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Islamic and Conventional Stocks' Volatility : Evidence from Three Waves of Covid-19 Pandemic

Abstract

This study aims to compare the performance of Islamic and conventional stocks' performance amid a crisis. The performance is measured by analyzing the volatility of the Indonesian Sharia Stock Index (ISSI) and the Composite Stock Price Index (IHSG) IHSG during the Covid-19 pandemic. Based on the results of the different tests using the paired t-test and Wilcoxon rank test methods, it was concluded that the ISSI and IHSG experienced significant changes before and after discovering the first case of Covid-19 in Indonesia. Significant changes in both values are also found when the Delta variance spreads. Meanwhile, when the wave 3 occurred due to the presence of the Omicron variant, ISSI and IHSG were able to move more stable and did not experience significant shocks. Then, the estimation results of the GARCH model conclude that both Islamic stocks and conventional stocks have an immense volatility power with an identical value of 0.94 or close to 1. The volatility is also significantly influenced by the previous volatility and the squared error representing other previous events outside the model. The volatility that occurs in Islamic and conventional stocks is not much different, even though both stocks have different characters in the ratio of debt and income. Fundamental factors also cause this high volatility in the form of shocks in several macroeconomic variables, including the rupiah exchange rate, gold prices, and world oil prices. In addition, the contagion effect that occurred during the Covid-19 crisis also contributed to the spread of systemic risk in global stock indexes on stock volatility in Indonesia.

Keywords: Islamic Stocks, Conventional Stocks, Volatility, Covid-19 pandemic, GARCH model

JEL Classification: E22, E44, G11, G17

Type of paper: Research Paper

I. Introduction

1.1. Background

The growth of stock investors has experienced a rapidly increasing trend over the last five years. As of September 2021, the number of stock investors has reached 2.8 million SID (Single Investor Identification) number. This amount covers 45.26% of the total capital market investors with a SID registered in The Indonesian Central Securities Depository (KSEI). Compared to the previous year, the number of stock investors throughout 2021 has grown by 72.69%. This number is greater than the total growth of investors in the capital market, which reached 61.86% (Puspitasari, 2021).

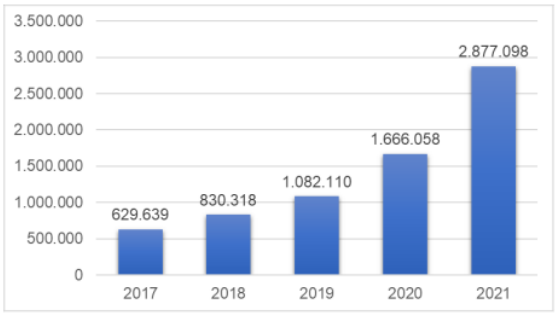

Figure 1. 1. Number of Stock Investors on the Indonesia Stock Exchange
Source: Financial Services Authority (OJK)

Interestingly, the trend of stock investment in Indonesia experienced rapid growth during the Covid-19 pandemic. The number of stock investors more than doubled during the pandemic compared to the previous 1.08 million SID in 2019. Millennials are the most dominating age group, with 59.23% of the total investors in the capital market (Sidik, 2021). Based on a survey conducted by the Katadata Insight Center of 806 stock investors, 41.3% of millennials stated that they had just started investing in stock in the last two years, particularly when the Covid-19 pandemic case was first identified in Indonesia (Siringoringo, 2021).

However, it is undeniable that the presence of Covid-19 has also affected the Indonesian economy since it first appeared in March 2020. Not to mention the capital market, the pandemic crisis caused the Composite Stock Price Index (IHSG) to reach its lowest point of decline in the last decade. The incident occurred on March 24, 2020, when the IHSG value fell 37% from the beginning of the year to a level of 3,937. A drastic reduction followed this decline in stock market capitalization reaching IDR 1,907 trillion (Tamara, 2020). The impact of the Covid-19 pandemic has also caused Indonesia to fall into a recession in the third quarter of 2020 due to negative economic growth for two consecutive quarters. The second quarter recorded economic growth of -5.32%, which was the lowest growth rate since 1998. Meanwhile, the third-quarter economic

growth reached -3.49% (Fauzia, 2020). The negative economic growth extended until the first quarter of 2021, at the level of -0.74%.

The crisis required the Indonesian government to adjust the various macroeconomic policies to maintain domestic economic stability. One of the implemented policies is to change the benchmark interest rate set by the central bank. Bank Indonesia has made six changes to the benchmark interest rate or BI 7 Day Reverse Repo Rate during the last two years, from the initial 5.0% in early 2020 to 3.5% in February 2021. This level is the lowest in the history of applying the benchmark interest rate in monetary policy (Elena, 2021).

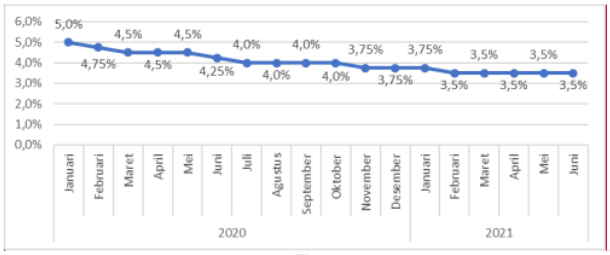

Figure 1. 2. The Trend of BI 7 Day Reverse Repo Rate
Source: Bank Indonesia

Changes in these macroeconomic variables certainly affect the development of the capital market, since one of the macroeconomic variables that affect investment is interest rates (Mankiw, 2009). Therefore, changes in the benchmark interest rate set by the central bank will determine the public interest in investing, including in the capital market.

1.2. Research Gap

Several previous studies have analyzed the comparison of Islamic and conventional stocks' performance amid a crisis. Siregar (2020) compared the performance of LQ45 with JII (Jakarta Islamic Index) at the beginning of the spread of Covid-19 cases and explained that LQ45 experienced a 1.22% decline in stock prices on average, while JII on average experienced an increase of 0.14%. Globally, Al-Khazali et al. (2014) found that the Dow Jones Sharia index performed better than the conventional index during the global economic crisis. This study aims to fill the gap in previous research by using inferential statistical analysis to compare the performance of the ISSI (Indonesian Sharia Stock Index) and the IHSG during the pandemic Covid-19. It is based on the recommendation of Nurdany et al. (2021), which only examines ISSI's volatility during the Covid-19 pandemic with GARCH analysis.

1.3. Objective

Following the problems that have been described, this study aims to compare the ISSI values before and after the spread of the Covid-19 virus, compare the IHSG values before and after the spread of the Covid-19 virus, and measure the volatility of ISSI and IHSG during the Covid-19

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pandemic. The results of this research will be helpful for various interested parties in the capital market industry in Indonesia. For capital market regulators, this research can become a reference for evaluating policies implemented to develop the stock market. The results of this study can also be considered to determine the proper steps in managing company finances during an economic crisis for stock issuing companies. As for investors, the research results can be useful to maintain the stability of the value of their assets in times of crisis by making the right decisions when choosing investment products in the stock market.

II. Literature Review

2.1. Background Theory

2.1.1. Covid-19

The first case of Covid-19 entered Indonesia on March 2, 2020. This virus caused various domino effects that can be seen in changes in people's lifestyles, including turmoil in the financial sector. For more than two years since it first appeared, this virus has undergone several mutations that produce new variants with no less terrible effects. The worst thing was the appearance of the Delta variant on May 3, 2021, followed by the Omicron variant on December 16, 2021 (Sabiila, 2022).

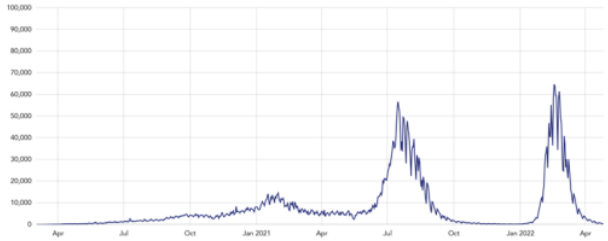

Figure 2. 1. Progress of Covid-19 Positive Cases Per Day
Source: covid19.go.id

The data above explains that the peak of Covid-19 cases in Indonesia occurred in July 2021 and February 2022. The spike in July 2021 was caused by the massive spread of the Delta variant, which peaked on July 15, 2021, with 56,757 confirmed cases in one day. Meanwhile, the spike in February 2022 was due to the massive spread of the Omicron variant, which peaked on February 16, 2022, with a total daily number of 64,718 cases. In addition to the first case of Covid-19, which caused turmoil in the Indonesian economy, these two variants certainly had their impact because they succeeded in creating a peak in Covid-19 cases.

2.1.2. Volatility

Volatility is a statistical measure used to measure the movement and distribution of a security product or market index prices at a specific time. The greater the volatility of the value of an asset, the greater the risk of investing in it (Nugroho & Robiyanto, 2021; Hayes, 2021). Price fluctuations that occur in a short period have high volatility, whereas if the price movement is slow, then the volatility is low (Mamtha & Srinivasan, 2015). In other words, volatility can be an indicator to assess financial market stability. Volatility, in general, can be measured by calculating the variance or standard deviation of the data set of price movements of an asset.

According to Thampanya et al. (2020), stock price volatility is broadly influenced by two determinants, namely fundamental factors and behavioral factors. Fundamental factors are derived from conventional financial theory assuming that investors follow fundamental financial theories and design investment strategies based on risk and profit calculations. Meanwhile, behavioral factors emphasize that investors are ordinary people easily influenced by sentiment and psychological conditions so investment decisions are made more based on good or bad news circulating.

Fundamental factors consist of indicators that can be measured clearly and unbiased, such as macroeconomic variables, including inflation rates, interest rates, exchange rates, and GDP (Francis & Soffer, 1997), as well as company financial ratios such as ROA (Return on Assets), ROE (Return on Equity), and cash flow (Chang & Dong, 2006). On the other hand, several studies also prove that behavioral factors determine stock volatility driven by investor sentiment based on their beliefs about future conditions (Baker & Wurgler, 2007). Based on the theory of capital market behavior, when bullish sentiment dominates the market, investors will buy more shares, and asset prices will be pushed above their fair value. Meanwhile, when bearish sentiment dominates, investors will sell or hold their shares so that prices are dragged below the fundamental value (Shefrin & Statman, 1994).

2.2. Previous Studies

Hasan et al. (2021) analyzed the comparison of the conditions of Islamic and conventional stocks during the Covid-19 crisis. The study uses the Dow Jones index and the FTSE as a sample for January-November 2020, each of which has a particular index for conventional and Islamic stocks. The study results found that the pandemic caused identical volatility in both stock market categories. This study also states that Islamic and conventional stocks experienced a reasonably strong relationship in their movements during the Covid-19 crisis.

Research on the comparison of the performance of Islamic and conventional stocks was also carried out by Siregar (2020) in Indonesia in the March-July 2020 period or when the Covid-19 case first entered Indonesia. This study uses the LQ45 and JII indexes as a representative sample of conventional and Islamic stocks. The study results revealed that both LQ45 and JII experienced fluctuations during the crisis. However, this study found that JII performed better with an average increase in the share price of 0.14%, in contrast to LQ45, which experienced a decrease in the average share price of 1.22%.

In addition to the crisis phenomenon during the Covid-19 pandemic, there have previously been various studies analyzing stock market conditions during the economic crisis. Dang & Nguyen (2020) have analyzed the relationship between liquidity risk and stock performance during the 2008-2009 global financial crisis from 17,493 companies spread across 41 countries. The results of the study found that stocks that made more profits before the crisis experienced a more significant price decline when there was a liquidity shock on global financial markets during a crisis.

In particular cases in Indonesia, Haryanto (2020) has examined the relationship between the number of Covid-19 cases and the value of the IHSG. Using the multiple linear regression analysis techniques, the study results concluded a significant negative effect of the Covid-19 case on the IHSG value. Every 1% increase in Covid-19 cases will cause a decrease in the value of the IHSG by 0.03%.

II. Methodology

3.1. Data

This study uses time-series data. The time-series in question consists of daily stock prices listed on the ISSI and IHSG values. Data on the movement of share prices can be obtained from the official portal of the Indonesia Stock Exchange. Because this data was not collected directly by the author, the data used are included in the category of secondary data. The variables used to measure stock price volatility are the ISSI and IHSG values according to the 2 stock categories analyzed, namely Islamic and conventional stocks. The stock price period used in this study is the daily price and weekly price. The daily share price means the ISSI and IHSG values at the closing of the stock exchange on that day according to the stock exchange operating hours.

Daily stock prices are used to compare stock performance before and after the spread of the Covid-19 virus. This study compares stock prices between 30 days before and after the official announcement from the government regarding the presence of the Covid-19 variant. Daily stock price data is also used to measure volatility during a pandemic, but the data needs to be transformed to find the daily return measurement of volatility began in March 2020 when the first Covid-19 case was found in Indonesia until March 2022 with a total period of 500 days.

3.2. Model Development

Time series data in the financial sector, such as stock prices, are prone to *volatility clustering*, that is if there is relatively high data variability at one time, the same trend will occur in the next period. The distribution of residuals from stock price data is often *fat tails*, it has a greater tendency for extreme events to occur in a certain period. Based on these properties, the GARCH model can explain data variance (Rosadi, 2012).

Bollerslev (1986) introduced the GARCH model of the simplest equation as follows:

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2$$

The model is a *variance equation* that states the conditional variance σ at time t does not only depend on the square of the error in the previous period but also on the conditional variance in the previous period (Gujarati, 2004).

3.3. Method

Comparative analysis or comparison can be done using a different test method consisting of *Paired t-test* or *Wilcoxon signed-rank test*. *Paired t-test* was carried out if the sample data were normally distributed. Meanwhile, Wilcoxon signed-rank test was carried out if the sample data were not normally distributed. Therefore, before carrying out a different test, it is necessary to test for normality. The difference test was carried out using the software SPSS Meanwhile, in measuring the volatility of a variable, the most appropriate analytical method to use is the GARCH *(Generalized Auto Regressive Conditional Heteroskedasticity)* model (Enders, 2004). As the name implies, this model takes into account elements of heteroscedasticity in different time series.

Several previous studies that analyzed stock volatility also used the GARCH model, including Aliyev et al. (2020), Azakia et al. (2020), Mhd Ruslan & Mokhtar (2021), Naik et al. (2020), and Nurdany et al. (2021). To test using the GARCH model, the data must first go through the stationarity test process. The stationarity test can be done by using unit root and correlogram. If the data is stated to be stationary, then it can be estimated using the ARMA (*Autoregressive Moving Average*) model to obtain the best model from the mean equation. The selection of the best ARMA model is shown from the smallest *Akaike Information Criterion* (AIC) and *Schwarz Information Criterion* (SIC) values. Against the ARMA model that was formed, a heteroscedasticity test was conducted to identify the element of volatility in the model. When it is found that the existing model is not homoscedastic, the data processing will proceed to the GARCH analysis stage. A series of analysis processes will be carried out using the *software* Eviews

III. Results and Analysis

4.1. Comparative Analysis

4.1.1. Result

The presence of the Covid-19 pandemic certainly has an impact on the movement of the country's economy, including the stock market. When compared between 30 days before and after the emergence of the first Covid-19 case in Indonesia, it can be seen that the movement of ISSI and IHSG values experienced a negative trend. The lowest value was recorded on March 24, 2020 or 22 days after the entry of the Covid-19 case in Indonesia, where ISSI touched 115.95 and the IHSG touched 3,937.63.

The same thing happened when the peak wave 2 of Covid-19 cases in Indonesia occurred due to the spread of the Delta variant. The ISSI and IHSG values have decreased when compared between 30 days before and after the appearance of the Delta variant in Indonesia. At first, the ISSI value was at 184.29. This figure has decreased to 171.29 after 30 days since the detection of

the first Delta case. Likewise, the IHSG decreased from 6,356.16 to 5,996.25. Meanwhile, a different trend occurred in the movement of the ISSI and IHSG values during the 3rd wave of Covid-19 cases in Indonesia due to the presence of the Omicron variant. The ISSI and IHSG values increased slightly when compared between 30 days before and after the emergence of the first Omicron variant case on December 16, 2021. The ISSI value increased from 186.22 to 188.36. Meanwhile, the IHSG increased from 6,586.44 to 6,645.51.

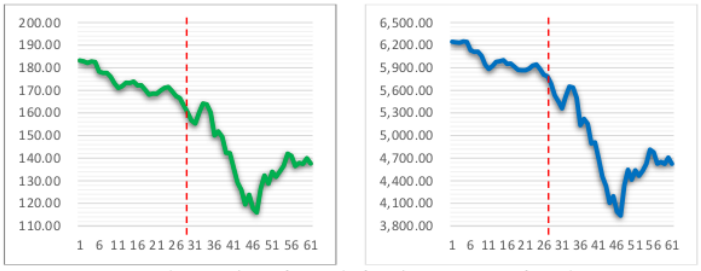

Figure 4.1. ISSI and IHSG Value Before and After The Emergence of Covid-19 First Case
Source: Indonesia Stock Exchange

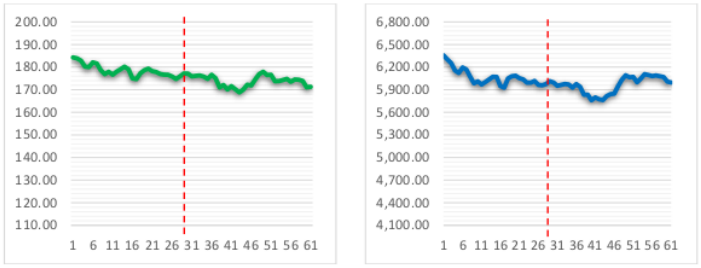

Figure 4.2. ISSI and IHSG Value Before and After The Emergence of Delta Variant
Source: Indonesia Stock Exchange

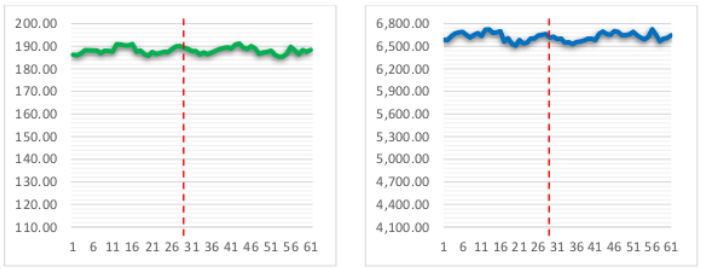

Figure 4.3. ISSI and IHSG Value Before and After The Emergence of Omicron Variant
Source: Indonesia Stock Exchange

Based on the existing graph, it can be clearly seen that the highest volatility of the ISSI and IHSG value movements occurred during the first wave of Covid-19 cases in Indonesia. When compared between 30 days before and after the appearance of the first case, the ISSI value fell to 24.86% and the IHSG value fell to 25.93%. In stark contrast to the second wave which only fell by 7.05% and 5.66% respectively and wave 3 which actually grew positively by 1.15% on the ISSI and 0.90% for the IHSG.

According to the prior discussion, every wave of Covid-19 patients has a similar movement tendency between ISSI and IHSG. However, this tendency does not adequately explain the comparison between ISSI and IHSG before and after the Covid-19 case. Given that the existence of the Covid-19 virus affects the stock market, researchers must divide the data into two categories: before and after the Covid-19 variants arrived in Indonesia.

Table 4.1. Descriptive Statistics of ISSI and IHSG

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	IHSG Pre First Case	5955.8260	30	194.52154	35.51461
	IHSG Post First Case	4720.2557	30	458.89349	83.78211
Pair 2	ISSI Pre First Case	172.5367	30	6.55064	1.19598
	ISSI Post First Case	138.2620	30	12.93999	2.36251
Pair 3	IHSG Pre Delta	6062.2040	30	105.22733	19.21179
	IHSG Post Delta	5959.9083	30	113.88358	20.79220
Pair 4	ISSI Pre Delta	178.4510	30	2.55470	.46642
	ISSI Post Delta	173.6917	30	2.42699	.44311
Pair 5	IHSG Pre Omicron	6628.9517	30	56.50490	10.31634
	IHSG Post Omicron	6623.6017	30	51.85356	9.46712
Pair 6	ISSI Pre Omicron	188.2253	30	1.53414	.28009
	ISSI Post Omicron	188.0177	30	1.49000	.27203

Source: SPSS

The table above shows that each wave of Covid-19 patients reduces the average ISSI and IHSG values in 30 days. The first wave is the most significant decline in both the ISSI and the IHSG values. Meanwhile, the smallest drop happened in wave 3 when the Omicron variety expanded to Indonesia. When comparing the two types of stocks, the IHSG's average value dropped more severely than the ISSI during the first wave of Covid-19. Before the arrival of Covid-19 cases in Indonesia, the average IHSG value declined by 20.75%, while the average ISSI value decreased by 19.87%. When the decline in values was compared to the change in the average value of the two during the Omicron variant wave, it was discovered that there was a very slight difference. The average IHSG value decreased by 0.08%, slightly less than the average ISSI value, which fell by 0.11%.

The data in the preceding table can also be used to compare volatility in the ISSI and IHSG based on their relative standard deviation values. Both the ISSI and the IHSG show an increasing and reducing volatility tendency in the first and third waves IHSG volatility increased. In contrast, ISSI volatility dropped, except for the second wave. When the percentage change is compared, each wave of Covid-19 consistently delivers more extensive volatility changes to the IHSG than the ISSI. The IHSG experienced an increase in volatility of up to 135.91% during the first wave, exceeding the ISSI's growth of 97.54%. Similarly, the IHSG experienced a volatility change of 8.2 % in the second and third waves, while the ISSI experienced a volatility change of less than 5%.

In order to confirm that the spread of the Covid-19 variant caused the change in value, a different test must be performed, comparing the IHSG and ISSI value groups before the space of the Covid-19 virus IHSG and ISSI value groups after the virus variant spreads. Before executing the difference test, the data was tested to determine its normalcy as a determinant of the different test methods used. Because the number of samples from each variable exceeds 50, the Kolmogorov-Smirnov test was performed to determine normality (Raharjo, 2021). The following criteria are used to make decisions in this test:

- The value of sig. > 0.05 means that the data are normally distributed, and the comparison test is carried out using the Paired T-Test method.
- The value of sig. <0.05 means that the data are not normally distributed, and the comparison test is carried out using the Wilcoxon Rank Test method.

Table 4.2. Normality Test Results

	IHSG First Case	ISSI First Case	IHSG Delta	ISSI Delta	IHSG Omicron	ISSI Omicron
N	60	60	60	60	60	60
Mean	5338.0408	155.3993	6011.0562	176.0713	6626.2767	188.1215
Std. Deviation	714.30593	20.05144	120.32383	3.44412	53.83522	1.50301
Test Statistic	.187	.161	.108	.060	.095	.087
Asymp. Sig.	.000	.001	.079	.200	.200	.200

Source: SPSS

According to the normality test results, a significant value of 0.05 was observed in the IHSG and ISSI variables in wave 1. In the Delta and Omicron variant waves, the IHSG and ISSI variables showed a significance value greater than 0.05. As a result, it is possible to conclude that the IHSG and ISSI data in wave one are typically distributed. In contrast, the IHSG and ISSI data in the Delta and Omicron variant waves are not. Based on these findings, the Wilcoxon Rank Test is the best alternative test method for the IHSG and ISSI wave one variables. Meanwhile, the Paired T-test method is employed for the IHSG and ISSI variables on the Delta and Omicron waves.

Following that, each data group was assessed using a comparative test based on the method provided by the normality test. Several studies were run to determine the impact of the Covid-19 variant's spread on changes in the IHSG and ISSI values. If the results of the various tests reveal a substantial difference, it is determined that changes in the IHSG and ISSI values can occur due to

the Covid-19 variant's spread. The following are the decision criteria for the various tests utilizing the Paired T-Test or Wilcoxon Rank Test methods:

- Value of sig. >0.05 indicates no significant difference in the stock index value between before and after the spread of the Covid-19 variant.
- Value of sig. <0.05 indicates a significant difference in the stock index value between before and after the spread of the Covid-19 variant.

Table 4.3. Paired T-Test Results

	IHSG Post First Case - IHSG Pre First Case	ISSI Post First Case – ISSI Pre First Case
Z	-4.782[b]	-4.782[b]
Asymp. Sig. (2-tailed)	.000	.000

Source: SPSS

Table 4.4. Wilcoxon Rank Test Results

		Difference	t	df	Sig. (2-tailed)
Pair 3	IHSG Pre Delta – IHSG Post Delta	102.29567	3.468	29	.002
Pair 4	ISSI Pre Delta – ISSI Post Delta	4.75933	8.161	29	.000
Pair 5	IHSG Pre Omicron – IHSG Post Omicron	5.35000	.372	29	.713
Pair 6	ISSI Pre Omicron – ISSI Post Omicron	.20767	.718	29	.479

Source: SPSS

Based on the Wilcoxon Rank Test findings, the value of sig. for IHSG and ISSI in wave one is 0.05 based on the different test outputs. Similarly, the Paired T-Test revealed the value of sig. IHSG and ISSI during the Delta variant wave were both 0.05. Meanwhile, when the test period was conducted during the Omicron variant wave, the sig. from the IHSG and ISSI showed a number greater than 0.05, indicating that it is insignificant. Based on these results, it is possible to conclude that significant changes in the IHSG and ISSI values occurred during the spread of the Covid-19 virus in the first wave and the Delta variant wave.

4.1.2. Analysis

Because the IHSG and ISSI values changed significantly, the two stock indices were assessed to have weak resistance to the Covid-19 crisis during the first and Delta variant waves. The findings of this analysis are proportional to the findings of Hasan et al. (2021) against the Dow Jones and FTSE indexes, which show that both Islamic and conventional stocks are vulnerable to the consequences of the Covid-19 issue. This is necessary since the Covid-19 issue prompted Indonesia to enter an economic slump, resulting in numerous national companies losing income and terminating worker contracts (Febrianto & Rahadi, 2021).

Interestingly, a different stock market reaction occurred during wave three caused by the Omicron variant. Based on the various tests above, there was no significant difference in the IHSG and ISSI values before and after the spread of the Omicron variant in Indonesia. This can happen because of differences in investor behavior in responding to events that occur (Thampanya et al., 2020). According to the Indonesia Stock Exchange (IDX) monthly report from March 2020, when the Covid-19 virus first invaded Indonesia, net trade by worldwide investors was negative, specifically -3.49 billion share units. When the Delta version began to spread in May 2021, the IDX stated that net trading by worldwide investors was similarly negative at -1.64 billion share units. Meanwhile, worldwide investor mood continued to recover in December 2021, as demonstrated by a positive net trade of 5.69 billion shares.

The restrictive policies enforced by the local government may impact the behavior of stock investors. Of course, this can affect stock price swings. The strategy of banning community activities led to panic selling among stock investors. Regarding Covid-19 prevention policies, the Indonesian government imposed Large-Scale Social Restrictions (PSBB) at the outbreak's start in reaction to the virus's increasingly widespread dissemination (Debora, 2020). When the Delta variety became more widespread, the authorities promptly imposed an Emergency Community Activity Restriction (PPKM), followed by PPKM Level 4 in the Java-Bali region for more than a month (Bardan, 2021). These two polices severely restrict people's activities, causing economic activity to suffer. Meanwhile, as the Omicron form spreads, the government merely applies PPKM level 3 with less stringent limitations, which is only valid for one month (Waseso, 2022). The presence of relaxation policies during the wave of the Omicron type undoubtedly provides an opportunity for the economy's wheels to turn more steadily.

The influence on stock prices can also be attributed to Covid-19 instances. Haryanto (2020) and Khalid et al. (2021) discovered that the number of Covid-19 models substantially impacted stock value and volatility. Based on the Indonesian Covid-19 Handling Task Force report, the number of active Covid-19 cases in March 2020 reached a very high level, accounting for 85.80% of all positive cases recorded. The number of active cases is still at 5.6% as of May 2021, and the positive monthly rate is 10.7 %, which is greater than the WHO (World Health Organization) standard. Meanwhile, the number of active cases declined dramatically to 0.1% in December 2021, with a positive rate of only 0.11 %. Based on these findings, it is highly probable that the occurrence of the Omicron variety in December 2021 will not result in significant changes to the IHSG and ISSI values.

4.2. Volatility Analysis

4.2.1. Result

Most earlier studies employed stock return data as the observed variable in the GARCH model (Azakia et al., 2020; Eliyawati, 2014; Irfan et al., 2021; Mhd Ruslan & Mokhtar, 2021; Nurdany et al., 2021). To calculate the return value of each stock index, the stock price data must be transformed into a natural logarithm using a first-order differential equation (Aliyev et al., 2020; Rosadi, 2012). Adopting this transformation can make it easier for researchers to measure changes in a stock's value and rate of return.

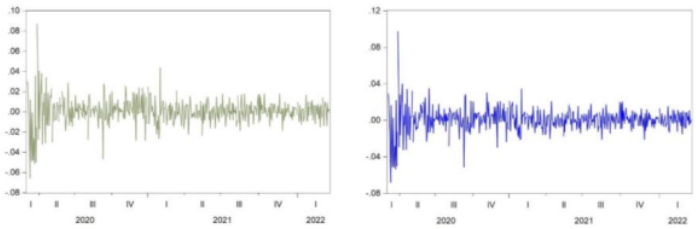

Figure 4.4. Volatility of ISSI and IHSG Return
Source: Indonesia Stock Exchange

The data transformation results are then exhibited in a graph to show the volatility. The ISSI and IHSG return identical exhibit volatility in the graph above. Significant changes will follow changes in the high rate of return. This condition is referred to as volatility clustering, and it is one of the characteristics of heteroscedastic data that must be examined using the GARCH model (Enders, 2004). As a result, the two stock indexes under consideration, ISSI, and IHSG, also exhibit volatility clustering.

Besides being heteroscedastic, the GARCH model also requires that the data to be analyzed must be stationary. To ensure this, the stationarity test was carried out using the *Augmented Dickey Fuller* (ADF) method to identify the presence of *a unit root* in the observed data. The basis for decision making in the stationarity test is as follows:

- Probability value >0.05 indicates that the data contains unit root and it is not stationary.
- Probability value <0.05 indicates that the data does not contain unit root and it is stationary.

Table 4.5. Stationarity Test Result

		ISSI		IHSG	
		t-Statistic	Prob.*	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.56089	0.0000	-17.03850	0.0000
Test critical values:	1% level	-3.976629		-3.976629	
	5% level	-3.418889		-3.418889	
	10% level	-3.131986		-3.131986	

Source: Eviews

Based on the stationarity test results, the resultant probability value at the level is <0.05. Similarly, the statistical value of the ADF test, -17.56 for ISSI and -17.04 for IHSG, is less than the value of the corresponding critical areas. Therefore, we can conclude that the ISSI and IHSG data are stationary since they lack a unit root. The ADF results, which revealed that the data were stationary at the level, were then used to create ACF (Autocorrelation Function) and PACF (Partial Autocorrelation Function) plots based on the correlogram graph. ACF and PACF charts are used in ARMA modeling to determine the correct order.

Table 4.6. Correlogram of ISSI Return

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.000	0.000	6.E-07	0.999
		2	-0.096	-0.096	4.6031	0.100
		3	0.192	0.194	23.171	0.000
		4	0.024	0.012	23.472	0.000
		5	0.042	0.082	24.349	0.000
		6	0.007	-0.030	24.374	0.000
		7	-0.049	-0.046	25.592	0.001
		8	0.017	-0.009	25.736	0.001
		9	-0.154	-0.172	37.806	0.000
		10	-0.082	-0.065	41.228	0.000

Source: Eviews

Table 4.7. Correlogram of IHSG Return

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.018	0.018	0.1613	0.688
		2	-0.075	-0.076	3.0124	0.222
		3	0.183	0.187	19.899	0.000
		4	-0.004	-0.020	19.907	0.001
		5	0.068	0.102	22.245	0.000
		6	0.034	-0.009	22.827	0.001
		7	-0.055	-0.039	24.383	0.001
		8	0.034	0.009	24.972	0.002
		9	-0.140	-0.163	35.035	0.000
		10	-0.093	-0.071	39.462	0.000

Source: Eviews

The PACF plot is used as a reference to determine the AR (Autoregressive) order, while the ACF plot is used as a reference to determine the MA (Moving Average) order. Significant ACF and PACF values are determined based on the lag that has a plot exceeding the boundary line. Based on the correlogram above, both return show ACF and PACF plots that exceed the limit at the lag third. Therefore, the tentative models that can be used are ARMA (3.0), ARMA (0.3), and ARMA (3.3). Each model is then estimated to get the coefficient of determination (R^2), AIC, and SIC. The best ARMA model chosen is the model that has the largest R^2 and the smallest AIC and SIC values.

Table 4.8. Summary of ARMA Modelling for ISSI and IHSG Return

Stock	Model	R^2	AIC	SIC
ISSI	ARMA (3, 0)	0,0336	-5,8771	-5,8517
	ARMA (0, 3)	0,0329	-5,8764	-5,8510
	ARMA (3, 3)	0,0322	-5,8737	-5,8398
IHSG	ARMA (3, 0)	0,0301	-5,8469	-5,8216
	ARMA (0, 3)	0,0279	-5,8446	-5,8193
	ARMA (3, 3)	0,0282	-5,8429	-5,8091

Source: Eviews

Based on the estimation results of the ARMA model that has been done, it can be seen that the best model for returns is ARMA (3,0). This model demonstrates that the return value heavily influences the return on ISSI and IHSG in the most recent period over the preceding three periods. The chosen ARMA model will be used as the mean equation in the GARCH model analysis. To identify the presence of the GARCH effect as an element of volatility in the model, a Heteroscedasticity test using the ARCH-LM (Lagrange Multiplier) method will be carried out on the mean equation formed from the ARMA model. The basis for decision making in the Heteroscedasticity test is as follows:

- Probability value >0.05 indicates that the data does not contain intense volatility and is homoscedastic, so it does not need to be estimated using the GARCH model.
- Probability value <0.05 indicates that the data contains intense volatility and is heteroscedastic, so it needs to be estimated using the GARCH model.

Table 4.9. Heteroskedasticity Test Result

Indicator	ISSI	IHSG
F-statistic	57.42780	43.70854
*R-squared	51.67620	40.33075
Prob. F	0.0000	0.0000
Prob. Chi-Square	0.0000	0.0000

Source: Eviews

The output of the Heteroscedasticity test using the ARCH-LM method shows the results in the form of a probability value lower than 0.05 for both ISSI and IHSG data. The ISSI and IHSG return data are both heteroscedastic and volatile based on this parameter. Thus, the next step is to estimate how much volatility happens based on the observed data using the GARCH model. The GARCH model estimation will yield two types of equations: the mean equation and the variance equation. According to the ARMA model, the mean equation shows how much stock returns from the prior period influence the current average stock return.

Table 4.10. GARCH Model Estimation

Indicator	ISSI		IHSG	
	Coefficient	Probability	Coefficient	Probability
Mean Equation				
C	0.000717	0.1135	0.000860	0.0608
AR(3)	0.101435	0.0368	0.118476	0.0123
Variance Equation				
C	4.80E-06	0.0228	5.05E-06	0.0133
RESID(-1)^2	0.059841	0.0219	0.064508	0.0239
GARCH(-1)	0.884831	0.0000	0.877207	0.0000

Source: Eviews

Meanwhile, the variance equation explains how much the strength of the volatility (persistence of volatility) of the stock index is determined by the volatility and the squared error in the previous period. The above estimation is carried out using the GARCH (1.1) model. All independent variables in the predicted output have a significant effect because their probability value is less

than 0.05. The constant value is also greater than zero, and the outcome of the sum of the coefficients of the independent variable is one. In other words, this model is thought to help evaluate the volatility of the ISSI and IHSG.

4.2.2. Robustness Test

However, before assessing the model, the ARCH-LM test was performed to guarantee that it was free of heteroscedastic features. In both models, the Heteroscedasticity test using the ARCH-LM approach yielded a probability value greater than 0.05. From this value, it can be seen that the ISSI and IHSG return data processed using the GARCH model have been free from the element of Heteroscedasticity. These results strengthen the feasibility of the model to be used in analyzing ISSI and IHSG returns.

Table 4.11. Heteroskedasticity Test Result for GARCH Model

Indicator	ISSI	IHSG
F-statistic	2.071596	1.782812
Obs*R-squared	2.071297	1.783595
Prob. F	0.1507	0.1824
Prob. Chi-Square	0.1501	0.1817

Source: Eviews

4.2.3. Analysis

Based on the estimated output of the GARCH model that has been formed in analyzing the volatility of the ISSI and IHSG, the resulting equation for the volatility of the ISSI is as follows:

$$\sigma_t^2 = 4{,}80 \times 10^{-6} + 0{,}0598\varepsilon_{t-1}^2 + 0{,}8848\sigma_{t-1}^2$$

While the equation formed for the volatility of the IHSG is as follows:

$$\sigma_t^2 = 5{,}05 \times 10^{-6} + 0{,}0645\varepsilon_{t-1}^2 + 0{,}8772\sigma_{t-1}^2$$

The above equation is a form of the *variance equation* that describes the factors determinant of how much stock volatility occurs.

The sum of the coefficients α+β becomes a measure of the volatility persistence in each stock index investigated (Campbell et al., 2012). The greater the sum, the more the volatility and the longer it can last. According to the equation, the volatility persistence of the ISSI stock index is in the region of 0.94. The volatility equation for the IHSG stock index yields the same result. Since the resulting value is so close to one, we can conclude that ISSI and IHSG are both highly volatile during the Covid-19 pandemic in Indonesia.

The probability value of each independent variable is less than 0.05, indicating the strength of high volatility. This value suggests that the previous period's volatility (σ2) and squared error (ε2) have a considerable effect on the level of volatility in the next period. The value of the coefficient on variable ε2 describes the impact of occurrences outside the model. Variable ε2 in the IHSG equation has a coefficient of 0.0645, which is bigger than the coefficient ε2 of 0.0598 in the ISSI equation. This shows that external factors outside the model have a more significant impact on

IHSG return volatility. Domestic macroeconomic factors or global stock index movements are examples of the events under consideration.

The estimated output of the GARCH model yields the same results as the output of the comparative tests, indicating that the Covid-19 problem has a proportional effect on ISSI and IHSG during the pandemic period, which encompasses three waves. These findings are consistent with those of Hasan et al. (2021)), who discovered that Islamic and conventional equities exhibit identical volatility and a strong association during the Covid-19 crisis. This type of effect is typical because the Covid-19 pandemic is not just a financial sector crisis but a multifaceted catastrophe that shocks different social areas of people's lives (Saputra & Ariutama, 2021). Therefore, while ISSI and IHSG have distinct personalities, their impact is not much different.

Fundamental reasons such as volatility in macroeconomic variables can also contribute to the persistence of volatility in Indonesian stocks (Thampanya et al., 2020). Based on Nugroho & Robiyanto (2021) research, the fundamental factors that also experienced volatility during the Covid-19 pandemic are the rupiah exchange rate and world gold price. The volatility that occurred in both variables had a significant influence on Indonesia's stock exchange market. Another variable that also became the attention was the volatility of world oil volatility, which increased in the middle of the Covid-19 crisis (Bourghelle et al., 2021). Syebastian et al. (2021) mentioned a significant correlation between the world oil price and stock volatility in Indonesia. The covid-19 crisis caused volatility in various domestic or global economic indicators. As a high-risk return investment asset, the stock is certainly easy to be influenced by volatility which occurs in other instruments.

Macro-economy variables cause it, but stock market volatility in a country is also caused by volatility in other countries' stock markets. This influence is called a contagion effect, a theory that explains that a crisis occurring in a region or country can spread its effect to another country either on a domestic scale or an international one (Dornbusch et al., 2000). During the crisis of Covid-19, the systemic risk resulting from the contagion effect experienced an increase in the financial sector (Louati et al., 2022). Based on the research by Kamaludin et al. (2021), the capital market condition in ASEAN-5 countries has a solid correlation to the Dow Jones index movement in the middle of the pandemic era. Referring to contagion theory, it is widespread if stock in Indonesia experiences intense volatility because of Dow Jones index volatility.

IV. Conclusion and Recommendation

5.1. Conclusion

The stock market experienced high volatility and uncertainty due to the pandemic. In less than a month, the Covid-19 crisis resulted in the drop of IHSG value to its lowest point in the last decade. Both Islamic and conventional stocks have experienced similar volatility during the Covid-19 pandemic. Based on the results of the different tests using the paired t-test and Wilcoxon rank test methods, it was concluded that the ISSI and IHSG experienced significant changes before and after discovering the first case of Covid-19. Significant changes in both values are also found when

the Delta variance spreads. In contrast, when wave 3 occurred due to the presence of the Omicron variant, ISSI and IHSG did not experience significant shocks.

This condition might happen because the community's immunity has been developed, and the government has been able to implement adaptive policies to prevent the transmission of the virus. The policy was then relaxed during the spread of the Omicron variant, where the government has allowed various community activities in public spaces. During the first wave of cases and the Delta variant wave, the number of active cases and the positivity rate were still above the WHO standard. Meanwhile, when the Omicron variant was found, the number of active cases and the positivity rate had approached 0 below the WHO standard.

The volatility that occurs in ISSI and IHSG is also proven by detecting elements of heteroscedasticity in stock return data. Based on the results of the heteroscedasticity test, it was found that both stock indices had a heteroscedastic return value and experienced high volatility. By applying the GARCH model in the analysis, the strength of stock volatility can be measured along with the factors that influence it. The estimation results of the GARCH model conclude that both Islamic stocks and conventional stocks have an immense volatility power with an identical value of 0.94 or close to 1. The current volatility is also significantly influenced by the previous volatility and the squared error representing other previous events outside the model.

The volatility that occurs in Islamic and conventional stocks is not much different, even though both stocks have different characters in the ratio of debt and income. Fundamental factors also cause this high volatility in the form of shocks in several macroeconomic variables, including the rupiah exchange rate, gold prices, and world oil prices. In addition, the contagion effect that occurred during the Covid-19 crisis also contributed to the spread of systemic risk in global stock indexes on stock volatility in Indonesia.

5.2. Recommendation

This study indicates that the volatility in the stock market may last as long as the crisis is not over. Therefore, investors are suggested to pay attention to the volatility that occurred in the previous days to predict stock prices in the future. Since the stocks experience high volatility throughout the pandemic, stock issuing companies need to adapt quickly and prepare alternative strategies to maintain stock price stability amid a crisis. Likewise, government agencies are highly encouraged to maintain macroeconomic stability, including exchange rates, inflation, and interest rates.

This research still contains several limitations on the information presented. The use of ISSI and IHSG as variables representing sharia and conventional stocks is not enough to reveal the differences in character between the two stocks. This is considering that the IHSG includes all issuers listed on the Indonesia Stock Exchange, both sharia and conventional stocks. So far, there is no index that includes sharia category stocks only. Therefore, it is recommended for further researchers who want to compare the performance of Islamic and conventional stocks to classify between the sharia and conventional stocks specifically.

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