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Results and Comparison of Volatility Between Prices Between IHSG and ISSI: a Case Study of the Turmoil Period 2020-2021

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ABSTRACT

The aim of this research is to determine the results and compare the effect of the period of instability between the volatility of the Composite Stock Price Index (IHSG) and the Indonesian Sharia Stock Index (ISSI). Additionally, to compare the effect of the volatility of IHSG and ISSI and find out the results of macroeconomic variables during the period of 2020 to 2021. The research data used is from the period of 2020 to 2021 as variables. Quantitative analysis is conducted using the TGARCH Model and VECM in this analytical method. Based on the results of TGARCH, the period of instability shows that the volatility of ISSI has a significantly smaller effect compared to the volatility of IHSG. According to the results of VECM analysis, the period of instability from 2020 to 2021 has a greater impact on the volatility of ISSI.

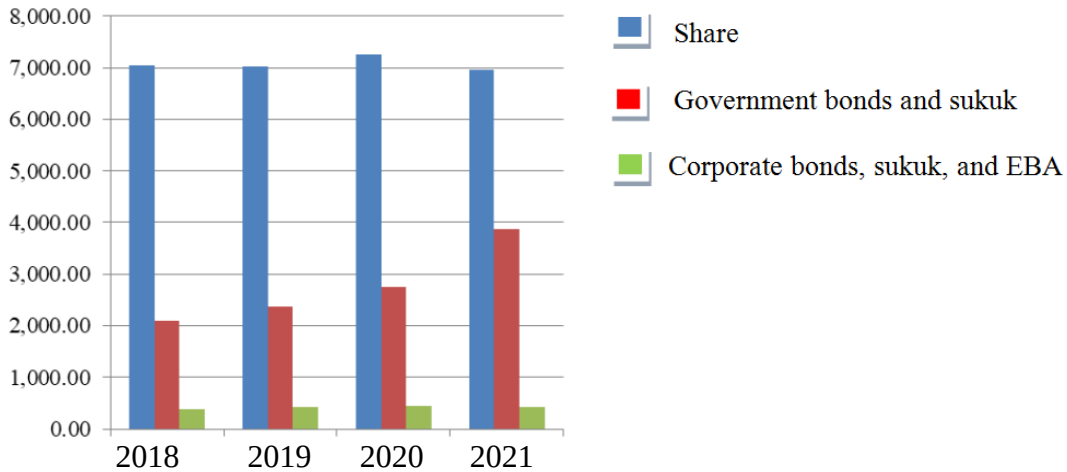
Abstrak: Tujuan penelitian ini untuk mengetahui hasil dan membandingkan efek periode ketidakstabilan antara volatilitas Indeks Harga Saham Gabungan (IHSG) dan Indeks Saham Syariah Indonesia (ISSI). Selain itu membandingkan efek volatilitas IHSG dan ISSI serta mencari hasil dari variabel makroekonomi periode tahun 2020 hingga 2021. data penelitian ini dari tahun 2020 hingga 2021 sebagai variabel. Analisis kuantitatif menggunakan Model TGARCH dan VECM dalam metode analisis ini. Terhadap periode ketidakstabilan, berdasarkan hasil TGARCH menunjukkan bahwa volatilitas ISSI memiliki efek signifikan yang lebih kecil dibandingkan dengan volatilitas IHSG. Menurut hasil analisis VECM menunjukkan bahwa periode ketidakstabilan dari tahun 2020 hingga 2021 memiliki lebih banyak dampak pada volatilitas ISSI.

Kata Kunci: Volatilitas, ISSI, IHSG, Waktu Ketidakstabilan..

A. INTRODUCTION

Preliminary The capital market plays an important role in development the country's economy. This is because the capital market is one a tool for wealth creation, where companies can obtain capital to develop business in order to increase profit (profit) company. In addition, the public can invest in stock instruments, bonds/sukuk, and mutual funds to obtain profit. The concept of wealth creation is in line with the teachings of Islam namely in QS. Al-Jumu'ah 62: verse 10 and QS. Yusuf: verse 47-49 which basically God commands humans to work and produce wealth. Humans are also commanded to save part of the property for future needs. Investing in the capital market is done so that the assets stored not buried but can be developed for generate benefits and profits (Kewal, 2012).

Stock instruments have a very big role for the country's economic development compared to the instruments other capital markets. According to data from the Financial Services Authority (OJK), the value of average capitalization on stock instruments from 2018 to 2021 reached Rp7,707.46 trillion. Meanwhile, the average value of outstanding on government and corporate bonds/sukuk only reached IDR 2,772.13 trillion and IDR 421.69 trillion .



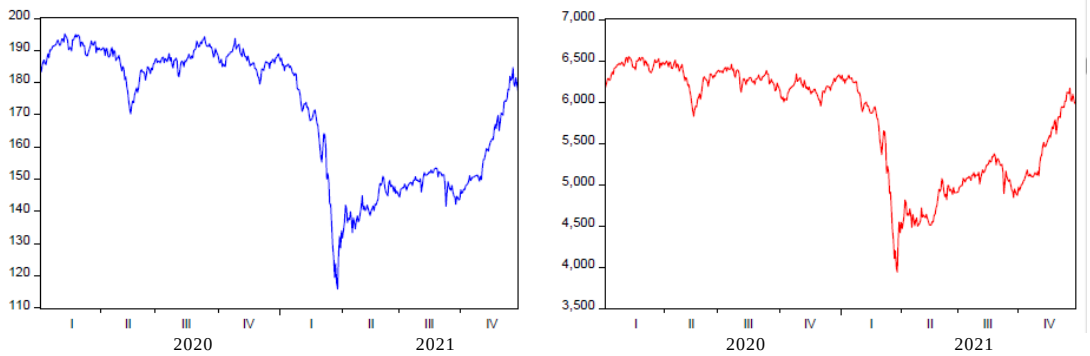
Source: Financial Services Authority

Picture 1. Share capitalization value and outstanding government and corporate bonds/sukuk for the period 2018-2021(Trillion IDR)

The stock market provides two advantages for investors, namely: dividend which is the distribution of profits from the company and capital gain which is the difference between the selling price and the purchase price. Capital gains are formed due to an increase in company performance which causes the company's stock price to rise. Stock market too much in demand by the public as a tool for investment. According to the press release of the Indonesia Stock Exchange (IDX), stock investors in 2021, up 53% from 2020, which is 1.68 million Single Investor Identification.

Indonesia adheres to a dual capital market system where there are Islamic shares and conventional shares. The existence of sharia-based shares opens opportunities for Muslims to invest in sectors that are according to sharia principles. However, many researchers who question whether the performance of Islamic stocks is better compared to conventional stocks (Saiti et al., 2014).

Based on empirical studies conducted after the crisis Financial institutions in the United States show that Islamic stocks have a better performance than conventional stocks, as well as Islamic stocks provide benefits in tranquil times and turmoil/crisis (Abbes & Trichilli, 2015). However, as an investment instrument, at In fact, Islamic stocks still have fluctuating movements relatively similar to conventional stocks during times of turmoil such as the Covid-19 pandemic. These changes can be seen from stock price movements of the Indonesian Sharia Stock Index (ISSI) and Composite Stock Price Index (IHSG) below.



Source: Yahoo Finance (2021) (data processed)

Picture 1. ISSI share prices (left) and IHSG (right) for the period 2020-2021

This study wants to analyze and compare the volatility of the Islamic stock index, namely ISSI, with the volatility index conventional stock, IHSG, during times of turmoil. Also, analyze and compare how much the factors reflect the mass turmoil in 2020 to 2021 in influencing volatility ISSI and IHSG prices.

METHOD

Method This research was conducted on the Sharia Stock Index Indonesia (ISSI) and the Composite Stock Price Index(IHSG). period used in this study, namely in 2020 to 2021. The turbulence period used in this study is the event impact on stock prices in Indonesia from 2020 to 2021, such as the decline in world oil prices, the trade war between United States with China, Covid-19 pandemic and chaos The Draft Law (RUU) on Job Creation (Nofiatin, 2013). Data type used in this study is secondary data using time series data (time period). Data used as

sample is daily data considering 5 (five) working days. The variables in this study can be seen in Table 3 below.

Table 1. Research Variables

Variable	Symbol	Variable Form	Source
Sharia Stock Index Indonesia	ISSI_SEF	Volatility	Yahoo Finance
Composite Stock Price Index	IHSG_SEF	Volatility	Yahoo Finance
Gross domestic product	LN_PDB	Logarithm Natural	BI
Inflation	Inflation	Percent	BI
Rupiah-dollar exchange rate	LN_KURS	Logarithm Natural	BI
Interest rate	IR	Percent	BI
World Oil Price (WOP)	LN_OP	Logarithm Natural	fred.stlouisfed
Shanghai Stock Exchange	LN_SSE	Logarithm Natural	Yahoo Finance
New York Stock Exchange	LN_NYSE	Logarithm Natural	YahooFinance

Data were analyzed using the Eviews 10 program with quantitative analysis methods. The method used in this research are Threshold GARCH and VECM. GARCH threshold used to estimate the volatility of the Indonesian Sharia Stock Index (ISSI) and the Composite Stock Price Index (IHSG), as well as the results of the analysis The GARCH threshold is used to analyze the impact of news bad or a period of turmoil regarding the volatility of ISSI and IHSG during the range of 2020 to 2021. Meanwhile, the VECM method (Vector Error Correction Model) is used to determine the effect macroeconomic variables affected by times of turmoil (GDP, inflation, rupiah-dollar exchange rate, interest rates, world oil prices, SSE and NYSE) to the volatility of ISSI and IHSG.

GARCH Threshold Model (TGARCH)

The TGARCH model estimation procedure consists of several steps, namely, (1) test the stationarity of the data. Select parameter values p,d,q on ARIMA model of autocorrelation function (ACF) and partial autocorrelation function (PACF); (2) heteroscedasticity test use the ARCH LM test to select the ARIMA (p,d,q) model the best. If there is a strong ARCH effect on the residuals, PACF on the Ljung-Box test will give you the option to choose best model, ARCH or GARCH model; (3) If PACF chooses the GARCH model, then the TGARCH (r,s) model can be used to analyze the volatility of the model. Parameter values r and s on TGARCH models can be selected based on the best ACF and PACF on ARIMA model (p,d,q) (4) The best TGARCH (r,s) model is tested with distribution assumptions such as normal (Gaussian), student's-t, generalized error (GED), student's-t with fixed .df and GED with fixed parameters (Yaziz, 2016).

VECM (Vector Error Correction Model)

VECM estimation procedure by performing stationarity test, optimum lag test, VAR stability test, and cointegration test. Then analyzed using the Granger Causality Test and Forecast Error Variance Decomposition (FEVD). 18 In this study There are two research model formulas, namely Research Model Formula 1 to analyze the relationship of macroeconomic variables to ISSI volatility and Research Model Formula 2 to analyze the relationship of macroeconomic variables to the volatility of the IHSG.

Research Model Formula 1

$$\begin{bmatrix} \Delta ISSI_{SEF\,t} \\ \Delta LN_{PDB\,t} \\ \Delta INFLASI_t \\ \Delta LN_{KURS\,t} \\ \Delta SB_t \\ \Delta LN_{OP\,t} \\ \Delta LN_{SSE\,t} \\ \Delta LN_{NYSE\,t} \end{bmatrix} = \begin{bmatrix} a_{01} \\ a_{02} \\ a_{03} \\ a_{04} \\ a_{05} \\ a_{06} \\ a_{07} \\ a_{08} \end{bmatrix} + \begin{bmatrix} a_{11} & \cdots & a_{17} \\ \vdots & \ddots & \vdots \\ a_{71} & \cdots & a_{77} \end{bmatrix} \begin{bmatrix} \Delta ISSI_{SEF\,t-1} \\ \Delta LN_{PDB\,t-1} \\ \Delta INFLASI_{t-1} \\ \Delta LN_{KURS\,t-1} \\ \Delta SB_{t-1} \\ \Delta LN_{OP\,t-1} \\ \Delta LN_{SSE\,t-1} \\ \Delta LN_{NYSE\,t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \\ e_{6t} \\ e_{7t} \\ e_{8t} \end{bmatrix}$$

Research Model Formula 2

$$\begin{bmatrix} \Delta IHSG\_SEF_t \\ \Delta LN_{PDB\,t} \\ \Delta INFLASI_t \\ \Delta LN_{KURS\,t} \\ \Delta SB_t \\ \Delta LN_{OP\,t} \\ \Delta LN_{SSE\,t} \\ \Delta LN_{NYSE\,t} \end{bmatrix} = \begin{bmatrix} \beta_{01} \\ \beta_{02} \\ \beta_{03} \\ \beta_{04} \\ \beta_{05} \\ \beta_{06} \\ \beta_{07} \\ \beta_{08} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \cdots & \beta_{17} \\ \vdots & \ddots & \vdots \\ \beta_{71} & \cdots & \beta_{77} \end{bmatrix} \begin{bmatrix} \Delta IHSG\_SEF_{t-1} \\ \Delta LN_{PDB\,t-1} \\ \Delta INFLASI_{t-1} \\ \Delta LN_{KURS\,t-1} \\ \Delta SB_{t-1} \\ \Delta LN_{OP\,t-1} \\ \Delta LN_{SSE\,t-1} \\ \Delta LN_{NYSE\,t-1} \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \\ \mu_{5t} \\ \mu_{6t} \\ \mu_{7t} \\ \mu_{8t} \end{bmatrix}$$

Information:

a_0	= Intercept coefficient model 1
β_0	= Intercept coefficient model 2
$a_{1,2,3,4,5,6,7,8}$	= Model variable coefficient 1
$\beta_{1,2,3,4,5,6,7,8}$	= Model variable coefficient 2
e_t	= *Error term* model 1
μ_t	= *Error term* model 2

RESULTS AND DISCUSSION

Before doing analysis using Threshold Generalized Auto Regressive Conditional Heteroskedasticity (TGARCH), it is necessary to test for stationarity and heteroscedasticity. Stationarity test is important, especially on time series data that contains unit roots so that it can lead to estimation results be pseudo and invalid. Meanwhile, the heteroscedasticity test carried out to test the data meet the assumption of homoscedasticity in determining the ARCH/GARCH model (Firdaus, 2018).

Stationarity Test Results The first test is to find out the stationarity of the data time series. Stationary data is data with mean and variance constant throughout the observation time. Meanwhile, in some data macroeconomics contains trends that cause data not stationary. Stationarity test is carried out by

looking at the unit root value using the Augmented Dickey Fuller (ADF) test. To determine the data is said to be stationary, it can be seen from the ADF-statistical value and the value of critical. The critical value used in this study is five percent. So, if the ADF-statistic value is greater than the critical value at the 5% level it can be concluded that the data contains unit roots or not stationary. The non-stationary data at the level level is then tested back to the level of first difference and second difference until the data be stationary. The results of this test can be seen in Table 2, as follows:

Table 2. ISSI and IHSG stationarity test results

Variable	Level		*First Difference*	
	ADF-statistics	**MacKinnon's Critical Value**	**ADF-statistics**	**MacKinnon's Critical Value**
ISSI	-1.116914	-2.867292	-10.98264	-2.867329
IHSG	-1.165761	-2.867292	-11.07636	-2.867329

Based on the results of the stationarity test (unit root test), it is known that the ADF-statistical values of ISSI and IHSG at levels are greater than the critical value of MacKinnon. Thus, the ISSI and IHSG variables are not stationary at the level level, but are stationary at the first difference.

Heteroscedasticity Test Results

In the ARCH-GARCH modeling, identification whether the data contains heteroscedasticity or not. Test heteroscedasticity is a test to see whether the variance of constant residue. The null hypothesis is the variance of the constant remainder and The alternative hypothesis is the residual variance containing heteroscedasticity. To determine the data contains heteroscedasticity can be seen from the probability value of the residual test. If the probability is more than the 5% significance level, then the hypothesis is not rejected null or there is no symptom of heteroscedasticity in the data (Firdaus, 2018).

Table 3
ISSI and IHSG . heteroscedasticity test results

Variable	Prob. F(1,481)	Information
ISSI	0,0000	Heteroscedastic
IHSG	0,0000	Heteroscedastc

Based on the results of the heteroscedasticity test above, it can be seen that that the probability value of 0.0000 is less than the critical value (5%). Could concluded that reject the null hypothesis or ISSI and IHSG variance the remainder contains heteroscedasticity. Data containing heteroscedasticity can be done using ARCH- GARCH.

TGARCH Analysis Results

Based on the stationarity test of the ISSI variable and the stationary IHSG at the first difference level. ACF and PACF values suggest values of the best

ARIMA parameter for the ISSI and IHSG variables is ARIMA (1,1,1). Heteroscedasticity test using ARCH.

LM shows that there is a strong ARCH effect on the residuals, where on the ISSI and IHSG variables have a probability of 0.0000. It means, ISSI and IHSG variables contain high heteroscedasticity. Thus, the best model that can be used is GARCH. If PACF chooses the GARCH model, then the TGARCH (r,s) model can be used to analyze the volatility of variables both ISSI as well as the IHSG (Okonkwo & Jude, 2019).

In analyzing the impact of bad news or bad news (in this study identified as a period of turmoil) on stock prices, TGARCH can be used. Because TGARCH has an asymmetric coefficient that can show how big the impact of bad news on the volatility of the model. If the asymmetric coefficient (γ) ter than 0 then there is an asymmetric effect on the model, and if equals zero 0 then vice versa. The effect of bad news on stock prices can be seen from the coefficient value a_r id γ_r.

If $a_r + \gamma_r > a_r$ it can be concluded that bad news has a greater impact than good news. Meanwhile, the difference between good news and bad news can be seen from the coefficient vγ_r.

ISSI's volatility analysis of times of Turmoil

After analyzing using the TGARCH model, found the best model using the most TGARCH simple, TGARCH (1,0), assuming the distributio$\varepsilon_t|\mu_0, a_r$ used is normal (Gaussian). In Table 4 it can be seen that the value of probability aγ_r is 0.0000; 0.0014 and 0.0001 are less than the five percent significance level. So, it can be said that the results of ARCH and GARCH is considered valid and significant.

Table 4. The Results of TGARCH Analysis (1,0) Variable ISSI_SEF

Variance Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
μ_0	2.022149	0.156275	12.93965	0.0000
a_r	0.240585	0.075480	3.187395	0.0014
γ_r	0.615733	0.162271	3.794463	0.0001

Furthermore, the heteroscedasticity test was carried out with the model TGARCH (1,0). Heteroscedastic test results using ARCH LM Test in the table shows that the probability value is 0.2495. It means ISSI or ISSI_SEF volatility no longer contains heteroscedasticity or homoscedastic.

Table 5. Hasil uji heteroskedastisitas ISSI_SEF

Variabel	**Prob. F(1,481)**	**Keterangan**
ISSI_SEF	0.2495	Homoskedastis

The asymmetric term coefficient (γ_r) is positive (0.615733) and significant at the 5% level of significance. This shows the variable ISSI_SEF has an asymmetric effect when it comes to news. Or can it is said that, ISSI_SEF volatility

when there is more bad news is 0.615733 compared to when there is good news. Whereas, the effect of bad news on ISSI_S γ_r is 0.856318 (+).

$$\hat{h}_t = 2.022149 + (0.240585 + 0.615733)u_{t-1}^2$$

IHSG Volatility Analysis Against Times of Turmoil

In the IHSG variable, the best model was found, namely using TGARCH (1,1) with the assumption that the distribution ε_t used is generalized error (GED). In the table it can be seen that the probability valu μ_0, a_r γ_r , a_r and β_m is 0.0000; 0.0057 and 0.0002 less than the five percent level of significance. So, it can be said ARCH and GARCH results on the IHSG are also considered valid and significant.

Table 6. The Results of the TGARCH Analysis (1,0) Variable IHSG_SEF

Variance Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
μ_0	2368.755	160.7055	14.73973	0.0000
a_r	0.213482	0.077277	2.762543	0.0057
γ_r	0.688636	0.186025	3.701839	0.0002

The IHSG volatility was tested for heteroscedasticity with the TGARCH(1.1) model. Heteroscedastic test results using ARCH The LM Test in the table shows that the probability value is 0.3956. This means that IHSG volatility or IHSG_SEF no longer contains heteroscedastic or homoscedastic.

Table 7. IHSG_SEF heteroscedasticity test results

Variable	**Prob. F(1,481)**	**Information**
ISSI_SEF	0,3956	Homoscedastic

The asymmetric term coefficient (γ_r) is positive (0.688636) and significant at the 5% level of significance. This shows that the IHSG_SEF variable has an asymmetric effect when news appears. It can be said that when there is bad news, the volatility of the JCI_SEF variable is 0.688636 higher than when there is good news.

Meanwhile, the effect of bad news on JCI_SEF is 0.90218 $(a_r + \gamma_r)$.

$$\hat{h}_t = 2368.755 + (0.213482 + 0.688636)u_{t-1}^2$$

Pre Estimation Test Results of the Effect of Macroeconomic Variables on ISSI and IHSG Volatility (Research Models 1 and 2)

Before processing the data using the Vector . method Error Correction Model (VECM), it is necessary to do a pre estimation test on the variables used (Claessens & Kose, 2013). Pre estimate test on VECM is the same as Vector Autoregression (VAR). This is because VECM is an restricted VAR. VECM is used for variable is not stationary at the level but has the chance to be cointegrated, so that in VECM an additional test is needed, namely the cointegration test or Johannsen Cointegration Test. To see the stationarity of the variable and the probability of the cointegrated variable is done by pre-estimation test. The steps in the pre-estimation test on the VECM are the test stationarity, optimum lag test, VAR stability test and cointegration test (Baffes, 2015).

Stationarity Test Results

Based on the results of the unit root test in Table 8, it is known that only the variables ISSI_SEF, IHSG_SEF and INFLATION have values ADF-statistics is less than the MacKinnon critical value. Could concluded that ISSI_SEF, IHSG_SEF and INFLATION are stationary at level level. Variables ISSI_SEF, IHSG_SEF, INFLATION, LN_EXCHANGE, SB, LN_OP, LN_SSE, LN_NYSE are stationary at the first difference level. Meanwhile, all variables are stationary at the second . level differences.

Table 8. Stationarity Test Results on Research Models 1 and 2

Variable	Level		*First Difference*		*Second Difference*	
	ADF-statistics	Critical Value	ADF-statistics	Critical Value	ADF-statistics	Critical Value
ISSI_SEF	**-4.739**	-2.867	**-14.65**	-2.867	**-14.970**	-2.867
IHSG_SEF	**-3.628**	-2.867	**-15.56**	-2.867	**-15.393**	-2.867
LN_PDB	-2.598	-2.867	-2.198	-2.867	**-25.639**	-2.867
INFLATION	**-3.796**	-2.867	**-2.948**	-2.867	**-13.052**	-2.867
LN_KURS	-0.919	-2.867	**-27.745**	-2.867	**-12.939**	-2.867
SB	-0.542	-2.867	**-3.166**	-2.867	**-9.722**	-2.867
LN_OP	-2.283	-2.867	**-15.257**	-2.867	**-16.103**	-2.867
LN_SSE	-2.458	-2.867	**-21.004**	-2.867	**-12.989**	-2.867
LN_NYSE	-2.656	-2.867	**-5.795**	-2.867	**-14.869**	-2.867

Optimum Lag Test Results

Lag testing on the VAR model is carried out to show how long the reaction of one variable to another variable. Test Optimum lag is also useful for eliminating autocorrelation on VAR models. Determination of the optimum lag used is the smallest value from the Likelihood Ratio (LR) criteria, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Hannan-Quinn Criterion (HQ). Optimum lag is determined based on the smallest value of the most criteria.

Table 9. The results of the lag test of the optimum research model 1 and 2

	Lag	LogL	LR	FPE	AIC	SC	HQ
MP 2	0	2871.214	NA	6.36e-16	-12.28847	-12.21733	-12.26047
	1	10605.88	15170.56	3.21e-30	-45.20977	-44.56947	-44.95777
	2	10886.40	540.5792	1.27e-30	-46.13906	-44.92959*	-45.66305
	3	11060.63	329.7640	7.89e-31	-46.61214	-44.83352	-45.91214
	4	11138.36	144.4592	7.45e-31	-46.67109	-44.32331	-45.74708
	5	11224.40	156.9397	6.79e-31	-46.76568	-43.84874	-45.61767
	6	11573.85	625.4099	2.00e-31	-47.99079	-44.50469	-46.61878*
	7	11663.44	157.2563	1.80e-31	-48.10060	-44.04534	-46.50458
	8	11742.67	136.3644*	1.69e-31*	-48.16598*	-43.54157	-46.34597
	0	1214.750	NA	7.78e-13	-5.179186	-5.108042	-5.151186

MP 3	1	8955.353	15182.21	3.82e-27	-38.12598	-37.48567	-37.87397
	2	9231.134	531.4417	1.54e-27	-39.03491	-37.82545*	-38.55891
	3	9408.464	335.6326	9.48e-28	-39.52130	-37.74268	-38.82130
	4	9485.364	142.9084	8.98e-28	-39.57667	-37.22889	-38.65266
	5	9576.273	165.8223	8.01e-28	-39.69216	-36.77522	-38.54415
	6	9926.938	627.5836	2.35e-28	-40.92248	-37.43638	-39.55047*
	7	10013.20	151.4186	2.14e-28	-41.01802	-36.96276	-39.42200
	8	10090.80	133.5538*	2.03e-28*	-41.07639*	-36.45198	-39.25638

Note: The asterisk (*) indicates the optimum lag

From Table 9, it can be seen that in the research model 1 the smallest value of all the most criteria is at lag 8 (eight). In the research model 2 the smallest value of all criteria the most is also in lag 8. So, the optimum lag used in the research model 1 and 2 is lag 8.

VAR Stability Test Results

The next test step is the VAR stability test or VAR stability condition check. This test is carried out to see the validity results in Impulse Response Function (IRF) and Forecast. analysis Error Decomposition Variance (FEVD). To determine whether the VAR model is considered valid or not, it can be calculated from the roots of the function polynomial or roots of characteristic polynomial. If all the roots of polynomial function is inside the unit circle or its absolute value less than 1, then the VAR model is considered valid (Mohammad et al., 2019).

Based on the results of the VAR stability test with a lag of eight above, it can be seen that in the research model 1 the roots of the function polynomials in the range 0.139978 to 0.997263. On model research 2, the roots of polynomial functions are in the range 0.108876 up to 0.997650. In other words, research models 1 and 2 all the root of the polynomial function is inside the unit circle or the value of absolute value is less than 1. So it can be concluded that the results Impulse Response Function (IRF) and Forecast Error analysis Decomposition Variance (FEVD) is considered valid or VAR model on Research models 1 and 2 have been considered valid.

Cointegration Test Results

The last test carried out is the cointegration test or Johannsen Cointegration Test. Cointegration test aims to determine whether variables that are not stationary at the level have a balance relationship long run between variables. To define the VECM model have a cointegration or not seen from the value of trace statistics and critical values . The null hypothesis is that there is no cointegration relationship and the alternative hypothesis is to have a cointegration relationship (Spiegel et al., 2020). If the trace statistic is greater than the critical value with a significant level five percent, then reject the null hypothesis or it can be said to be a model VECM has a cointegration relationship (Siregar, 2019).

Table 10. Cointegration test results of research models 1 and 2

	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
MP 2	None *	0.170177	234.1811	143.6691	0.0000
	At most 1 *	0.095159	147.6253	111.7805	0.0000
	At most 2 *	0.084525	101.2270	83.93712	0.0016
	At most 3 *	0.047487	60.25015	60.06141	0.0482
	At most 4	0.037788	37.67594	40.17493	0.0873
	At most 5	0.029380	19.80259	24.27596	0.1655
	At most 6	0.009173	5.965797	12.32090	0.4402
	At most 7	0.003635	1.689880	4.129906	0.2275
MP 3	None *	0.158544	226.8382	143.6691	0.0000
	At most 1 *	0.095439	146.7420	111.7805	0.0001
	At most 2 *	0.082907	100.2000	83.93712	0.0021
	At most 3	0.046620	60.04270	60.06141	0.0502
	At most 4	0.037284	37.89063	40.17493	0.0834
	At most 5	0.030677	20.25995	24.27596	0.1478
	At most 6	0.008723	5.802895	12.32090	0.4605
	At most 7	0.003738	1.737771	4.129906	0.2203

Note: The asterisk (*) indicates the cointegrated hypothesis

Table 10 shows that the cointegration test with lag eight in research model 1 have a greater trace statistic value from the critical value of the five percent level of significance, namely the null hypothesis, at most 1, at most 2 and at most 3. This means that there is a maximum three cointegration equations that can explain the whole model 1. In research model 2 the results of the cointegration test with lag eight has a trace statistic value greater than the critical value level five percent, namely on the null hypothesis, at most 1 and at most 2. Shows that there are a maximum of two cointegration equations that can be able to explain the whole model 2. So, it can be concluded that research models 1 and 2 can be estimated using VECM.

Effect of Macroeconomic Variables on ISSI Volatility and IHSG

Analysis of the effect of macroeconomic variables on ISSI volatility based on Granger Causality Test Granger Cusality Test or Granger causality test is used to determine the causal relationship between variables in the model. In addition, this test can see whether the independent variable (independent) variable) can improve the performance of the dependent variable (dependent variable) significantly (Central Bank of Chile, 2019). Causality relationship can be known by probability value. The null hypothesis is that there is no relationship causality, while the alternative hypothesis is that there is a relationship causality. If the probability is less than the five percent significance level (5%) then it can be concluded to reject the null hypothesis or there is causality.

Table 11. Granger causality test results research model 1

Dependent variable: D(ISSI_SEF)			
Excluded	**Chi-sq**	**Df**	**Prob.**
D(LN_PDB)	6.295520	8	0.6142
D(INFLASI)	13.59370	8	0.0930
D(LN_KURS)	25.81996	8	0.0011
D(SB)	5.707892	8	0.6799
D(LN_OP)	38.43462	8	0.0000
D(LN_SSE)	5.399904	8	0.7141
D(LN_NYSE)	80.24932	8	0.0000

The causality test of research model 1 shows that dependent variable (the dependent variable) is ISSI_SEF, while independent variables (independent variables) are LN_GDP, INFLATION, LN_EXCHANGE, SB, LN_OP, LN_SSE, LN_NYSE. Based on the results of the Granger causality test with a significance level of five percent, it can be seen that that:

1. Variable Gross Domestic Product (GDP) has no effect significant to the volatility of the Indonesian Sharia Stock Index with a probability value of 0.6142;
2. Inflation variable has no significant effect on volatility Indonesian Sharia Stock Index with probability value 0.0930;
3. The rupiah exchange rate against the dollar has a significant effect on the volatility of the Indonesian Sharia Stock Index with probability value 0.0011;
4. The interest rate variable has no significant effect on the volatility of the Indonesian Sharia Stock Index with a value of probability 0.6799;
5. The world oil price variable has a significant effect on the volatility of the Indonesian Sharia Stock Index with a value of probability 0.0000;
6. The Shanghai Stock Exchange variable has no significant effect on the volatility of the Indonesian Sharia Stock Index with probability value 0.7141;
7. The New York Stock Exchange variable has a significant effect on the volatility of the Indonesian Sharia Stock Index with probability value 0.0000.

Table 12 Granger Causality Test Results Research Model 2

Dependent variable: D(IHSG_SEF)			
Excluded	**Chi-sq**	**Df**	**Prob.**
D(LN_PDB)	4.414305	8	0.8179
D(INFLASI)	8.556089	8	0.3811
D(LN_KURS)	21.41711	8	0.0061
D(SB)	12.14170	8	0.1450
D(LN_OP)	21.86378	8	0.0052
D(LN_SSE)	5.280373	8	0.7272
D(LN_NYSE	55.74908	8	0.0000

Analysis of the effect of macroeconomic variables on ISSI volatility based on Forecasting Error Variance Decomposition (FEVD)

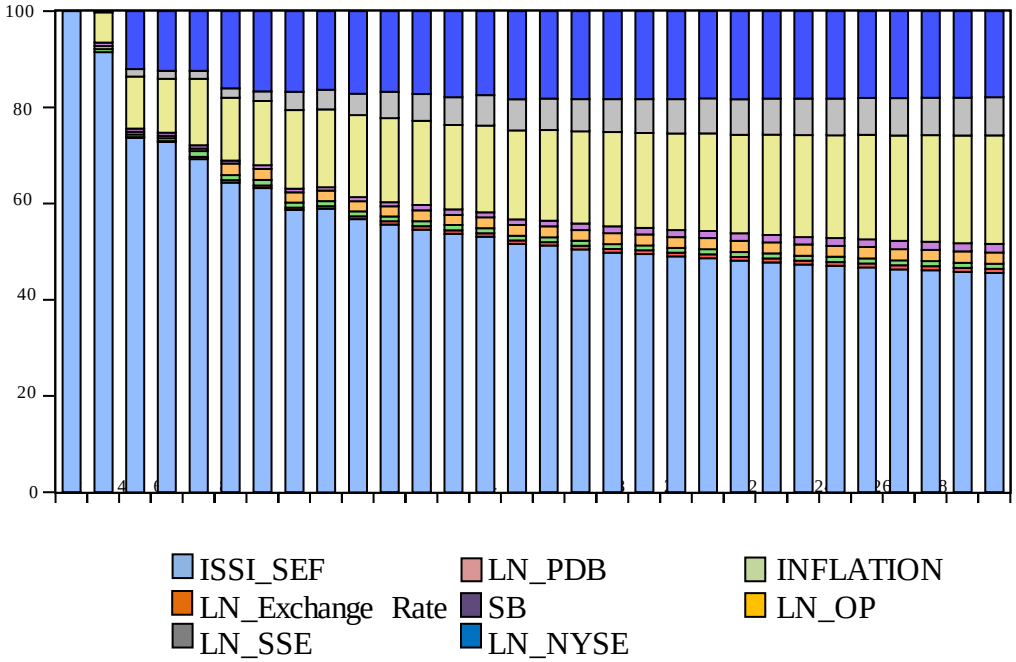
The FEVD method is used to see how changes in the variables indicated by changes in error variance are affected by other variables in the model. Thus, in this model it can be seen that the strengths and weaknesses of each variable affect other variables within a certain period of time. To analyze the results of the FEVD, it is done by calculating the percentage of the square of the prediction with a future k-timeframe, so it can be seen how big the difference in error variance before and after the shock occurs from the variable itself and other variables in the model (Darmawan, 2020).

The results of variance decomposition in picture 2, show that in the first period shocks on macroeconomic variables in research model 1 (Gross Domestic Product, inflation, rupiah exchange rate against the dollar, interest rates, world oil prices, Shanghai Stock Exchange and New York Stock Exchange) had absolutely no effect on ISSI volatility. In other words, ISSI volatility affected 100 percent by the shocks themselves. Shock on Gross Domestic Product (GDP), inflation, rupiah exchange rate against the dollar, interest rates interest rates and the Shanghai Stock Exchange have a low effect on ISSI volatility. The highest shock of the variable is sequentially, namely 0.83 percent in the thirtieth period; 1.2 percent on fifth period; 2.37 percent in the 6th period; 1.73 percent on the thirtieth period; and 7.92 percent in the thirtieth period.

Meanwhile, shocks to world oil prices and New York Stock Exchange has a big influence on ISSI volatility. Influence shocks in ISSI world oil prices from the first period to the thirtieth period continues to increase. In the second period influence on the volatility of ISSI by 6.26 percent, until the period the thirtieth reached 22.60 percent. New York Stock Influence The exchange also experienced an increase in ISSI volatility on every month the period. The second period of the impact of the New York Stock shock Exchange on ISSI volatility is lower than world oil prices that is 0.27 percent. However, in the thirtieth period of influence New York Stock Exchange shocks increased significantly to be 17.91 percent (Nofiatin, 2013).

Broadly speaking, in the first period the volatility performance ISSI is not influenced by other variables. However, in the time period the length of the shock on other variables will affect the volatility ISSI. The effect of the ISSI volatility shock caused by other variables in the lowest model, namely in the thirtieth period by 54.43 percent. Meanwhile, the effect of the variable shock is itself by 45.57 percent.

Variance Decomposition of ISSI_SEF using Cholesky (d.f. adjusted) Factors



Picture 2. FEVD Results of Research Model 1

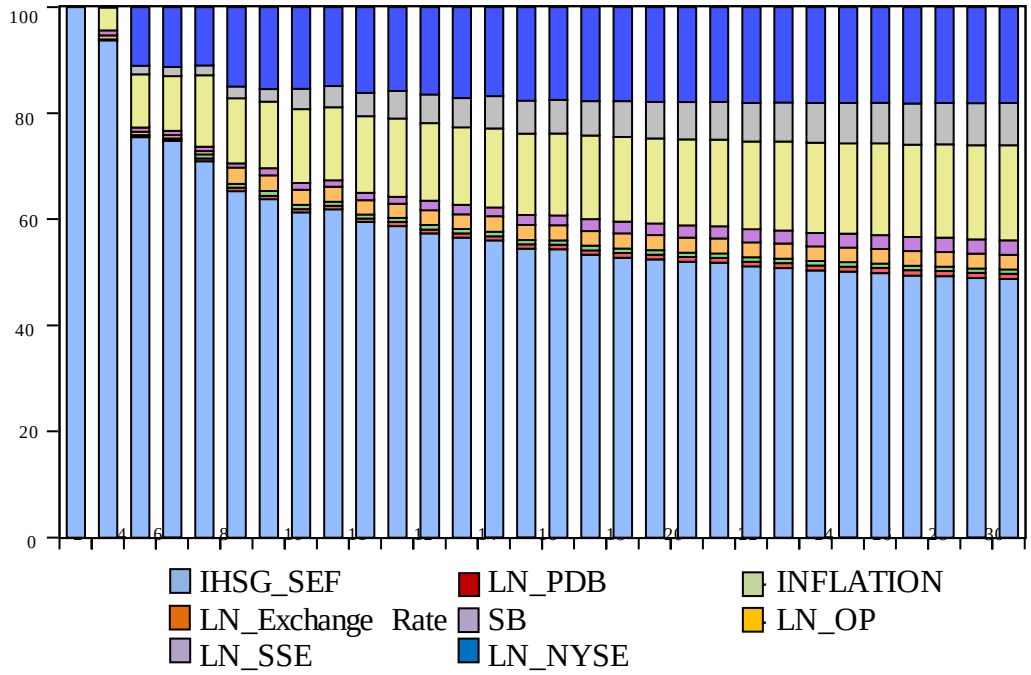
Analysis of the effect of macroeconomic variables on IHSG volatility based on Forecasting Error Variance Decomposition (FEVD.)

In research model 2, the results of variance decomposition can be seen in Picture 3. These results show that in the period First, IHSG volatility is influenced by IHSG volatility shocks itself is 100 percent. Less variable shock affect the volatility of the IHSG, namely Gross Domestic Product, inflation, rupiah exchange rate against the dollar, interest rates and the Shanghai Stock Exchange. The highest effect of these variable shocks on volatility IHSG sequentially, namely 0.99 percent in the thirtieth period; 0.89 percent in the seventh period; 3.07 percent in the sixth period; 2.73 percent in the thirtieth period; and 7.99 percent in the period thirtieth.

Meanwhile, a strong variable shock affects IHSG volatility is world oil prices and New York Stock Exchange. The effect of world oil prices on IHSG volatility started in the second period of 4.35 percent and the highest effect in the thirtieth period, namely 17.89 percent. On variable New York Stock Exchange, the effects of shocks start from the period second with a low value of 0.01 percent, then at the third period increased significantly to reach 11.08 percent. While the highest influence is in the thirtieth period by 18.10 percent (Haryanto, 2020).

IHSG volatility in the first period was not affected by other variables in this research model 2. But in the long term the length of the variable shock in the model affects the volatility IHSG. The highest influence is in the thirtieth period where IHSG volatility is influenced by 51.30 percent by other variables in models. Meanwhile, the effect of the shock variable itself by 48.70 percent.

Variance Decomposition of IHSG_SEF using Cholesky (d.f. adjusted) Factors



Picture 3. FEVD Results of Research Model 2

CONCLUSION

Based on the problems, objectives and discussions carried out in this study. The researcher concludes that the existence of a period of turmoil will have a greater effect on the volatility of the Composite Stock Price Index compared to the volatility of the Indonesian Sharia Stock Index. Where the influence of the period of turmoil on the volatility of the Indonesian Sharia Stock Index is 0.856318. Meanwhile, the effect on the Composite Stock Price Index is 0.90218.

The volatility of the Indonesian Sharia Stock Index and the Composite Stock Price Index in 2020 to 2021 has a causal relationship with the rupiah exchange rate against the dollar, world oil prices and the New York Stock Exchange. The results of variance decomposition show that the biggest influence of volatility on the Indonesian Sharia Stock Index and the Composite Stock Price Index on the New York Stock Exchange, respectively, is 17.91 percent and 18.10 percent; to world oil prices, respectively, namely 22.60 percent and 17.89 percent; against the Shanghai Stock Exchange respectively 7.92 percent and 7.99 percent; and against the rupiah exchange rate against the dollar, respectively, namely 2.37 percent and 3.07 percent. Meanwhile, the effect of volatility in the Indonesian Sharia Stock Index and the Composite Stock Price Index on other variables in the model such as Gross Domestic Product, inflation and interest rates is very small or less than 3 percent.

From the results of the research that has been carried out, the long-term impact of the turmoil has more impact on the volatility of the Indonesian Sharia

Stock Index, which is 54.43 percent compared towith the volatility of the Composite Stock Price Index which has an impact of 51.30 percent.

The volatility of the Indonesian Sharia Stock Index and the Sharia Stock Price Index in 2020 to 2021 was greatly influenced by a period of turmoil, namely the trade war between the United States and China, the decline in world oil prices and the Covid-19 pandemic. Meanwhile, the political conflict over the rejection of the Job Creation Bill did not significantly affect the volatility of the Indonesian Sharia Stock Index and the Composite Stock Price Index in 2020 to 2021.

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