



Comparative Analysis of Volatility Levels of 10 Stock Indices on the Indonesian Stock Exchange on 2 Economic Events Using Time Series Econometric Methods

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ABSTRACT: The purpose of this study is to determine the level of volatility of the 10 Stock Indices on the IDX during COVID-19 Economic Crisis and in the Economic Recovery periods in order to understand the benefits and risks of investing in post-economic crisis. The results of this study indicate that 6 of 10 stock indices have no difference in the level of volatility in the 2 events. Only 4 Stock Indices have different levels of volatility. In the post-crisis period, the volatility of the stock index is at a very low level, so it is very interesting to see the investment returns opportunities. Although in these 2 events; majority of volatility levels of stock indices are relatively low in terms of parameters; but there is a fairly large gap of volatility values. High levels of volatility can also occur not only during crisis but also when the economy has improved.

KEYWORDS: 2 Economics events, Time series method, Volatility levels.

INTRODUCTION

The COVID-19 pandemic, which has been going on for approximately two years, has caused many problems in the social, economic and political fields in all parts of the world. Difficulty in meeting basic needs, limited ability to carry out activities outside the home, and the economic crisis and recession experienced by the global economy are some of the impacts caused by the COVID-19 pandemic.

The COVID-19 pandemic in Indonesia resulted in an economic crisis that led to a recession throughout 2020 until early 2021 for 4 consecutive quarters. Indonesia's economic growth in Q1 2020 experienced a decline of 2.97% YoY (Year on Year) until the worst occurred in Q2 2020, namely -5.32% YoY (www.bps.go.id). The impact of the COVID pandemic -19 was also experienced by the Indonesian Capital Market. In the first month of the COVID-19 pandemic hitting Indonesia; IHSG (Composite Stock Price Index) experienced a very deep decline. JCI reached its lowest price in the last 4 years (2018-2022) at 3,990 or around -31.38% (www.tradingview.com). The main cause of the JCI correction is investors withdrawing capital, which affects the supply side of the Indonesian stock exchange (Sumiyati et al, 2021). The act of withdrawing capital is an investor's reaction to save their investment assets. The decline also occurred in the stock indices on the Indonesian Stock Exchange. As a result, the movement in the value of stock indices on the Indonesian Stock Exchange looks unstable after the IHSG correction. Uncertainty about future economic fate is also the reason why the value of stock indices on the Indonesia Stock Exchange has high volatility during the COVID-19 pandemic economic crisis (Sumiyati et al, 2022). Based on the research results of Riyadi et al (2021), Marwa et al (2021) and Widodo et al (2021) found that the volatility of stock prices and stock indices on the Indonesian Stock Exchange before and during the COVID-19 pandemic had significant differences. There are symptoms of high volatility in share prices and stock indices on the Indonesia Stock Exchange during the COVID-19 pandemic compared to before the COVID-19 pandemic.

After the crisis experienced by the Indonesian economy due to the COVID-19 pandemic has ended; Indonesia's economy is growing and improving again starting from the second quarter of 2021 (www.bps.go.id). Significant economic growth occurred in Q2 2021 amounting to 7.07%. This significant economic growth also has a positive impact on the Indonesian capital market. This can be seen from the rapid increase in the number of investors in the capital market due to the easier access for people to invest, which is indicated by the increase in the number of assets in the Indonesian capital market by 28.44% in 2021 (www.ksei.co.id). Statistically, Indonesia's economic growth and capital markets have experienced significant recovery and growth (www.bps.go.id&www.ksei.co.id). This economic and capital market growth also has an impact on improving the value of stock indices on the Indonesian Stock Exchange.



Based on the results of previous research, we can see that there are differences in the level of volatility before and during the COVID-19 pandemic. This research will examine further the level of volatility on the Time Line and the scope of research objects which are different from previous studies. This research will measure the level of volatility in 10 selected Stock Indices on the Indonesia Stock Exchange for 2 Economic Events using the Time Series Econometric Method to find out whether there are differences in the level of volatility in the 10 Stock Indices and what the investment prospects are in these two Economic Events, especially in the post-crisis period. The 2 Economic Events that form the Time Line in this research are the 2020 COVID-19 Pandemic Economic Crisis Period and the 2021 Economic Recovery Period.

LITERATURE REVIEW

a. *Share*

Shares are proof of an investor's capital participation in a public company. Thus, the investor has the right to income, assets and attend the general meeting of shareholders in the company where he invests (Pratomy, 2019). Shares are also one of the investment instruments chosen by many capital market investors. Shares are considered safer and the profits offered are also very attractive; starting from Dividends to Capital Gains (Adnyana, 2020). Apart from profits, shares also contain risks, namely; Capital Lost, Liquidity Risk and Bankruptcy (www.idx.co.id). Just like goods in general; Shares have buying and selling prices. The share price is the price per share that an investor must pay if he wants to invest in shares. Share prices are very volatile because share prices are formed from Demand and Supply on the stock market.

b. *Stock Index*

According to www.idx.co.id, a stock index is a statistical measurement standard that reflects the overall performance of stock price movements selected based on certain criteria and is also evaluated periodically. Like shares, indices also have fluctuating values. This is because it is the shares in the index that move the index value so that it fluctuates. Shares that experience a large price decline will automatically reduce the value of the index that covers them. On the Indonesia Stock Exchange as of July 2022 there are 40 stock indexes which are calculated based on 4 calculation methods (www.idx.co.id). Each period, the Indonesian Stock Exchange will release an Annual Index Performance Report, which in this report contains information regarding the price and performance of the index, shares and any shares included in or excluded from an index.

c. *COVID-19 Pandemic Economic Crisis*

Crisis can be understood as a situation where something experiences disruption, shortages and scarcity so that it cannot run properly. In *Crisis And Recovery: Ethics, Economics and Justice* (Williams et al, 2010) describes an economic crisis as a situation where there is macro disruption or imbalance in an economic system. This imbalance can occur due to many things, such as scarcity of production factors and labor, instability in currency values; or other things that are Force Majeure in nature, such as natural disasters, war and disease outbreaks. An economic crisis will certainly hamper a country's economic growth, leading to a recession. Recession itself is an economic downturn which is the impact of the economic crisis experienced by a country. A country's economy can be said to be in recession if there is negative growth for two consecutive quarters. An economy experiencing a recession due to the crisis needs immediate rescue action. The rescue action that is usually taken is to use Quantitative Easing, such as lowering interest rates. However, in its estimation, crises are very difficult to detect or look for Early Warning Signals. However, usually, the Early Warning Signal of an economic crisis can arise from several sources such as unhealthy monetary and fiscal policies (Suta et al, 2003).

d. *Economic Recovery*

Economic recovery is a situation where in the previous period economic growth was at a minus figure, which then moved up to a positive growth figure. Economic recovery can occur due to many things. One of the things that can make the economy improve is Quantitative Easing. The aim of this is so that economic circulation can return to running as it should. If economic circulation is running, there will be more and more participants or parties involved in carrying out economic activities. A lot of labor will also be absorbed thereby increasing people's consumption power. With smooth economic circulation, Economic Recovery will be realized (www.bps.go.id& DPR-RI, 2020).



e. Volatility

Volatility is a situation where the value or price of an index experiences high fluctuations due to strong demand and supply for the shares in the index which is caused by several things (Kartika, 2010). This volatility also shows what risks investors will and are currently facing due to uncertainty in price movements (Riyadi et al, 2021). Things that can cause high volatility in stock indices include rumors or what is commonly known as positive sentiment or negative sentiment (Widodo et al, 2021), economic uncertainty due to epidemics or unclear economic regulations and interest rate announcements by the Fed. (US Central Bank) (Rahardja et al, 2018) Volatility can be very profitable or even detrimental (Harmfull) if it cannot be utilized properly. In research conducted by Marwa et al, 2021; Widodo et al, 2021 & Mutiarasari et al, 2022 found that there was a high level of volatility in stock prices and stock indices on the Indonesian Stock Exchange. From the results of these studies, it was found that the COVID-19 pandemic had quite a strong influence which had an impact on high volatility on stock prices and stock indices during that period.

f. Time Series Econometrics

Time Series Econometrics is a branch of science and methods in Econometrics which also includes the science of Statistics. Time Series Econometrics is different from standard Econometric models because this section specifically discusses the behavior of data that is tied to time (Juanda et al, 2012). Time Series Econometrics uses statistical principles in accepting and rejecting hypotheses as well as its overall use so that Time Series Econometrics is inseparable from Statistics. In the financial world, Time Series Econometrics is usually used to see the behavior of movements in financial data such as stock prices, stock indices, foreign exchange values and other quantitative economic data to see whether there is a high level of volatility in these data within a certain time period. as well as predicting the level of volatility that may occur in the future. The basic assumption of Time Series Econometrics is data stationarity (Juanda et al, 2012). Because non-stationary data is assumed to be heteroscedastic and this data usually has varying volatility. The general modeling used to analyze the level of volatility in heteroscedastic data is GARCH (Generalized Autoregressive Conditional Heterocedasticity) modeling.

RESEARCH METHOD

Based on the type of data used and the level of explanation applied; This research is classified as a Descriptive Quantitative type of research using Time Series Econometric Methods (Ibrahim et al, 2018 & Juanda et al, 2012). The data used in this research is Weekly Indices Statistics Report data from each index released by the BEI in the period 2020 and 2021, totaling 1050 Time Series data. In this research, research data was obtained by means of Document Collecting. The research population is the stock index listed on the IDX and the research sample is 10 selected stock indices based on the Purposive Sampling Theory (Hikmawati, 2020). The ten indices whose price movement data are the analysis samples in this research are; LQ 45, IDX 30, IDX 80, IDX BUMN 20, KOMPAS 100, INFOBANK 15, JII, PEFINDO 25, BISNIS-27 and Investor 33. The instrument used is Eviews 10 Econometric analysis software. The sequence of data analysis stages is as follows (Juanda et al, 2012):

1. The Augmented Dickey-Fuller Test was carried out at Level and Differentiation levels to Stationary data.
2. Box-Jenkins modeling was carried out using the AR 1, AR 2, MA 1, MA 2 and ARIMA 1.1 models and determined the Best Model based on the smallest Akaike Information Criterion (AIC) and Schwarz Criterion (SC) values.
3. The Best Model was tested with Residual Diagnostic with Correlogram Q-Statistic up to lag 36 with Q-Stat conditions. $< X^2$ (50.99) to ensure Random Walk (Heteroscedastic) data.
4. GARCH 1.1 (Generalized Autoregressive Conditional Heterocedasticity) modeling was carried out to measure the level of volatility based on the results of $RESID (-1)^2 (\alpha)$ and GARCH (-1) (β) with the following parameters (Mutiarasari et al, 2022) :
 - If $\alpha_1 + \beta_1 = < 1$ Low Volatility
 - If $\alpha_1 + \beta_1 = 1$ High Volatility
 - If $\alpha_1 + \beta_1 = > 1$ Extremely High Volatility
5. The measurement results are then compared to find out whether there are differences in the level of volatility in the two economic events.



RESEARCH RESULTS AND DISCUSSION

Based on the results of the Augmented Dickey-Fuller Test, the data is declared stationary at the Level and Differentiation levels as follows:

Table 1.ADF Test test results

Crisis Period			Recovery period		
Index	Lvl	1 st Dif.	Index	Lvl	1 st Dif.
LQ 45	0.0312		LQ 45		0.0000
IDX 30	0.0237		IDX 30		0.0000
IDX 80		0.0000	IDX 80		0.0000
IDX BUMN20		0.0000	IDX BUMN20		0.0000
KOMPAS 100		0.0000	KOMPAS 100		0.0000
INFOBANK 15		0.0000	INFOBANK 15		0.0000
JII		0.0000	JII		0.0000
PEFINDO 25		0.0001	PEFINDO 25		0.0000
BISNIS-27	0.0264		BISNIS-27		0.0000
Investor 33		0.0000	Investor 33		0.0000

Source: Eviews 10

Box-Jenkins modeling is carried out to obtain the Best Model which will be used in subsequent modeling with the Best Model obtained for each stock index in each event as follows:



Table 2. The best model for each stock index

Crisis Period		Recovery period	
Index	GoF	Index	GoF
LQ 45	AR 1	LQ 45	AR 2
IDX 30	AR 1	IDX 30	ARIMA 1,1
IDX 80	AR 1	IDX 80	AR 2
IDX BUMN20	AR 1	IDX BUMN20	AR 2
KOMPAS 100	MA 1	KOMPAS 100	AR 2
INFOBANK 15	MA 1	INFOBANK 15	AR 2
JII	AR 2	JII	MA 1
PEFINDO 25	AR 1	PEFINDO 25	AR 2
BISNIS-27	AR 1	BISNIS-27	MA 2
Investor 33	ARIMA 1,1	Investor 33	AR 2

Source: Eviews 10

Residual Diagnostic Test was carried out with Correlogram Q-Stat. up to lag 36. All the Best Models have been declared Random Walk (Q-Stat. < 50.99) which can be seen in the following table:



Table 3. Residual Diagnostic Test Results

CRISIS PERIOD			RECOVERY PERIOD		
Index	Information		Index	Information	
LQ 45	30.73	<i>Random Walk</i>	LQ 45	22.69	<i>Random Walk</i>
IDX 30	30.16	<i>Random Walk</i>	IDX 30	24.36	<i>Random Walk</i>
IDX 80	24.47	<i>Random Walk</i>	IDX 80	21.69	<i>Random Walk</i>
IDX BUMN 20	27.90	<i>Random Walk</i>	IDX BUMN20	20.76	<i>Random Walk</i>
KOMPAS 100	22.49	<i>Random Walk</i>	KOMPAS 100	21.93	<i>Random Walk</i>
INFOBANK 15	26.01	<i>Random Walk</i>	INFOBANK 15	26.54	<i>Random Walk</i>
JII	18.30	<i>Random Walk</i>	JII	27.45	<i>Random Walk</i>
PEFINDO 25	29.72	<i>Random Walk</i>	PEFINDO 25	34.86	<i>Random Walk</i>
BISNIS-27	30.49	<i>Random Walk</i>	BISNIS-27	22.38	<i>Random Walk</i>
Investor 33	23.65	<i>Random Walk</i>	Investor 33	27.31	<i>Random Walk</i>

Source: Eviews 10

GARCH 1.1 modeling was carried out with the calculation results and comparison of volatility levels in the two economic events as follows:



Table 4. Results of measurement and comparison of volatility levels

Masa Krisis			Masa Pemulihan			Ket
Indeks	Vol.	Tingkat	Indeks	Vol.	Tingkat	
LQ 45	0.98 < 1	Low	LQ 45	0.43 < 1	Low	TB
IDX 30	0.97 < 1	Low	IDX 30	0.81 < 1	Low	TB
IDX 80	0.95 < 1	Low	IDX 80	0.44 < 1	Low	TB
IDX BUMN 20	1.05 > 1	E. Hight	IDX BUMN20	0.58 < 1	Low	B
KOMPAS 100	0.91 < 1	Low	KOMPAS 100	0.63 < 1	Low	TB
INFOBANK 15	0.84 < 1	Low	INFOBANK 15	1.24 > 1	E. Hight	B
JII	0.92 < 1	Low	JII	0.91 < 1	Low	TB
PEFINDO 25	1.39 > 1	E. Hight	PEFINDO 25	0.5 < 1	Low	B
BISNIS-27	0.9 < 1	Low	BISNIS-27	0.85 < 1	Low	TB
Investor 33	0.88 < 1	Low	Investor 33	1.41 > 1	E. Hight	B

Source: Eviews 10

Overall, the results of calculating the level of volatility for the two events above found that 8 out of 10 indices experienced low levels of volatility at each event. There were only 2 indices for each event that experienced a level of volatility classified as Extremely High Volatility (>1). The IDX BUMN 20 Index and the PEFINDO 25 Index are indices that experienced very high levels of volatility (>1) during the Crisis Period, while during the Recovery Period the indices that experienced very high levels of volatility (>1) occurred in the INFOBANK 15 and Investor 33 indexes. we see a comparison of the overall volatility levels of the index in both events; then we can see that 6 out of 10 indices have no difference in the level of volatility between the Crisis Period and the Recovery Period. There are only 4 indices that have different levels of volatility, namely the IDX BUMN 20 Index, INFOBANK 15, PEFINDO 25 and Investor 33. The results of this research are different from previous studies conducted by Marwa et al, 2021; Widodo et al, 2021 & Mutiarasari et al, 2022. The differences in the results of this research occur because of two of the most basic things, namely that previous studies used a different range of Time Series data from this research so that it greatly influenced the calculation of volatility levels. Another thing that also influences it is that Marwa et al., 2021's research uses a different method to this research, making it possible for differences in interpretation to occur.

The causes of high and low volatility of each index are caused by various factors originating from phenomena that occur in macroeconomic activities. During the crisis, the financial sector was the sector most sought after by investors in Indonesia. This is because the financial sector is considered a supporting sector for the economy to run amidst the pandemic. Apart from that, the financial sector also received quite a lot of positive sentiment at this time. The "Gas and Brake" economic policy launched by the Indonesian Ministry of Finance is also a positive sentiment. Basically, this positive sentiment was obtained from the reduction in interest rates carried out by BI to increase the circulation of money in society. In this way, the Financial Sector will play a big role so that its business will continue to run even though it is hit by the COVID-19 pandemic. This positive sentiment has made Financial



Sector shares optimistic about a more stable technical movement. This is proven by the low volatility measurement results of the INFOBANK 15 index <1 . Other indices such as LQ 45, IDX 30, IDX 80, KOMPAS 100, BISNIS-27, Investor 33, and INFOBANK 15 whose largest index composition is Financial Sector shares also appear to have a low level of volatility (<1). The second sector which was no less competitive during the Crisis Period was the Primary Goods Sector which made up the largest composition of the JII index. The Primary Goods Sector is a sector that is very important in meeting the supply of food and basic needs during this time. Therefore, the business carried out will continue to run very well and will not experience stagnation so that companies operating in the Primary Goods Sector achieve fantastic profit growth.

This is a positive sentiment for the sector. Apart from the sectors of interest; There are also sectors that are less popular, namely the Energy, Raw Goods, Secondary Goods and Transportation Sectors. Although just as important; Technically, Sector and Raw Goods shares appear to have high volatility because during the Crisis Period there was a coal embargo imposed by coal producing countries. This is one of the negative sentiments that has hit coal stocks and other Energy and Raw Goods stocks because currently the selling price of coal is very high and there is the issue of energy transition which makes investors hesitant to invest in Energy and Raw Goods Sector stocks. This ultimately affects the level of volatility of the IDX BUMN 20 index, which has a fairly large percentage of Energy and Raw Goods shares, namely 11.3% of those making up the index. The Secondary Goods and Transportation sectors experienced a similar fate, namely that the businesses providing Secondary Goods and Transportation were hindered by the PPKM policy which greatly hampered these two sectors. PPKM narrows people's movements and reduces people's consumption levels so that people shop less at this time.

Different from the Recovery Period. Financial sector shares experience quite high levels of volatility, which is proven by measuring the level of volatility on the INFOBANK 15 index which is >1 . Meanwhile, the Investor 33 index also had the same fate. At this time, the financial sector is very adapting because it is entering a recovery period where the government's economic policies regarding recovery are very varied and dynamic. At one time the government needs to raise the benchmark interest rate to maintain inflation, but at another time the government needs to reduce the benchmark interest rate in order to maintain the economy so it can grow. This is also caused by the Fed which is the reference for central banks throughout the world. The Fed often makes adjustments to US interest rates, this decision affects central banks around the world. From this incident, investors became a little hesitant to invest in Financial Sector shares because there were many policies that were still uncertain. Therefore, the Financial Sector experiences high volatility. On the other hand, shares in the Non-Primary and Transportation sectors experienced fantastic growth as a result of the easing carried out by the government and this easing then increased people's interest and purchasing power to buy secondary and even tertiary needs provided by Non-Primary sector companies and Transportation. The energy and raw goods sectors are also experiencing growth because the coal export ecosystem is moving as it should.

CONCLUSION

The level of volatility is one indicator that influences investors in making investment decisions. Therefore, the Volatility Level is very important. From the results of this research, it can be seen that the level of volatility that occurs in the stock indices on the IDX is different in the two periods; but not too significant. High volatility is also very likely to occur when the economy is growing. It can also be seen that the Indonesian Capital Market was quite strong when hit by economic waves during these two periods. This research certainly has shortcomings because it uses measurements on the Stock Index scale which are more aggregate and general in nature. It is hoped that future research can calculate volatility per stock sector in order to obtain sharper and deeper conclusions, while still using the same method.

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