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THE IMPACT OF THE COVID-19 PANDEMIC CRISIS ON THE PERFORMANCE OF PHARMACEUTICAL COMPANIES' STOCK PRICE CASE STUDY OF PHARMACEUTICAL COMPANIES IN INDONESIA

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Abstract

This thesis analyzes the impact of the COVID-19 pandemic on the performance of pharmaceutical company stock prices, in which research was conducted on pharmaceutical company stocks in Indonesia. The impact of the COVID-19 pandemic felt by the community is a decrease in income. The decrease in income has also been felt by investors and owners of industries in various manufacturing sectors. Some companies have even closed factories and laid off their workers. Thus this also affects the stock market of the manufacturing industry in Indonesia. In this study, we will analyze the effect of the increase in the rate of positive daily cases and the death rate from COVID- 19 on the performance of pharmaceutical companies' stock prices. The selection of the research sample of 5 (five) pharmaceutical industry stock prices is based on the size of the market capitalization value that is included in the top 10 pharmaceutical industries in Indonesia. In analyzing the performance of pharmaceutical stock prices, the most appropriate GARCH model will be selected by comparing the symmetric model (SGARCH) to the a-symmetric model (TGARCH and EGARCH) and the most appropriate model is the Exponential General Autoregressive Conditional Heteroskedastic (EGARCH) model. Daily positive (dailycase) and daily cases of death (deathcase) have a positive coefficient value, which means that the impact of the COVID-19 pandemic has had a significant effect on the price of these pharmaceutical stocks.

Keywords

Impact of COVID-19, Dailycase, Deathcase, Pharmaceutical Stock Prices, EGARCH Model

1. INTRODUCTION

As experienced together, when the COVID-19 virus variant entered Indonesia, it started with the Alpha, Beta, Gamma, Delta and Omicron variants (www.who.int/en/activities/tracking- SARS-CoV-2-variants/). The one with the most fatalities is the Delta variant, which occurred in early 2021 where there was a surge in positive daily cases and hospitals throughout Indonesia were full, there have been many fatalities, then towards the end of 2021 the Omicron variant entered Indonesia where this Omicron variant has a high transmission rate. which is very fast compared to the previous variants. This has an impact on the wider community's economy and in various sectors of the manufacturing industry. However, not all manufacturing sectors have experienced the impact of a decline, the sector in the pharmaceutical industry during this pandemic has experienced an increase, so stock investors will see more opportunities in the pharmaceutical industry sector. The pharmaceutical sector has experienced an increase and has become a potential market, as can be seen from Figure 1.1.

Figure 1.1 shows that the medical supply and services sector is a sector that has the potential to be a winner during a pandemic like it is today. Likewise, data from the Central Statistics Agency (BPS) shows that the chemical, pharmaceutical and traditional medicine industries are progressing during a pandemic COVID-19. The demand for medicines, especially vaccines and traditional medicines to maintain body health, has increased during the pandemic, making this industry actually reach its highest level in the last 9 years. The Central Statistics Agency (BPS) reports that the domestic product (GDP) of the chemical, pharmaceutical and traditional medicine industry sub- sector at current prices (ADHB) will reach IDR 339.18 trillion in 2021.

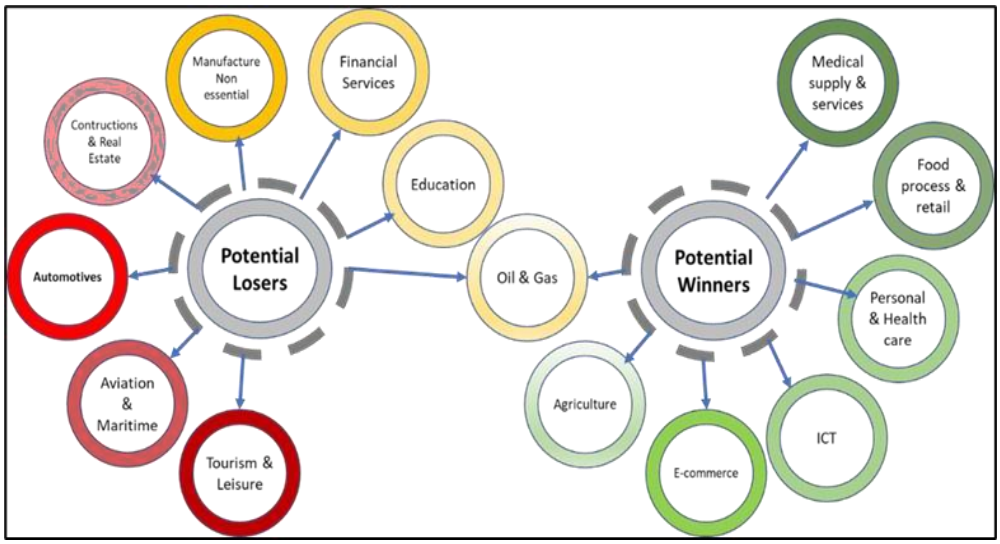

Figure 1.1: Decoding The Economics Of Covid-19: Potensial Winners & Losers In The Short Term, Source: Dcode EFC Analysis (2020).

2. LITERATURE REVIEW AND HYPOTHESIS

Bodie, Zvi., et al (2021), state that systematic risk is part of the variations in investment returns that cannot be eliminated through diversification by investors. Systematic risk is also known as market risk, meaning that the risk occurs due to events or incidents outside the company, such as recession, inflation, interest rates, exchange rates and so on, so this risk is a risk that cannot be diversified. Meanwhile, unsystematic risk is a risk that can be eliminated by forming a portfolio or by diversifying securities. In this study, the COVID-19 pandemic is part of unsystematic risk because it has an inhomogeneous impact on all sectors. For example, the tourism and hospitality sectors experienced a disadvantaged impact, while on the other hand the pharmaceutical sector was a sector that benefited from the COVID-19 pandemic.

The definition of shares according to Darmadji and Fakhruddin (2012: 5) stock are a sign of the participation or ownership of a person or entity in a company or limited liability company. Stock valuation is a method for calculating the estimated fair price of a stock (fair value). The fair price of a stock is often also called the intrinsic value, which is a stock value that is considered to truly represent the performance of a company. is to conduct stock valuation (stock valuation). Analysis of stock valuation consists of the two most common techniques in stocks, namely technical analysis and fundamental analysis. Wira (2011) there are two categories for calculating the valuation of stocks with fundamental analysis, namely the Comparative/Price Multiple method and the Absolute Method. The current research is part of a fundamental analysis, it can be seen that fundamental analysis is based on the performance of the pharmaceutical companies themselves, whereas the COVID-19 pandemic has had a beneficial impact on pharmaceutical companies where products related to public health will be increase in sales, and of course this will increase the company's profits and also affect the increase in stock prices and stock returns of the pharmaceutical company.

Schwert and W. Smith, Jr. (1992), volatility in financial markets is divided into 5 (five) types, namely Future Volatility, Historical Volatility, Forecast Volatility, Implied Volatility, and Seasonal Volatility. We often hear the term volatility or market mood when we make a stock investment transaction. Volatility itself is a statistical change in a security's price within a certain period. The higher the value of volatility, the faster the movement or change. Due to frequent changes in stock prices, both increasing and decreasing, the volatility value can be used to estimate opportunities or risks. During the COVID-19 pandemic, a product that was urgently needed by the wider community was the need for health products (medicines, multivitamins) to prevent the COVID-19 virus, thus of course having a positive impact, namely increasing sales of products from the pharmaceutical companies themselves. this will also have an impact on increasing company profits and affect the increase in the stock price of the company. Thus the conceptual hypothesis of this study is that the daily positive cases of Covid-19 have a significant impact on stock performance in the pharmaceutical stock sector and the daily death cases of Covid-19 have a significant impact on stock performance in the pharmaceutical sector.

3. METHOD

The research data for the period March 12 2020 to December 30 2022 used is secondary time series data from 2 (two) data sources, the first data source is from www.ourworldindata.org/covid-cases research and data by Edouard Mathieu, the data includes daily positive cases and daily death cases due to COVID-19 in Indonesia. The second data source is from www.idnfinancials.com/id/, this data includes daily stock price data at the last price position (closed

price). There are 5 pharmaceutical company shares as research objects, namely PT Kalbe Farma Tbk (KLBF) shares, PT Sido Muncul Tbk (SIDO) Jamu and Pharmaceutical Industries Tbk (SIDO) shares, PT Kimia Farma Tbk (KAEF) shares, PT Indofarma Tbk (INAF) shares, PT Pyridam Farma Tbk (PYFA) shares. The selection of the research sample of 5 (five) pharmaceutical industry stocks is based on the size of the market capitalization value that is included in the top 10 major pharmaceutical industries in Indonesia. The variables in this study consisted of independent variables which are variables that affect other variables or are often called exogenous variables, namely variables that cause changes both positively and negatively. There are 2 (two) independent variables in this study, namely positive daily cases of COVID-19 and cases of death of COVID-19. The next variable is the dependent variable, which is a variable that is influenced by other variables or often called endogenous variables. In this study, the dependent variable is the stock price of pharmaceutical sector companies.

Chinmaya Behera (2020) uses the Event Study Analysis method, Fama and French 3-Factor Model and buy-and-hold abnormal return (BHAR) method, where research is conducted on 9 pharmaceutical companies in India, the selection of these pharmaceutical companies is based on capitalization market. The research data for closing stock prices are secondary data for the period December 3 2019 to May 28 2020. The results of the study found that during the COVID-19 pandemic statistically significant positive returns were experienced for Abnormal Return (AR) and Cumulative Abnormal Return (CAR). These results are also strengthened by the authors with the buy-and-hold abnormal return (BHAR) test as evidenced by consistent results. Nassar S. Al-Nassar (2022) used the BEKK-GARCH (1,1) asymmetric VAR-model, this model is used to model dynamic conditional correlations between primary markets and small and medium enterprises (SMEs), which are then used to determine and explore portfolio design and value hedging implications. Michał BuszkoID (2021) regarding the impact of the COVID-19 pandemic on stock stability on the Warsaw stock exchange (the stock exchange in Poland), which is one of the most important stock markets in the Central and Eastern Europe (CEE) region.

The analytical method used is to apply the symmetric or a-symmetric GARCH modeling. This method was chosen because the variable to be examined in this study is stock prices which in various previous empirical studies have proven that daily data tends to show volatility clustering (heteroscedastic) characteristics. Therefore, before estimating the GARCH model is carried out, the volatility clustering test will be carried out using the ARCH-LM test procedure. The specifications for the Standard-GARCH, EGARCH, and TGARCH models to be estimated in this study are shown in the following equation:

$$Y_t = \beta_1 + \beta_2 DaC_{t-1} + \beta_3 DeC_{t-1} + \mu_t \;\; ;\mu_t \approx N\,(0, h_t) \quad \text{3.1}$$

$$h_t = \delta + \alpha_1 \mu_{t-1}^2 + \beta_1 h_{t-1} + \delta_1 DaC_t + \delta_2 DeC_t \quad \text{3.2}$$

$$\ln(h_t) = \delta + \beta_1 \ln(h_{t-1}) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] + \delta_1 DaC_{t-1} + \delta_2 DeC_{t-1} \quad \text{3.3}$$

$$h_t = \delta + \alpha_1 \mu_{t-1}^2 + \beta_1 h_{t-1} + \gamma \mu_{t-1}^2 I_{t-1} + \delta_1 DaC_{t-1} + \delta_2 DeC_{t-1} \quad \text{3.4}$$

Remarks:

Yt : pharmaceutical stock price
DaC : Daily Case / Daily positive case
DeC : Death Case / Case of daily death
Ht : pharmaceutical stock price volatility

The Standard-GARCH specification is shown by equations 3.1 and 3.2. EGARCH specification is shown by equations 3.1 and 3.3, while TGARCH is shown by equations 3.1 and 3.4. The asymmetry parameters for the EGARH and TGARCH models are shown by the parameter γ in their respective variance equations. The significance of these two parameters indicates that there is an asymmetry pattern in the effect of shock/news on stock price volatility. It is impossible to capture this pattern of asymmetry in the Standard-GARCH model specifications.

Parameters β_2 and β_3 in the model above are parameters that measure the impact of the COVID-19 pandemic on stock prices, while δ_1 and δ_2 are good in equation 3.2; 3.3; and 3.4 are parameters that measure the impact of the pandemic on stock price volatility. Stock price volatility is closely related to risk in stock investment.

4. RESULTS AND DISCUSSION

4.1 Examination of Data Patterns

By using the help of e-views software, we can see the pattern of stock price data for each company by looking at the graph as follows:

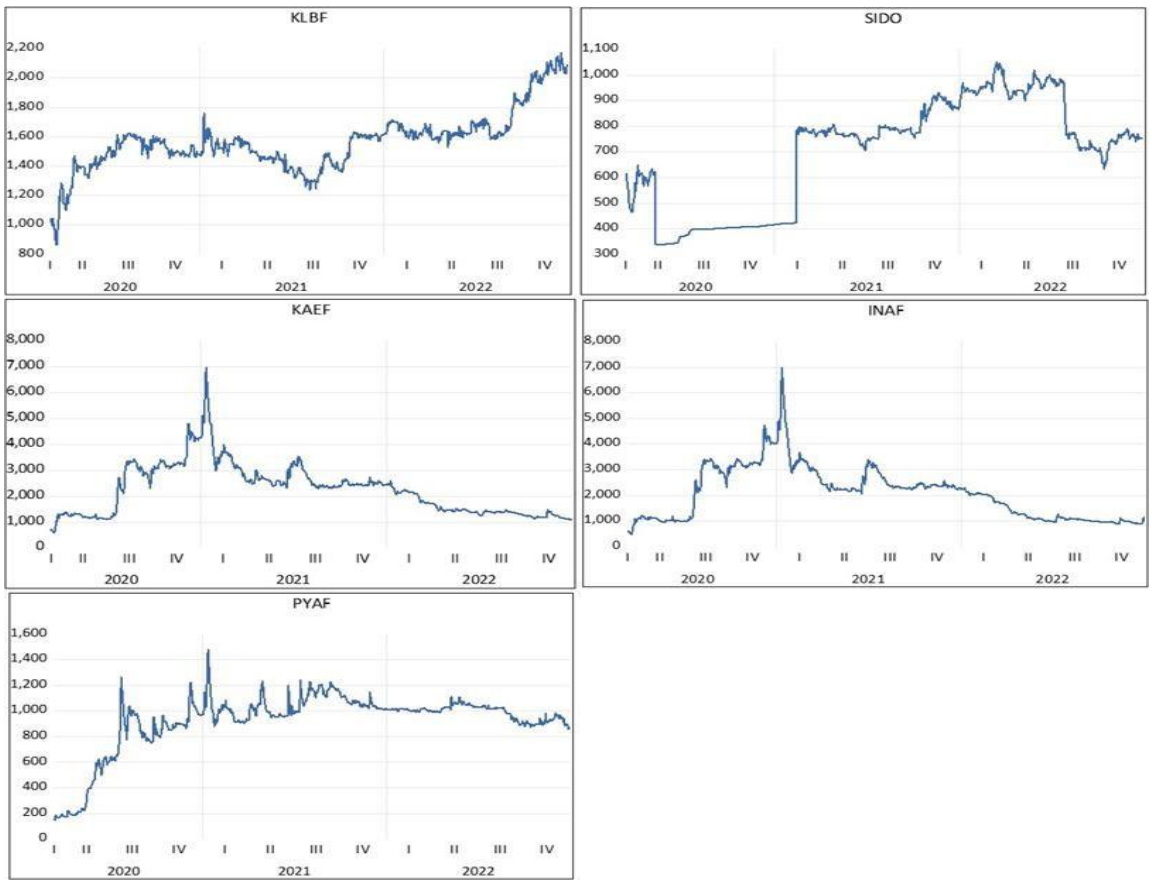

Figure 4.1: Graphic Patterns of the Share Prices of 5 (five) Pharmaceutical Companies.

From visual observation of the graphic patterns in Figure 4.1, it can be seen that for all the stocks that are the object of this research, there has been a significant trend of increasing prices throughout 2020. From a volatility pattern perspective, it appears that there are periods of time where price movements are very volatile, while in other time periods prices move with fluctuation patterns that are not too sharp. In other words, the fluctuation pattern of the daily stock price data tends to show volatility clustering (heteroscedastic) characteristics.

4.2 Heteroscedasticity Testing

Heteroscedasticity testing or volatility clustering characteristics were carried out using the ARCH- LM test procedure, the results of which are shown in the following table.

INAF

Heteroskedasticity Test: ARCH

F-statistic	6944.270	Prob. F(1,730)	0.0000
Obs*R-squared	662.3699	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/16/23 Time: 14:26
Sample (adjusted): 3/12/2020 12/30/2022
Included observations: 732 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	49838.07	23992.99	2.077193	0.0381
RESID^2(-1)	0.951039	0.011413	83.33229	0.0000

R-squared	0.904877	Mean dependent var	1050784.
Adjusted R-squared	0.904747	S.D. dependent var	1820745.
S.E. of regression	561939.1	Akaike info criterion	29.31890
Sum squared resid	2.31E+14	Schwarz criterion	29.33146
Log likelihood	-10728.72	Hannan-Quinn criter.	29.32375
F-statistic	6944.270	Durbin-Watson stat	1.107246
Prob(F-statistic)	0.000000		

KAEF

Heteroskedasticity Test: ARCH

F-statistic	7629.153	Prob. F(1,730)	0.0000
Obs*R-squared	668.0749	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/16/23 Time: 14:31
Sample (adjusted): 3/12/2020 12/30/2022
Included observations: 732 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	41618.76	21792.98	1.909732	0.0566
RESID^2(-1)	0.955046	0.010934	87.34502	0.0000

R-squared	0.912671	Mean dependent var	949987.9
Adjusted R-squared	0.912551	S.D. dependent var	1752185.
S.E. of regression	518152.4	Akaike info criterion	29.15665
Sum squared resid	1.96E+14	Schwarz criterion	29.16921
Log likelihood	-10669.34	Hannan-Quinn criter.	29.16150
F-statistic	7629.153	Durbin-Watson stat	1.134115
Prob(F-statistic)	0.000000		

Table 4.1: Heteroscedasticity Test of Pharmaceutical Stocks

The table above is an example for two pharmaceutical stocks, for all diagnostic test results for all stocks that are the object of this study with Prob. Chi-Square < α 0.05. Thus this study found sufficient statistical evidence to state that the price movements of the 5 stocks studied show heteroscedastic characteristics (volatility clustering). Therefore, the relationship between stock prices and their predictors in this study will be estimated using the GARCH approach, which is a model that can handle the problem of heteroscedasticity data.

4.3. Best Model Selection

There are so many GARCH variants developed after the introduction of the Standard- GARCH model, requiring researchers to choose which GARCH specifications are most appropriate for the data in this study. In selecting the most appropriate model, the authors will compare the symmetric model (SGARCH) with the two a-symmetric GARCH models, namely TGARCH and EGARCH). The criteria used for the selection are based on testing the significance of the asymmetry parameters in the TGARCH and EGARCH models as well as the Akaike Info Criterion, Schwarz Criterion, and Hannan-Quinn Criterion statistics. The results of the comparison based on these criteria are shown in Table 4.2 below.

		SGARCH				
No.	Paramater	INAF	KAEF	KLBF	PYAF	SIDO
1	Akaike info criterion	16.2312	16.25656	12.85967	12.53367	13.30107
2	Schwarz criterion	16.28148	16.30684	12.90995	12.58395	13.35135
3	Hannan-Quinn criter.	16.2506	16.27596	12.87907	12.55306	13.32047

		TGARCH				
No.	Paramater	INAF	KAEF	KLBF	PYAF	SIDO
1	Akaike info criterion	16.31165	14.97954	13.12559	12.30489	13.30107
2	Schwarz criterion	16.36822	15.03611	13.18216	12.36146	13.35135
3	Hannan-Quinn criter.	16.33348	15.00137	13.14742	12.32671	13.32047

		EGARCH				
No.	Paramater	INAF	KAEF	KLBF	PYAF	SIDO
1	Akaike info criterion	**15.00028**	**14.97479**	**11.61164**	**11.4734**	**11.78521**
2	Schwarz criterion	**15.05678**	**15.0313**	**11.66815**	**11.5299**	**11.84172**
3	Hannan-Quinn criter.	**15.02207**	**14.99659**	**11.63344**	**11.49519**	**11.80701**

Table 4.2: Selection of the Best Model

From table 4.2 the selection of the best model can be seen based on 3 test parameters namely the Akaike info criterion, Schwarz criterion and Hannan-Quinn criterion where the a-symmetric EGARCH model is the best model because it produces the lowest value of the three for all these pharmaceutical stocks, this shows the EGARCH a-symmetric model is the best used compared to the other two methods in this study.

4.4 EGARCH Estimation Results

Model specifications 3.1 and 3.2 show that in the mean equation, stock price movements are hypothesized to be influenced by a one-period lag of the daily positive case and daily death case variables. The daily case lag variable is used because information on positive cases and daily death cases by the health authorities is only released every 4 pm, while the stock exchange on the same day has closed one hour earlier. Thus, the impact of the daily case announcements on the stock market was only observed one day later. The two estimation results generated from the EGARCH modeling are the mean equation and the variance equation. The mean equation is an equation that describes the behavior of pharmaceutical stock price movements, while the variance equation is an equation that explains the volatility of pharmaceutical stock prices. The higher the volatility of stock prices, the higher the risk of investing in stocks. The estimation results with the EGARCH model can be summarized in the following table.

Mean Equation	INAF		KAEF		KLBF		PYAF		SIDO	
	Coeff.	Alpha	Coeff.	Alpha	Coeff.	Alpha	Coeff.	Alpha	Coeff.	Alpha
Dailycase(-1)	0.010526	0.0000	0.009686	0.0000	0.001525	0.0000	-0.000228	0.0000	0.000009	0.3278
Deathcase(-1)	0.901721	0.0000	0.585227	0.0000	-0.223855	0.0000	0.041044	0.0000	0.016421	0.0000
Variance Equation	INAF		KAEF		KLBF		PYAF		SIDO	
	Coeff.	Alpha	Coeff.	Alpha	Coeff.	Alpha	Coeff.	Alpha	Coeff.	Alpha
C(9)*Deathcase(-1)	0.000392	0.0790	0.000378	0.0494	0.000291	0.0296	0.000263	0.1533	0.000159	0.7264
C(8)*Dailycase(-1)	-0.000007	0.2362	-0.000001	0.0013	-0.000005	0.2669	-0.000005	0.2019	-0.000004	0.9855
C(7)*LOG(GARCH(-1))	0.941127	0.0000	0.921728	0.0000	0.906515	0.0000	0.921449	0.0000	0.928880	0.0000
C(5)*ABS(RESID….)	1.600192	0.0000	1.553013	0.0000	1.140562	0.0000	0.999816	0.0000	1.696993	0.0000

Table 4.3: Summary of EGARCH Model Estimation Results

The mean equation in Table 4.3 shows that both daily positive cases and daily death cases have a significant positive impact on INAF's share price. Coefficient C(9) with prob. 0.0790 in the variance equation shows that at a significance level of 10% alpha, the covid variable that has a significant positive effect on INAF stock price volatility is only death cases. The higher the daily death cases, the more volatile INAF's stock price, while the increase in daily positive cases (dailycase) did not have a significant impact on stock price volatility. Thus the increase in daily death cases, does not only have an impact on increasing INAF's share price, but also on increasing the volatility of its share price. In other words, an increase in daily death cases (deathcase) has an impact not only on creating positive returns but also on increasing the risk of the stock.

Another significant parameter estimate in the variance equation is C(7) which means that the volatility of INAF's share price in this period was significantly influenced by the volatility of stock prices in the previous period. This finding adds statistical evidence for the presence of volatility clustering characteristics in INAF's daily stock price data. Meanwhile, the estimation of parameter C(5) which is significant in the variance equation shows that the form of shock or news, whether it is a positive or negative shock that enters the stock market, has an asymmetric impact on stock price volatility. In other words, the magnitude of changes in stock price volatility will depend on whether the news that enters the market is bad news or goodnews.

The impact of covid 19 on KAEF shares is not much different from INAF shares. The estimation results for processing KAEF stock data in Table 4.4 show that the increase in daily case and death case has a significant positive impact on KAEF's share price. This is indicated by positive signs for daily case and death case in the mean equation with each prob value. smaller than alpha <0.05. Like the behavior of INAF stock volatility, KAEF stock price volatility is positively and significantly affected by daily death cases. The higher the daily death cases, the volatility of KAEF's share price also increases. This is indicated by the positive and significant coefficient C(9) at an alpha of 5%.

As was the case with INAF shares, the asymmetry pattern from the impact of good news or bad news on the volatility of KAEF's share price was also significantly observed. This is indicated by the prob value. C(5) on the variance equation which is smaller than alpha 0.05. This means that bad news and good news shake the volatility of KAEF shares with different magnitudes. The significance of the C(7) coefficient in the variance equation shows that the volatility of KAEF's share price in this period was influenced by the volatility of stock prices in the previous period. As with INAF shares, this finding reinforces the volatility clustering characteristic of KAEF stock price movements. And so on, have the same analysis method for the other three stocks.

5. CONCLUSION

The estimation results of the mean equation from the EGARCH model show that in the majority of stock samples studied, positive daily cases (daily case) and daily death cases (death cases) have a significant impact on the stock price of the pharmaceutical sector. In general, the increase in daily cases contributed significantly to the increase in the share price of the pharmaceutical sector.

The estimation results of the variance equation show that the daily death case (death case) is a variable that has a significant positive impact on stock price volatility, this occurs in all five samples of pharmaceutical stock prices. Meanwhile, positive daily cases (dailycase) have a negative coefficient with an insignificant alpha value and also occur in the five samples of pharmaceutical stock prices. Thus the risk of investing in stocks in the pharmaceutical sector during the pandemic has increased significantly with increasing daily death cases.

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