Jurnal Samudra Ekonomi & Bisnis
Volume 15, Nomor 1, Januari 2024
P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

An Investigation of the Effect of Covid-19 on Efficient Market Hypothesis (EMH) Anomalies: Econometric Approach

Investigasi Pengaruh Covid-19 terhadap Anomali Efficient Market Hypothesis (EMH): Pendekatan Ekonometrik

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Article Info

Article History :
Received: 29 June 2023
Accepted: 8 November 2023
Published: January 2024

DOI Number :
10.33059/jseb.v15i1.8093

How to Cite :
Widodo, P. (2024). An investigation of the effect of Covid-19 on efficient market hypothesis (EMH) anomalies: Econometric approach. *Jurnal Samudra Ekonomi dan Bisnis*, *15*(1), 130-143. DOI: 10.33059/jseb.v15i1.8093.

Abstract

The research aims to analyze the influence of the Covid-19 crisis on changes in the daily return pattern of the LQ45 Index, and to see whether the daily return pattern of the LQ45 Index is efficient as argued by the EMH (Efficient Market Hypothesis). The observation period was before and during Covid 19. Data analysis used an econometric approach to test any EMH anomalies, as well as running the ARCH-GARCH model due to the use of dummy variables. The analysis results show that Covid-19 has no effect on the daily return pattern of LQ45, The Week Four effect is proven, but The Day of Week effect, Monday effect and Weekend effect are not found. Another finding that the trading day anomaly testing model is sensitive to the error term distribution, also suggests that good news or bad news in volatility not only depends on the asymmetric model but also the choice of error term distribution.

Keywords: Covid-19, Daily Return, Efficient Market Hypothesis, LQ45.

Info Artikel

Riwayat Artikel :
Diterima: 29 Juni 2023
Disetujui: 8 November 2023
Dipublikasikan: Januari 2024

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Abstrak

Penelitian ini bertujuan menganalisis pengaruh peristiwa krisis Covid-19 terhadap perubahan pola return harian Index LQ45, serta melihat apakah pola return harian index LQ45 bersifat efisien seperti diargumentasikan EMH (Efficient Market Hypothesis). Periode pengamatan yaitu sebelum dan selama Covid 19. Analisis data menggunakan pendekatan ekonometrika untuk menguji setiap anomaly EMH, serta menjalankan model ARCH-GARCH akibat digunakannya variabel dummy. Hasil analisis menunjukkan Covid-19 tidak berpengaruh terhadap pola return harian LQ45, The Week Four effect terbukti, namun The Day of Week effect, Monday effect dan Weekend effect tidak diketemukan. Temuan lain bahwa model pengujian anomaly hari perdagangan sensitif terhadap distribusi error term, serta mengisyaratkan bahwa good news atau bad news dalam volatilitas tidak hanya bergantung pada model asimetris tetapi juga pilihan distribusi error term.

Kata Kunci: *Covid-19, Return Harian, Efficient Market Hypothesis, LQ45.*

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

INTRODUCTION

The world economy, including Indonesia, has just experienced a shock caused by the Covid-19 pandemic. According to Yanto & Frymaruwah (2022), the pandemic brought a decline in Indonesia's economic growth. The initial assumption was to experience a growth of 5.3 percent, but in the second quarter it fell sharply to -5.32 percent in the second quarter of 2020 and -3.49 percent in the third quarter. Fortunately, the government, through Bank Indonesia, took immediate action, so that the end of 2020 rose slightly -2.19 percent. The second quarter of 2021 became positive at 7.07 percent and the third quarter of 2022 at 5.27 percent. The economic shock affected most firms' profit margins on the Indonesia Stock Exchange, leading to uncertainty and a reduction in demand for goods and services. As a result, the decline in stock prices became inevitable, with LQ 45 seeing a steep decline from 1,038.97 in 2019 to 691.13 in 2020.

The purpose of this study is to determine whether the Covid 19 crisis has affected the LQ45 daily return pattern. Furthermore, it seeks to verify the efficiency of the LQ45 daily return pattern, as proposed by the Efficient Market Hypothesis (EMH). Furthermore, Spulbar *et al*. (2021) argue that Kendall & Branford's (1953) random walk theory - which holds that "stock price fluctuations are independent of each other and have the same probability distribution" - is the origin of inspiration for the EMH idea. Fama (1970) claimed that the future path of the price level of a security is no more predictable than the path of a series of cumulated random numbers. In addition, the topic of efficient capital markets was raised, and it was proposed that the ideal capital market would be one "where prices provide accurate signals for resource allocation". An efficient capital market corresponds to one in which prices "fully reflect" the information that is available, implying that the market is efficient in dealing with information.

One of the main theories in finance, the EMH, has been the subject of much discussion among specialists up to this point because of evidence that has been found to contradict the hypothesis. Differences or anomalies in the market might manifest in various forms and vocabulary. A well-known anomaly in the market is the calendar effect, which is made up of day-of-the-week impacts. The day-of-the-week effect can be broadly classified into two categories, i.e.: weekend effect and Monday effect. The economic shock affected most firms' profit margins on the Indonesia Stock Exchange, leading to uncertainty and a reduction in demand for goods and services. As a result, the decline in stock prices became inevitable, with LQ 45 seeing a steep decline from 1,038.97 in 2019 to 691.13 in 2020. The weekend effect suggested that Friday has a positive impact on the stock return, whereas the Monday effect claimed that Monday has a negative impact. The existence of The Day-of-the-Week effect has been the focus of numerous studies conducted in various nations since it has garnered a great deal of scholarly attention. The day of the week impact appears to have been empirically studied for the first time in research by Cross (1973) and Harris (1986), who also looked at this effect in a variety of markets.

The findings from numerous Indonesian researchers. Pratiwi (2018)'s research, which used LQ45, found that there were anomalies in the weekday and weekend effects but was unable to demonstrate the Monday effect. Ardhian & Marisan (2017) came to the conclusion that there are day-of-the-week effects using the LQ45 period spanning from February 2015 to January 2016. The findings of a study by Nuroniyah *et al*. (2018) utilising the LQ45 period from February 2016 to January 2017 indicated the presence of day-of-the-week impacts but not Monday or weekend effects. Additionally, Suryandari & Wirawan's (2018) study utilising LQ45 for the months of February 2015 to August 2016 revealed an anomaly in the Monday effect, Day of the Week effect,

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

and Month of the Year effect, but no January effect. Using LQ45, research by Hendrawaty & Hazaimah (2019) found that there was an anomaly in the Monday effect and day of the week effect, but not in the Weekend effect or January effect. According to research by Karissanata (2019), there was no irregularity in the day-of-the-week impact for LQ45 between 2015 and 2018. Further using ANOVA analysis, Bagaskara & Khairunnisa (2019)'s LQ45 period 2013–2017 discovered the Day of the Week effect but not the January effect, Rogalsky effect, and Week-Four effect.

The evolution of the financial sector is substantially impacted by extreme events like the global financial crisis (GFC). For example, the recent COVID-19 epidemic severely impacted most developed, emerging, and developing nations around the world, causing lockdowns that negatively impacted the performance of all economic sectors, including the banking system (Batool *et al*., 2020). Nevertheless, in contrast to industrialised countries, emerging economies see less of an influence from global financial liberalisation. As a result, having a theoretical framework that offers effective solutions is crucial, particularly during difficult financial circumstances.

This research deviates from earlier studies. The analysis of data that will be applied. Originally, to investigate the possibility of EMH anomalies on global stock markets, researchers employed linear regression models. To determine whether any of the following days have returns that are statistically different from zero, dummy variables (Monday, Tuesday, Wednesday, Thursday, and Friday) are included in the linear regression model. The ordinary least square (OLS) model is typically used to estimate the coefficients of these dummy variables. However, there are a number of problems with OLS use, and using this approach may result in the following specific issues: (i) the returns are likely to be autocorrelated; (ii) the residuals may not be normal; (iii) the problem of heteroscedasticity may arise; (iv) outliers with high or low return values may distort the overall picture; and (v) time series data has stationarity issues, which could lead to spurious regression (Widodo, 2022).

LITERATURE REVIEW

The Day of Week Effect

With regard to the day of the week impact, equities market returns on Friday are often higher than those on Monday. The efficient market theory, on the other hand, maintains that agents should not experience these anomalies as they use all of the information at their disposal to create expectations. Nonetheless, a number of reasons attest to the Day of the Week effect's presence (Gayaker *et al*., 2020). On the other hand, Mondays tend to have negative stock returns whereas stock returns on other days of the week are often positive. This phenomenon is known as the Monday effect. In the meantime, the Weekend effect happens since Friday is the last day of the workweek, which makes investors feel upbeat and likely to generate profits at the conclusion of the week (Suryandari & Wirawan, 2018).

Many emerging economies have also been the subject of research on the day-of-the-week effect. Time-varying volatility using ARCH-type (autoregressive conditional heteroskedasticity) models is allowed in recent literature. The Day of the Week effect is examined by Caporale & Zakirova (2017) for the Russian stock market from 1997 to 2016, and they find that while it is present in the mean equation for stock market returns, it vanishes when returns are adjusted for transaction costs. Zhang *et al*. (2017) use the GARCH(1,1) model and the rolling sample test to investigate the Day of the Week effect in 28 markets from 25 countries. They discover that the day of the week effect varies by region.

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

Week-four Effect

The Monday effect only happens in the fourth or fifth week of every month, pursuant to a phenomena known as the Week-Four effect. Monday returns, which can be negative or equal to zero, are regarded as inconsequential from the first to the third week. Wang *et al*. (1997) were the first to identify this Week-Four effect occurrence. Week-Four effect argued that when there are a lot of expenses at the end of the month, investors restrict their capital market trading because of liquidity issues (Cahyaningdyah & Faidah, 2017). Thus, all things considered, Mondays of the fourth and fifth weeks yield substantially smaller returns than Mondays of the other weeks.

This is a result of individual investors' desires for liquidity at the end of the month, which means that sales pressure will increase or sales activities on Mondays of the fourth and fifth week will increase. Due to the hectic work schedules of individual investors, who must write month-end work reports, investors are unable to monitor stock movements, which results in low stock returns as a result of a decline in the volume of buying and selling transactions (Alexandri *et al*., 2020).

Covid-19 and its Effect on EMH Anomalies

The Covid-19 virus affects health and has an impact on social and economic circumstances, beginning with an attack on the respiratory system which results in death in the Chinese city of Wuhan at the end of 2019. In addition, the World Health Organisation (WHO) declared a global emergency situation pertaining to the coronavirus on January 30, 2020, taking into account China's highest daily surge in death rates and its subsequent spread to other nations. This will have a cascading effect on the economy in early 2020, impacting global capital markets as well.

Due to lockdowns and other measures taken to stop the virus's transmission, the Covid-19 pandemic caused an economic crisis. As a result, industries including tourism, transportation, and entertainment saw sharp declines. Shanghai Stock Exchange and Dow Jones New York for the period of March 1–25, 2020 demonstrated a notable decline in stock returns in the capital market as a reaction to the Covid-19 pandemic (Sansa, 2020). Covid-19 also identified has an impact on the global financial markets, resulting in a drop in global stocks, oil, bonds, and equities as well as banking (Baret *et al*., 2020). The ARDL model was applied by Gherbi & Alsedrah (2021) utilising monthly Saudi Arabian data from January 2018 to October 2020. The findings indicated that Covid-19 has a short-term impact on the financial crisis.

METHOD

The LQ45 index returns are used in this study. The worldwide financial crisis, which started in the US in 2008 and ended on December 30, 2020, served as the starting point for the investigation. After that, the data is divided into: (a) prior to the Covid-19 pandemic period runs from January 3, 2008 to February 28, 2020; (b) the period from March 1, 2020 to December 30, 2022; and, (c) from January 3, 2008 to December 30, 2020.

Financial data does not follow a normal distribution because it is typically time series data that tends to trend at a level with significant swings. The data is generally not stationary at the level due to the excessive movement. Widodo (2022) recommended use a logarithmic method to get around this. Thus, the following formula is used to calculate LQ 45 returns:

$$RLQ45_t = ln(\frac{LQ45_t}{LQ45_{t-1}}) \quad \text{..... (1)}$$

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

where LQ45t represents the period *t* daily LQ45 index, and LQ45t-1 represents the index from the prior period. This study makes use of time series data, which requires testing for stationarity issues because of the primary issue with time series data (Widarjono, 2018). If the average and variance of data remain constant across time, it is referred to as stationary data. ADF stands for Augmented Dickey-Fuller in stationary testing.

In order to assess whether the ARCH effect exists, the study also look at the ARCH test. The GARCH (generalised autoregressive conditional heteroskedastic model), EGARCH (exponential generalised autoregressive conditional heteroskedastic model), TARCH (Threshold GARCH), PARCH (The Power ARCH), and ARCH (autoregressive conditional heteroskedastic) models, are developed if there is an ARCH effect problem (Nur & Dewangkara, 2020).

Model I: The Day of Week Effect

For Monday, Tuesday, Wednesday, and Thursday, the dummy variables were Mont, Tuest, Wedt, and Thurst. The location of $\sum_{i=1}^{p} RJKSE_{t-i}$ are the return variable's lag values. It was added to the formula in order to rule out the potential for autocorrelated mistakes and the heteroscedasticity issue (Nur & Dewangkara, 2020).

$$RLQ45_t = \beta_o + \beta_1 Mon_t + \beta_2 Tues_t + \beta_3 Wed_t + \beta_4 Thurs_t + \sum_{i=1}^{p} RJKSE_{t-i} + \varepsilon_i \ldots\ldots (2)$$

Whether there are variations in returns from Monday to Friday indicates the existence of The Day of Week effect. Conversely, if Monday's regression coefficient is noticeably lower than the average regression coefficient of the previous days, the Monday effect is identified. The term "Weekend Effect" or "Friday Effect" refers to a situation in which the regression coefficient on Friday is noticeably higher and more positive than the regression coefficient on other days (Cahyaningdyah & Faidah, 2017).

Model II: The Week Four Effect

While the dummy variables for Mondays in the first, second, third, and fourth weeks are Monw1t, Monw2t, Monw3t, and Monw4t. According to Cahyaningdyah & Faidah (2017), the Week Four effect is identified if the regression coefficient on Mondays of the first, second, and third weeks is not significant; but on Mondays of the fourth and fifth weeks, it is considerably negative. Time series data frequently exhibits non-constant variance and average, which makes forecasting challenging (Widarjono, 2018). Stationarity testing is done to get around this. The ADF test is used for stationarity testing. The data is stationary at the level, according to the ADF test results, which also show that the t-statistic is equal to -56.61903 with a probability of 0.0001.

$$RLQ45_t = \beta_o + \beta_1 Monw1_t + \beta_2 Monw2_t + \beta_3 Monw3_t + \beta_4 Monw4_t + \beta_5 Covid_t + \sum_{i=1}^{p} LQ45_{t-i} + \varepsilon_i \ldots (3)$$

As shown in Table 1, the average daily return is LQ45. The highest return on average before Covid-19 happened on Wednesday, the highest return during Covid on Friday, and the highest return before Covid-19 occurred on Wednesday. The lowest value of average return on LQ45 stocks was recorded on Monday before Covid-19, Monday during Covid, and Monday before-during Covid.

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E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

Table 1. Descriptive Statistics of Trading Days Before, During and Before–During Covid

Day			Mean	Std. Deviation	Minimum	Maximum
Monday	Covid	Before	-0.0015	0.0172	-0.1538	0.0786
		During	-0.0023	0.0174	-0.0817	0.0499
	Before-During		-0.0016	0.0173	-0.1538	0.0786
Tuesday	Covid	Before	0.0001	0.0141	-0.0729	0.0710
		During	0.0005	0.0134	-0.0662	0.0573
	Before-During		0.0002	0.0139	-0.0729	0.0710
Wednesday	Covid	Before	0.0014	0.0150	-0.1085	0.0875
		During	0.0000	0.0119	-0.0401	0.0362
	Before-During		0.0011	0.0144	-0.1085	0.0875
Thursday	Covid	Before	-0.0003	0.0149	-0.0991	0.0564
		During	0.0008	0.0179	-0.0666	0.1206
	Before-During		-0.0001	0.0155	-0.0991	0.1206
Friday	Covid	Before	0.0004	0.0139	-0.0817	0.0636
		During	0.0015	0.0129	-0.0269	0.0589
	Before-During		0.0006	0.0137	-0.0817	0.0636

Source: Secondary data (processed), 2023.

Table 2. Results of Model I: The Day of Week Effect

Variable	Coefficient	Std. Error	z-Statistic	Prob.	
FRI	0.00053	0.00039	1.34626	0.1782	
MON	-0.00144	0.00053	-2.74334	0.0061	***)
TUES	0.00026	0.00056	0.45994	0.6456	
WED	0.00077	0.00055	1.4071	0.1594	
THUR	-0.00016	0.00054	-0.28907	0.7725	
COVID	-0.00023	0.00036	-0.63574	0.5249	
AR(26)	0.02439	0.01396	1.74783	0.0805	
MA(3)	-0.03242	0.01602	-2.02342	0.043	*)
MA(2)	-0.0645	0.016	-4.0178	0.0001	**)
MA(4)	-0.0216	0.0162	-1.3321	0.1828	***)
Variance Equation					
C(11)	-0.275279	0.038646	-7.123032	0.0000	***)
C(12)	0.163922	0.017969	9.122603	0.0000	***)
C(13)	-0.072484	0.010814	-6.702888	0.0000	***)
C(14)	0.982759	0.003655	268.8492	0.0000	***)
T-DIST. DOF	5.776148	0.541242	10.67203	0.0000	***)

Note: ***) significant at the 1% level, **) significant at the 5% level, *) significant at the 10% level,
Source: Secondary data (processed), 2023.

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

The next stage is to model the LQ45 return using trading day dummy variables and Covid when it is established that the LQ45 daily return is stationary and the data description. Using the Box-Jenkins approach is the initial stage, followed by a white noise test. Given that the probability value is greater than the significance level and the Q (Portmanteau) test (Box and Pierce Test) on the Box Jenkins model with lag 36 yielded a Q of 31.196 while the probability is 0.456, it can be concluded that the ARMA/ARIMA model contains white noise.

Next, we use the LM test and squared residual correlation to see if there is an ARCH effect. The probability is significant at the 1 percent level according to the results of the LM Test using F-statistics and Chi-Square; however, the Box and Pierce Test, also known as the Q Test (Portmanteau Test), with a lag of 36 on the Quadratic Residual Correlogram obtained Q equal to 2240.8 while the probability is 0.000, leading to the conclusion that there is an ARCH Effect issue. Then, as suggested by Brooks (2019), the ARCH-GARCH model, which is devoid of the ARCH effect, is examined to see whether a leverage effect exists. The authors employ Engle and Ng's (1993) leverage testing (Brooks, 2019).

RESULTS

According to the Engle and Ng's test (1993), negative bias and joint bias are significant at the 1 percent level. These findings suggest that there is a problem leverage effect, or that responses differ depending on whether good or bad news is delivered. It is modelled using an asymmetric model, specifically EGARCH (1,1), TARCH(1,1), and PARCH(1,1), due to the leverage effect. The outcome is summarized in Table 2.

Table 2 reveals that in Model I, while EGARH(1,1) is the right model, it follows the t-distribution rather than the normal distribution. C(13) observes the presence of the leverage effect. These findings align with the research by Shamshir & Mustafa (2014), which modelled returns on the Karawachi Stock Market using a non-normal distribution and the GARCH model. The presence of a leverage effect is validated since the coefficient C(11) exhibits a negative and significant sign (Brooks, 2019). Furthermore, it is evident that Covid-19 is not significant, indicating that the problem has no bearing on the daily return pattern of LQ45.

In addition, the Wald test is used to evaluate the importance of the day-of-week effect. The test's null hypothesis is that all of the Monday, Tuesday, Thursday, and Friday regression coefficients add up to zero. It may be inferred that there is The Day of the Week effect on LQ45 based on the Wald test findings, which demonstrate that the *F*-statistic and Chi Square are both significant. These findings are consistent with the work done by Wulandari (2009) utilising LQ45 for the 2007 time frame. The Monday effect is a subset of the day of the week effect, wherein days other than Monday tend to yield positive returns but Mondays typically produce negative returns.

Table 2 also indicates that the regression coefficient is not significant on the other days, but it is significant on Friday and negative on Monday. Next, in order to determine whether Monday's average daily return is lower than that of other days, the author applies the Wald test. The Monday effect can be demonstrated in this investigation, according to the Wald test, which reveals that the *t*-statistics are -4.196 with a probability of 0.000. The Wald test results indicate that Monday's coefficient differs from the average regression coefficient on other days by a smaller amount because the likelihood is less than 1% and the value is statistically significant. The Monday effect is present in the LQ45 return pattern, according to previous findings. Wulandari (2009), Muzakir (2013), Handayani & Suartana (2015), Saraswati *et al*. (2015), Ardhian & Marisan (2017), Pratiwi

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

(2017), Suryandari & Wirawan (2018), Bagaskara & Khairunnisa (2019), Hendrawaty & Huzaimah (2019), Fadlilah (2019), and Meylianawati (2020) are all in line with this result.

Finding out if there is a Friday effect or Weekend effect is the next test. The conclusion that follows from the Wald test results is that there is no Weekend effect on the LQ45 return pattern, with the *t*-statistic being 0.8845 with a probability of 0.3765. Research by Dery (2020) and Kusherawati (2022) produced the same outcomes. The descriptive statistics for Model II testing are summarized in Table 3.

Table 3. Descriptive Statistics of Week Four Effect

Day			Mean	Std. Deviation	Minimum	Maximum
Mon – Week 1	Covid	Before	0.0006	0.0135	0.0471	-0.0517
		During	0.0039	0.0146	0.0439	-0.0362
	Before-During		0.0012	0.0137	0.0471	-0.0517
Mon – Week 2	Covid	Before	-0.0002	0.0160	0.0824	-0.1318
		During	-0.0010	0.0169	0.0477	-0.0862
	Before-During		-0.0004	0.0161	0.0824	-0.1318
Mon – Week 3	Covid	Before	0.0006	0.0154	0.0980	-0.0623
		During	-0.0010	0.0156	0.0483	-0.0687
	Before-During		0.0003	0.0154	0.0980	-0.0687
Mon – Week 4	Covid	Before	-0.0011	0.0147	0.0911	-0.1068
		During	0.0006	0.0175	0.1391	-0.0685
	Before-During		-0.0008	0.0153	0.1391	-0.1068
Mon – Week 5	Covid	Before	0.0011	0.0139	0.0155	-0.0739
		During	0.0015	-0.0001	0.0127	-0.0411
	Before-During		0.0006	0.0009	0.0151	-0.0739

Source: Secondary data (processed), 2023.

Table 4. Results of Model II: The Week Four Effect

Variable	Coefficient	Std. Error	z-Statistic	Prob.	
SEN*M5	0.00056	0.000206	2.715196	0.0066	***)
SEN*M1	0.003395	0.001584	2.143079	0.0321	**)
SEN*M2	-0.001819	0.000661	-2.752786	0.0059	***)
SEN*M3	-0.002309	0.000827	-2.79027	0.0053	***)
SEN*M4	-0.003065	0.000554	-5.53259	0.0000	***)
COVID	-0.000285	0.000379	-0.752244	0.4519	
AR(3)	-0.042975	0.016219	-2.649622	0.0081	***)
AR(4)	-0.030224	0.015995	-1.889588	0.0588	*)
Variance Equation					
C(9)	-0.307757	0.025015	-12.30296	0.0000	***)
C(10)	0.172182	0.011769	14.63052	0.0000	***)
C(11)	-0.068761	0.006604	-10.41274	0.0000	***)
C(12)	0.979669	0.002366	414.1419	0.0000	***)

Note: ***) significant at the 1% level, **) significant at the 5% level, *) significant at the 10% level,
Source: Secondary data (processed), 2023.

P-ISSN 2089-1989
E-ISSN 2614-1523
Terakreditasi (SK No. 225/E/KPT/2022)

According to Table 3, Mondays of the first and second weeks before, during, and after Covid consistently have positive average returns; Mondays of the second week have negative returns; and Mondays of the third and fourth weeks have inconsistent returns. Data analysis follows the description of Model II. Similar to Model I, the Box Jenkins approach is used initially, followed by a white noise test. Model II ARMA/ARIMA has white noise, according to the results of the white test on the Jenkins Box model using the Box and Pierce Test or the Q Test (Portmanteau Test) with a lag of 36. The probability is 0.225, but the probability value is greater than the significance level, yielding a Q equal to 35,487. The LM test and the squared residual correlation are then used to determine whether the ARCH effect is present.

The likelihood of the *F*-statistic and probability chi square is less than 1 percent, as demonstrated by the LM test, leading to the conclusion that there is an ARCH effect issue. Subsequently, ARCH-GARCH(1,1) modelling employed and retested with the LM test to confirm that Model II no longer exhibits the ARCH Effect. Based on the LM test results, it can be inferred that Model II does not have an issue with the ARCH Effect because the probability of both the *F*-statistic and Chi Square is more than the level of significance. Once the ARCH Effect has been determined to be absent, the presence of a leverage effect is ascertained as recommended by Brooks (2019).

According to the findings of the leverage testing by referencing Engle and Ng's test (1993), there is a joint-bias that is significant at the 1 percent level (Brooks, 2019). This indicates that there is an issue with the leverage effect, or that there is a difference in response between receiving good and bad news. It is modelled using an asymmetric model, specifically EGARCH (1,1), TARCH(1,1), and PARCH(1,1), due to the leverage effect. According to the results of the model II, EGARH(1,1) is the proper model, although it does not follow the student *t*-distribution, which is the normal distribution. The result also illustrates if the C(10) coefficient is substantial and negative, indicating that the existence of the leverage effect is verified (Brooks, 2019). The Covid-19 problem does not appear to have an impact on the JII daily return pattern, according to other findings that imply the Covid variable is not important. These results are summarized in Table 4.

Based on Table 4, the first Monday of the week must be positive but insignificant in order for the four-week effect to be present, whereas the second and third Mondays must be negative and significant. Furthermore, there is a notable improvement on Monday of the fifth week and a notable improvement on Monday of the sixth week. The Week Four effect is as expected because this study was able to detect the week four effect, as evidenced by the regression coefficients for Mondays of the first, second, and third weeks being significantly negative, and Mondays of the fifth week being significantly positive. These findings are consistent with the study of Fadhilah *et al*. (2021) and Saraswati *et al*. (2015), who employed the LQ45 daily return for the 2013 period.

Discussion

According to the study's findings, there is no relationship between Covid-19 and the presence of EMH anomalies - nor is there a relationship between the two. Investors originally viewed the Covid pandemic event negatively, and as a result, the JCI (Composite Stock Index) reached its lowest point in March 2020 - the lowest level in the last eight years beginning in 2020. But in the start of 2021 - the first January of the Covid pandemic - investors started to feel increasingly optimistic, leading some of them to repurchase shares (Maruli, 2022).

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This phenomenon demonstrates investors' high enthusiasm for buying and selling shares in Indonesia following the country's unstable and declining economic conditions caused by the Covid-19 virus, which spread rapidly throughout the world and made Indonesia one of the countries with the highest rate of infection. This made conditions for the stock market and stock trading less favourable and weakened at the time because everyone, especially the government, was focused on controlling the virus at that time in order to recover from the pandemic period. According to research by Susanti & Rahmawati (2020), the anomalous return of equities in the JII group was the same before and after Covid-19. Through studies employing American, Japanese, and Indonesian stock exchanges, Apriani & Komariah (2022) found no discernible difference in stock returns before and during the Covid against EMH phenomenon. According to Alam *et al*. (2020) research on the Indian Exchange, the government-imposed lockdown has a favourable impact on stock market performance.

The Day of Week effect, the Monday effect, and the Friday effect were all found to exist in this study. Suryandari & Wirawan (2018) claim that it happens as a result of Monday's high trading activity, which is brought on by individual investors' greater willingness to sell than to purchase shares. Because of this, Monday trade prices are typically lower than those of other trading days. The Monday effect has to do with making both illogical and reasonable decisions. The psychological aspects of investors, who make judgements about their investments based on more than just logical, practical, and objective evidence, can be used to understand the origin of the Monday effect. However, a number of factors, including investor mood, psychological states, and emotions, might also have an impact. Because it is the first day of work, Monday is regarded as the worst day of the week; on the other hand, Friday is regarded as the best day because it is the last day of work before the holiday.

Investor sentiment thus tends to be negative on Monday and positive on Friday. The average Monday return is negative because to this irrational behaviour propensity. The tendency for Monday stock returns to be negative is also influenced by issuers disclosing negative news on the final day of trading. When investors learn of negative news regarding the company on Monday, they will sell their shares right away. This includes the mindset that leads investors to overreact to the most recent information. Due to investors' psychological tendency to overreact, this condition is also inextricably linked to psychological variables. Furthermore, according to Abidin *et al*. (2009), investors' views are influenced by the negative return on Monday. As a result, they believe that the stock price is low enough to attract more buyers the following week, which drives up the stock price and results in a positive return. Cahyaningdyah & Faidah (2017) speculate that the Monday effect could be caused by the terrible Friday, or negative return, that happened the prior Friday. Additionally, some researchers have discovered that if there is unfavourable information (bad news), represented by a negative return on the Friday before (poor Friday), there will be more pressure from individual investors to sell.

The Week Four effect's existence was established by this study. Based on the test findings, it can be deduced that the Monday effect phenomena on the IDX is caused by negative returns in the second and third weeks in addition to those that occur in the fourth and fifth weeks. This may occur due to the fact that the issue of liquidity wants is unrelated to stock exchange investments, i.e., the money invested in the stock market is not utilised to satisfy liquidity demands at the end of each month. Contrary to this situation, the US capital market has a large number of small investors, and the liquidity demand at the end of the month plays a significant role in influencing their trading

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activity on the exchange. As a result, individual investors will be under more pressure to sell at the end of the month. Due to the psychological effects of investors who dislike Mondays as the first trading day, individual investors tend to sell more on Mondays. As a result, there will be even more selling pressure on Mondays towards the end of the month, namely in the fourth and fifth weeks. The real negative Monday returns thus only happen in the fourth and fifth weeks.

The study's findings suggest that using daily return patterns to profit from stock investments is not likely because stock movements do not follow a predetermined pattern, probably due to Indonesia's efficient stock market. Since numerous scholars have demonstrated the impact of macroeconomics and national concerns on changes in stock returns, macroeconomic analysis and national issues ought to be included as well

CONCLUSION

This analysis demonstrates that there is no variation in the movement of stock returns prior to, during, and subsequent to COVID-19. The LQ45 saw a sharp decline at the start of COVID-19, but because of the government's quick and accurate handling, which inspired investor optimism, the LQ45 did not fall too far; in other words, COVID-19 only had a temporary impact on Indonesia's capital market before the return pattern returned to normal.

The models used to demonstrate the existence of the EMH anomaly are typically asymmetric; however, there isn't a dominating model. Instead, each model - FIGARCH(1,1), TARCH(1,1), EGARCH(1,1), and EGARCH(1,1) - provides a distinct asymmetric model that follows the *t*-student distribution. The Day of the Week effect, Monday effect, and Friday effect were all demonstrated to exist in this study, but the Week Four effect could not be demonstrated. This could be the case since the liquidity needs that arise on Monday of the week before the month's conclusion have no effect on investor activity.

This study's limitation is that it does not compare the outcomes using a variety of analytical approaches, such as regression analysis, ARCH-GARCH, ANOVA, GLM, and others. in order to determine the analytical tools' consistency when employed for EMH anomaly testing. Macroeconomic variables should also be added in order to determine whether they have an impact on the LQ45 daily stock return pattern.

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