895	1	-0.412920	-0.796458
logER	0.223683	0.820726	-0.157251	-0.412920	1	0.759134
logGDP	0.513125	0.966118	-0.384393	-0.796458	0.759134	1

Source: Author's Computation Using E-views 10).

Table 4 presents the summary statistics for the five macroeconomic variables as well as the stock market variable used in the model. The stock market has a negative correlation with the inflation rate and interest rate while positively correlated to the money supply, exchange rate, and business cycle. The money supply variable is positively correlated to the exchange rate and business cycle; however, it negatively correlated to the inflation rate and the interest rate. The inflation rate has a positive correlation to the interest rate. However, it has a negative correlation on the exchange rate and business cycle. The interest rate has a negative correlation on the exchange rate and business cycle. However, the exchange rate has a positive correlation on the business cycle.

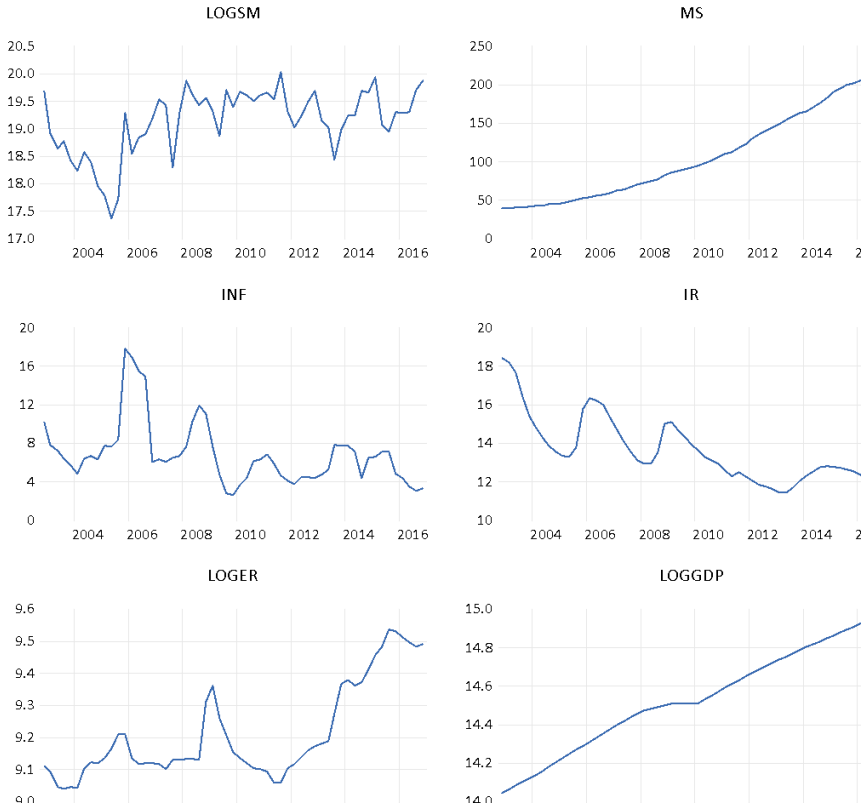

Figure 1. Time Series Properties of Macroeconomic Variables. The figure presents historical plots of macroeconomic data from 2002 — quarter 4 to 206 quarter 4 (Source: Author's Computation Using E-views 10).

Figure 1 shows the historical plots of the real levels data of five variables estimated in this study. All levels exhibit adjustment during the global financial crisis 2007/08 except the money supply. The downturn of the stock market, inflation rate, business cycle, and interest rate are similar to the high price of the dollar in Indonesian currency, which means there is a higher depreciation of the exchange rate of IDR vis-à-vis USD in the global financial crisis period.

IV.3. Empirical Analysis and Discussion

The relationship between the stock market and the macroeconomic variables is mainly estimated using the structural VAR (SVAR). We analyze the effect of money supply, inflation rate, interest rate, the exchange rate of IDR vis-à-vis USD, and the business cycle on the volatility of the stock market in Indonesia The result of the estimation is presented in table 5. The following explanation is the result of long-run identification restrictions based on the Granger Causality test result in table 5.

Table 5. Pairwise Result of Granger Causality Test

Null Hypothesis	Obs.	F-Statistic	Prob.
MS does not Granger Cause LOGSM	55	1.60083	0.2119
LOGSM does not Granger Cause MS		1.83898	0.1696
INF does not Granger Cause LOGSM	55	0.65477	0.5240
LOGSM does not Granger Cause INF		3.37888	0.0420
IR does not Granger Cause LOGSM	55	0.89201	0.4163
LOGSM does not Granger Cause IR		4.93737	0.0110
LOGER does not Granger Cause LOGSM	55	1.46943	0.2398
LOGSM does not Granger Cause LOGER		1.15574	0.3231
LOGGDP does not Granger Cause LOGSM	55	3.60314	0.0345
LOGSM does not Granger Cause LOGGDP		0.18598	0.8309
INF does not Granger Cause MS	55	0.17983	0.8360
MS does not Granger Cause INF		1.48428	0.2365
IR does not Granger Cause MS	55	2.47548	0.0944
MS does not Granger Cause IR		5.87072	0.0051
LOGER does not Granger Cause MS	55	4.46602	0.0164
MS does not Granger Cause LOGER		3.36101	0.0427
LOGGDP does not Granger Cause MS	55	3.33473	0.0437
MS does not Granger Cause LOGGDP		1.76375	0.1819
IR does not Granger Cause INF	55	0.18856	0.8287
INF does not Granger Cause IR		1.37668	0.2618
LOGER does not Granger Cause INF	55	0.57888	0.5642
INF does not Granger Cause LOGER		0.24311	0.7851
LOGGDP does not Granger Cause INF	55	1.68925	0.1950
INF does not Granger Cause LOGGDP		0.66955	0.5165
LOGER does not Granger Cause IR	55	1.03946	0.3612
IR does not Granger Cause LOGER		3.34772	0.0432
LOGGDP does not Granger Cause IR	55	5.71450	0.0058
IR does not Granger Cause LOGGDP		0.09182	0.9124
LOGGDP does not Granger Cause LOGER	55	2.36829	0.1041
LOGER does not Granger Cause LOGGDP		0.39661	0.6747

(Source: Author's Computation Using E-views 10)

The result of the pairwise Granger Causality test shows that the causality flows from the exchange rate to the other five macroeconomic variables, especially for the stock market. All of the macroeconomic variables such as money supply, inflation rate, interest rate, exchange rate, and business cycle Granger Cause the stock market in Indonesia. The stock market Granger Cause also the money supply, exchange rate, and the business cycle in Indonesia. However, the stock market variable does not Granger Cause the inflation rate and the inflation rate variables.

The estimation result of long-run responses in the SVAR model is presented in table 6. Since we arrange that ϵ_t^1, ϵ_t^2, ϵ_t^3, ϵ_t^4, ϵ_t^5, and ϵ_t^6 are risk premium shock, first demand shock, second demand shock, supply shock, foreign shock, and aggregate spending shock respectively, and we estimate the long-run response of SVAR model from the equation (7).

Table 6. The Estimation Result of Long-run Responses in the SVAR Model

Type of Shock		Coefficient	Std. Error	z-Statistic	Prob.
Risk premium shock	$logSM_t$	19.70647	1.880822	10.47758	0.0000
	MS_t	-124.7025	27.65766	-4.508785	0.0000
	INF_t	9.603394	1.028571	9.336638	0.0000
	IR_t	17.57433	1.694337	10.37239	0.0000
	$logER_t$	8.902201	0.859679	10.35526	0.0000
	$logGDP_t$	14.06837	1.349620	10.42395	0.0000

First demand shock	MS_t	-185.1608	17.65451	-10.48802	0.0000
	INF_t	2.102226	0.421603	4.986268	0.0000
	IR_t	1.031853	0.218445	4.723630	0.0000
	$logER_t$	-0.910170	0.097978	-9.289499	0.0000
	$logGDP_t$	-0.924229	0.103892	-8.896044	0.0000
Second demand shock	INF_t	2.750725	0.262271	10.48809	0.0000
	IR_t	0.660363	0.184593	3.577407	0.0003
	$logER_t$	-0.035997	0.045353	-0.793720	0.4274
	$logGDP_t$	-0.099890	0.054197	-1.843102	0.0653
Supply shock	IR_t	1.286878	0.122699	10.48809	0.0000
	$logER_t$	0.172936	0.042109	4.106828	0.0000
	$logGDP_t$	0.110548	0.052302	2.113650	0.0345
Foreign shock	$logER_t$	-0.287354	0.027398	-10.48810	0.0000
	$logGDP_t$	-0.365254	0.037571	-9.721806	0.0000
Aggregate spending shock	$logGDP_t$	-0.104547	0.009968	-10.48809	0.0000

This study use standard error that indicates the rejection of the null hypothesis at 1, 5, and 10 percent of significance level (Source: Author's Computation Using E-views 10).

Table 6 presents the estimation result of the equation (7) by using the structural vector auto-regression (SVAR) model. The coefficient estimates of the money supply variable of the first line shock are negative and significant. It indicates that risk premium shock hurts the money supply. However, it has a positive impact on the dynamic of the stock market, inflation rate, interest rate, exchange rate, and the business cycle in Indonesia. This result supports the finding of Yang et al. (2018). The second line of the table 6 explains that first demand shock has a positive and significant impact on the money supply, inflation rate, interest rate, exchange rate, and the negative and effect on the business cycle in the long-run.

The second demand shock has a positive and significant effect on the inflation rate and the interest rate. However, it has negative but not significant on the exchange rate and business cycle at 5 percent. The supply shock has a positive and significant effect on the interest rate, exchange rate, and the business cycle in the long-run. Oppositely, the foreign shock has a negative and significant impact on the exchange rate and the business cycle, as well as the aggregate spending shock on the business cycle.

Figure 2 presents the accumulative impulse response for macroeconomic shocks such as risk premium shock, first demand shock, second demand shock, supply shock, foreign shock, and aggregate spending shock. The figure about the response of logSM to innovation explains that only first demand shock has a positive effect on the stock market for all the extended horizon of 9 quarter. However, it decreases in the ten quarters. Supply shock hurts the stock market for all long horizon of ten quarter, except at quarter four, five, and six. The aggregate demand shock has declined in the negative impact on the stock market in the third, fourth, and fifth quarters and increase to the positive after in the sixth quarter.

Money supply has a positive response to the risk premium shock, first demand shock, second demand shock, supply shock, and aggregate spending shock. However, it has a negative response to the foreign shock. According to the response of the inflation rate, the shocks have a negative impact on the inflation rate after the fifth quarter. Except for the aggregate demand, the shock has a positive effect on the inflation rate after the fifth quarter. The figure for the response of IR to innovations explains that first demand shock hurts the interest rate at all of ten quarters. The risk premium shock and the aggregate demand shock have a positive impact on the interest rate after the fifth quarter.

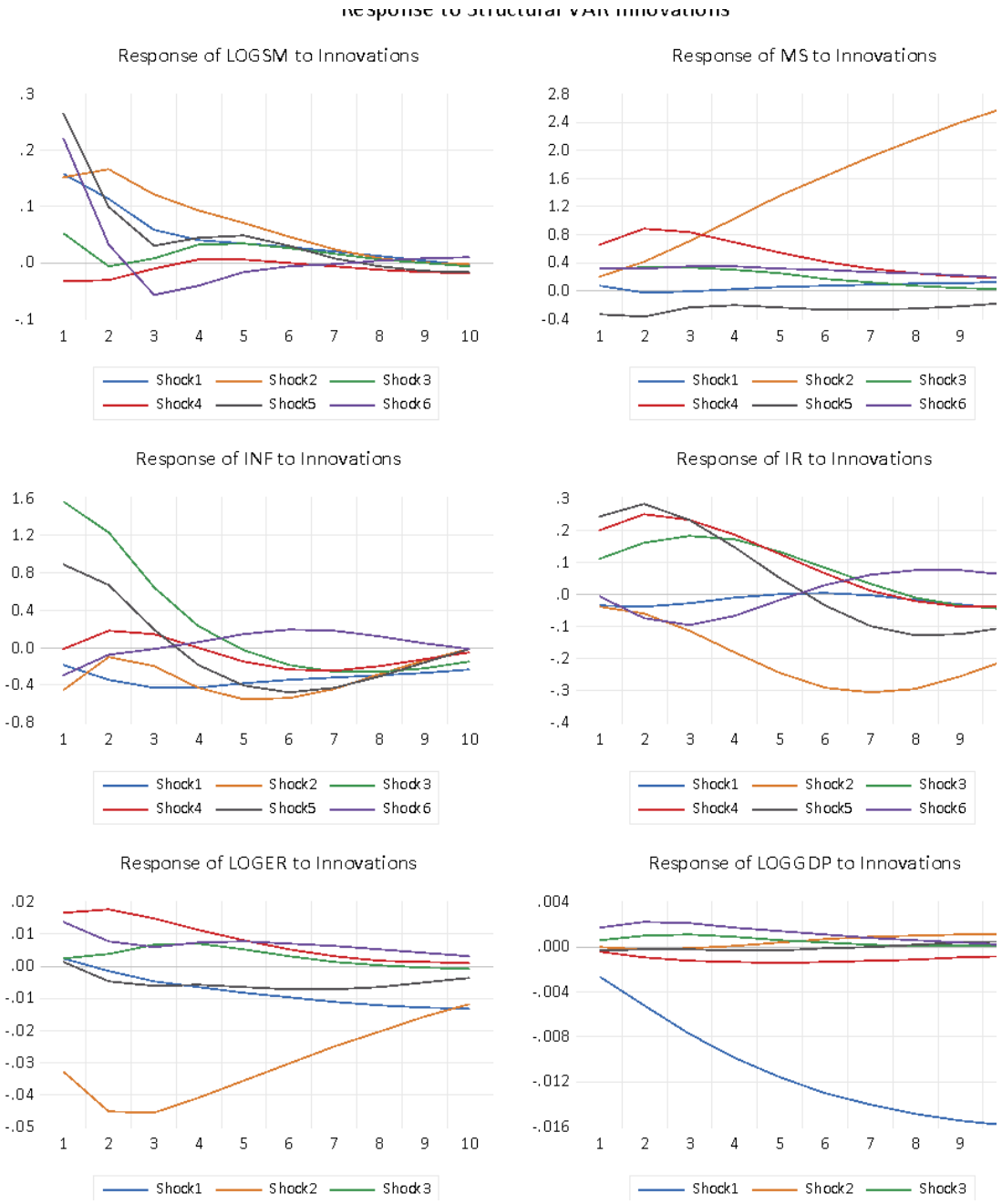

Figure 2. Accumulated Impulse Response to the Structural Shocks. Shock 1, shock 2, shock 3, shock 4, shock 5, shock 6 are risk premium shock, first demand shock, second demand shock, supply shock, foreign shock, and aggregate spending shock respectively (Source: Author's Computation Using E-views 10).

According to the figure of the Response of LOGER to the Innovations, the risk premium shock, first demand shock, and foreign shock have a negative impact on the exchange rate almost at all of the quarter. However, the other three shocks have a positive impact on the exchange rate. The last figure explains the response of the business cycle to all of the shocks for ten quarters. The result explains that risk premium shock, supply shock, and foreign shock have a negative impact on the business cycle for all of the long horizon. However, first demand shock, second demand shock, and the aggregate demand shock have a positive impact on the dynamic of the business cycle in Indonesia.

Conclusion

The study of stock market determinants in Indonesia has recently improved since macroeconomic changes in Indonesia will undoubtedly affect the national economy and the entire industry, especially the stock market. We improve the previous studies that analyze the effect of macroeconomic variables on the stock market. Our result based

on the Granger Causality test suggests that all of the macroeconomic variable estimates have a significant effect on the stock market in Indonesia. Based on the accumulated impulse response to the structural shock, the risk premium shock, first demand shock, and foreign shock have a positive effect on the stock market before the fifth period. However, there are differences in variability response of the stock market on the shock of a second demand shock, supply shock, and the aggregate demand shock in the long-run.

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