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INVESTOR BEHAVIOR IN THE CAPITAL MARKET: A REVIEW OF ADAPTIVE MARKETS HYPOTHESIS EVOLUTION THEORY OF COMPANIES IN INDONESIA DURING THE COVID-19 PANDEMIC

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Abstract

The anomaly that occurred during the COVID-19 pandemic indicates that the market is not always efficient, the anomaly occurs because there is asymmetric information received by investors. This is contrary to the EMH theory (efficiency markets hypothesis), which states that investors will not get abnormal returns in an efficient market. This research aims to empirically test the adaptive markets hypothesis during the COVID-19 pandemic. The population used in this study are companies listed on the Indonesia Stock Exchange 809 companies in 2020 – 2022. The sampling technique in this study was to use purposive sampling. The sample in this study is 56 companies that are politically connected and affected by COVID-19. The statistical test used in this study is the Variance Ratio Test. The anomalies that occurred during the COVID-19 pandemic cannot be explained by the efficiency markets hypothesis, so a theory is needed that can explain the pattern and nature of the stock exchanges that have occurred. The pattern and nature of the stock exchanges can be explained by the adaptive market's hypothesis. The implication of the adaptive markets hypothesis is that markets can be efficient at one time and inefficient at the next, so companies must adapt to survive in any situation. This research succeeded in answering the formulation of the problem in this study, where the results of the variance ratio test in the 5 observation periods experienced varying efficiencies, thereby strongly supporting the existence of the adaptive markets hypothesis during the COVID-19 pandemic.

Keywords: Anomalies, Efficiency Markets Hypothesis, Adaptive Markets Hypothesis, Abnormal Return, Variance Ratio Test.

JEL Classification: Q56 M12

INTRODUCTION

The spread of coronavirus disease-2019 (Covid-19) can affect human health. The virus was first discovered in China on December 31, 2019. The impact of the coronavirus disease-2019 (COVID-19) has been felt since early January 2020. The spread of the coronavirus disease 2019 (COVID-19) also resulted in a weakening of the Composite Stock Price Index (CSPI). Chairman of the OJK Board of Commissioners Wimboh Santoso (2020) said that the weakening of the JCI was due to investors' concerns about the spread of the coronavirus disease 2019 (COVID-19) in Indonesia. Investors are worried about the spread of coronavirus disease-2019 (Covid-19) which will have an impact on the performance of issuers in Indonesia. The Composite Stock Price Index (CSPI) was suspended several times after trading halts or a

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decline of up to 5% occurred on Thursday 12 March 2020, Friday 13 March 2020, Tuesday 17 March 2020, Thursday 19 March 2020, and Monday 23 March 2020. The following is the data for the Jakarta Composite Index (IHSG) for January 2020 to March 23, 2020.

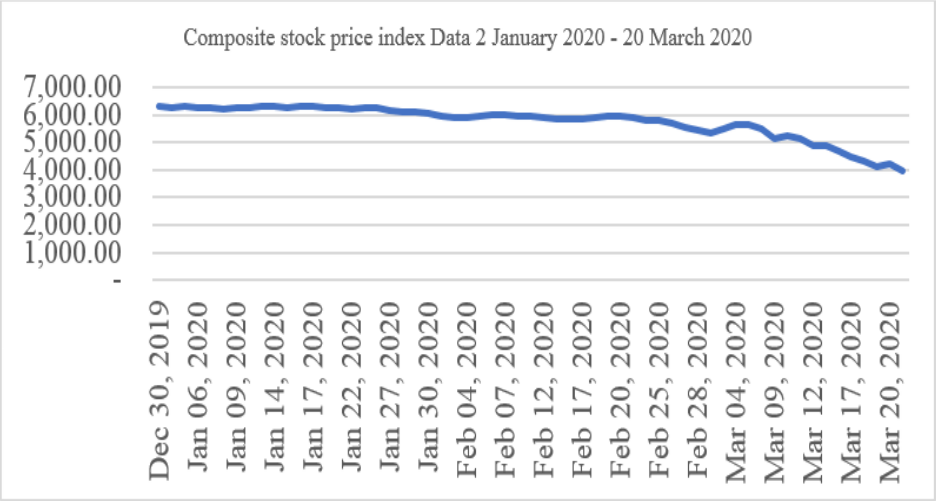

Figure 1: Data on the Movement of the Composite Stock Price Index from 2 January to 23 March 2020

Source: Indonesia Stock Exchange, 2020

Based on Figure 1, there was a decline in the Composite stock price index (CSPI) from January 2, 2020, to March 23, 2020, due to information on the spread of coronavirus disease-2019 (COVID-19). In early January 2020, the CSPI was at 6,283.58 points but then decreased to 3,989.52 points on March 23, 2020. The worst decline occurred in March 2020, when the coronavirus disease 2019 (COVID-19) entered Indonesia, resulting in several trading halt occuring.

From the beginning of 2020 to March 23, 2020, stock trading conditions on the Indonesia Stock Exchange continued to experience significant pressure. At the close of trading Monday, March 23, 2020, the Composite stock price index (CSPI) decreased by 205.43 points or 4.9% to 3,989.52 or 3,990. There was a trading halt at the end of session II, where 68 stocks experienced an increase, 332 stocks fell, and 112 stocks stagnated at the end of trading. Trading transactions reached IDR 5.3 trillion from 6.52 billion shares traded. The LQ45 index fell 41.35 points or 6.6% to 583.41, the Jakarta Islamic Index (JII) index fell 28.6 points or 6.6% to 402.57, the IDX30 index fell 22.82 points or 6.6 % to 321.35 and the MNC36 index fell 14.75 points or 6.6% to a level of 209.64.

Several stocks with large market capitalizations became top losers, namely PT Indocement Tunggal Prakasa Tbk (INTP) shares fell 6.97%, PT Indofood CBP Sukses Makmur Tbk (ICBP) shares fell 6.96%. This happened in line with the slowdown and pressure on the global, regional and national economy as a result of information on the spread of the coronavirus disease-2019 (Covid-19) outbreak. The decline in share value was due to increasing investor panic after the

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first case of the spread of the coronavirus disease 2019 (COVID-19) in Indonesia. This sentiment caused investors to panic sell. Different investor behavior also occurred in several stocks with a small market capitalization that became top gainers, namely, PT Metro Healthcare Indonesia Tbk (CARE) shares rose 25.36%, and PT Indofarma Tbk (INAF) shares rose 24.78%. Based on these data, the shares of the pharmaceutical sector have increased. This is due to an increase in demand for medical devices such as masks and hand sanitizers.

Anomalies occurred in the stock market during the Covid-19 pandemic, one of which was overreaction. Overreaction is one of the anomalies of market efficiency (Sabina *et al.,* 2017). Pratama *et al.,* (2016) stated that overreaction is based on information asymmetry. The intended information asymmetry is the information gap received by investors with one another. This information gap has an impact on investor behavior regarding the investment decisions they will make. Investors who receive information will act rationally, while investors who do not receive information are less rational in investing in securities in the capital market (Lestari 2015). Stock trading in the capital market is an activity that contains high uncertainty. Investors in the capital market often show irrational behavior. Susanti *et al.,* (2020) stated that this irrationality causes the market to panic and has the potential to disrupt the market so that market movements become abnormal. Levi (1996) explains that market anomalies are divided into 4 types, including firm anomaly, seasonal anomaly, event anomaly, and accounting anomaly. This research uses seasonal anomaly. Indriasari (2014) states that seasonal anomalies are related to market trading times that occur in the capital market. The following presents the anomaly that occurred in daily stock returns at the start of the Covid-19 pandemic from March 12, 2020, to July 27, 2020, for companies affected by Covid-19:

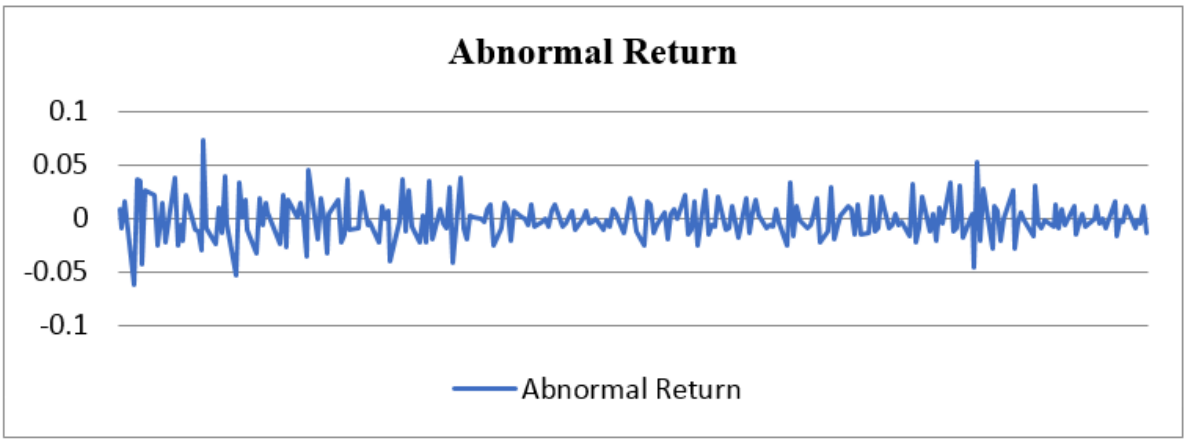

Figure 2: Graph of Abnormal Return at the Beginning of the Covid-19 Pandemic Period

Source: Yahoo.finance.com, Data processed 2023

Figure 2. Illustrates the abnormal return at the beginning of the Covid-19 pandemic. At the beginning of the Covid-19 pandemic, there were anomalies that occurred in the form of abnormal returns which fluctuated from time to time. Indriasari (2014) mentions that market anomalies are where things are found that should not have happened when the market was

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considered efficient. This anomaly at the beginning of the Covid-19 pandemic contradicts the theory of the Efficiency Market Hypothesis (EMH), which explains that in an efficient market, investors cannot beat the market or investors cannot get abnormal returns. Tendelilin, (2017) states that a market that has negative or positive abnormal returns means that the market is an inefficient market, or it can be called that the market is in the inefficiency phase. An inefficient market is one in which current prices do not reflect all publicly available demand and supply information, due to negligence or breakdown of communication between buyers and sellers.

Andrew Lo (2018) states that if the efficiency market hypothesis is in a stable stock environment and stable stock market policies, it will be fine, but when the market experiences high market dynamics, dynamic investment policies are also needed to reflect these changes. Lo (2018) also revealed that if the stock market experiences the things mentioned earlier, investors must adapt to changes in market conditions. Therefore, we need a theory that can explain the anomaly above. Several previous studies have suggested the AMH theory (adaptive market hypothesis) as a theory that can explain the anomalies that occur. Previous studies such as those conducted by Urquhart, (2013) examined the DJIA from January 2, 1897, to December 31, 2009. This study revealed that the adaptive markets hypothesis is better at explaining stock market behavior than the efficiency market hypothesis. Andrew Lo in 2004 introduced a revolutionary theory from EMH, namely the AMH (Adaptive markets hypothesis) to answer market conditions in a highly dynamic state. Lo, (2004) proposes a framework that is AMH on rationality theory in modern and traditional finance can coexist consistently. Campbell et al. (1997) and Xiong et al., (2018) proposed the notion of relative efficiency that differentiates markets referring to different levels of efficiency.

Specifically, AMH is a price that reflects information (Lo, 2004). According to Lo, (2004) market participants, each behave in general. If many market participants compete for scarce resources in one market then the market tends to be very efficient, for example, the US 10-Year Treasury Notes market which reflects the most relevant and very fast information. Conversely, if the market participants in a market have very little competition for the resources that are abundant in a particular market, then the market will be less efficient, such as the market for paintings from the Italian Renaissance. Market efficiency is highly dependent on context and dynamics (Lo, 2004).

Kim *et al,* (2011) tested whether the US stock market evolved over time in the US. As a result, they found market conditions to be a factor driving predictability and that markets were more efficient after the 1980s than in the previous period. Then Noda (2012) concluded that TOPIX supports AMH while TSE2 rejects AMH. Subsequent research by Alvarez-Ramirez *et al.* (2012) provided evidence supporting AMH and find the US market more efficient from 1973 to 2003. Urquhart & Hudson's (2013) documents provide mixed results for the United States, United Kingdom and Japan and conclude that AMH provides a convincing description of capital market behavior. that happened. This research seeks to reveal and prove that market efficiency by using AMH occurred during the COVID-19 pandemic.

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This research is the development of knowledge about AMH (adaptive markets hypothesis) through empirical testing and proving the AMH theory in companies in Indonesia. AMH testing on companies in Indonesia has a very important urgency because it can help understand market behavior in Indonesia and develop strategies that are more adaptive and responsive to market changes that occur. In addition, AMH testing can also strengthen AMH theory as one of the relevant theories in explaining market behavior around the world.

The remainder of this paper is organised as follows. Section 2 reviews the related literature of this study. Section 3 introduces the data and methodology. This is followed by the results and discussion in Section 4, and lastly, the conclusion and implications in Section 5.

LITERATURE REVIEW

Efficiency Market Hypothesis (EMH)

For a better understanding of price formation in a competitive market, the random walk model is then seen as a series of observations that are consistent with the efficient market hypothesis. The shift in emphasis begins with the observation that, like that of Samuelson (1965), evidence of correctly anticipated prices fluctuating randomly begins with the observation that in a competitive market, there is a buyer for every seller. Samuelson (1965) asserts that arguments like this are used to conclude that competitive prices must show random price changes without any bias and can be predicted. Fama (1970) developed a theory and evidence for market efficiency. An efficient market is a market where trading is based on available information that does not provide abnormal profits, so the market can be considered efficient. There are several conditions that must be met to achieve market efficiency, including:

1. There are many investors who are rational and try to maximize profits. These investors actively participate in the market by analyzing, valuing, and trading stocks. In addition, they are also price takers, so the actions of an investor alone will not be able to influence prices and securities.
2. All market participants can obtain information at the same time in a cheap and easy way.
3. Information that occurs is random.
4. Investors react quickly to new information so that security prices will change according to changes in actual value due to this information.

Fama *et al.* (1970) revealed that market efficient forms can be grouped into three, known as the efficient market hypothesis. The three forms of market efficiency referred to are:

1. Weak form of the efficient market hypothesis
2. The semi-strong form of the efficient market hypothesis
3. Strong form of the efficient market hypothesis.

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Adaptive Market Hypothesis (AMH)

Andrew W. Lo (2004) accommodates changes in market efficiency levels from time to time. Andrew W. Lo (2004) proposes a new version of the efficiency markets hypothesis derived from evolutionary principles. Andrew W. Lo (2004) argues that insight can be viewed and explained from a biological perspective as an evolutionary alternative to market efficiency. Andrew W. Lo (2004) proposes a new framework in which the efficiency markets hypothesis can coexist with financial behavior in a consistent and intellectual manner. This paradigm is called the adaptive markets hypothesis or abbreviated as AMH (Urquhart, 2013). Andrew W. Lo (2004) argues that much of the biased behavior in finance is actually consistent with evolutionary models. It is the impact of evolutionary forces on financial institutions and market participants that together determine market efficiency, investment performance, business and industry. The principles that outline AMH are described in Lo (2005) as follows:

1. Individuals act in their own self-interest
2. Individuals make mistakes
3. Individuals learn and adapt
4. Competition encourages adaptation and innovation
5. Natural selection shapes market ecology
6. Evolution determines market dynamics

Andrew W. Lo (2004) suggests a new idea to address the shortcomings of conventional studies on market efficiency. AMH provides a new framework for adapting EMH to the concept of limited rationality. An important implication of AMH is related to market efficiency which may vary from time to time due to changing market conditions, for example bubbles, crashes, and crises. To meet different levels of market efficiency from time to time.

Classification of Stock Return Behavior

The market is likely to go through independent periods and dependent periods. In analyzing behavior over time, a polynomial trendline is chosen because it will provide a clear depiction of behavior. The five types are:

1) Efficient market. Markets are never inefficient and markets are highly efficient. This means that there is no level of predictability or dependency on returns.
2) Move towards efficiency. Markets are not efficient, but over time market forces have forced markets to become efficient.
3) Turn to inefficiencies. The market has been efficient, but over time the market has become inefficient.
4) Adaptive Markets Hypothesis. The market has gone through at least three different stages of efficiency. That is, the market has become efficient, inefficient and then efficient again, or inefficient, efficient and inefficient.

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5) Market inefficiency. Under these circumstances the market has a degree of predictability or dependability across the sample and exhibits inefficiencies across the market.

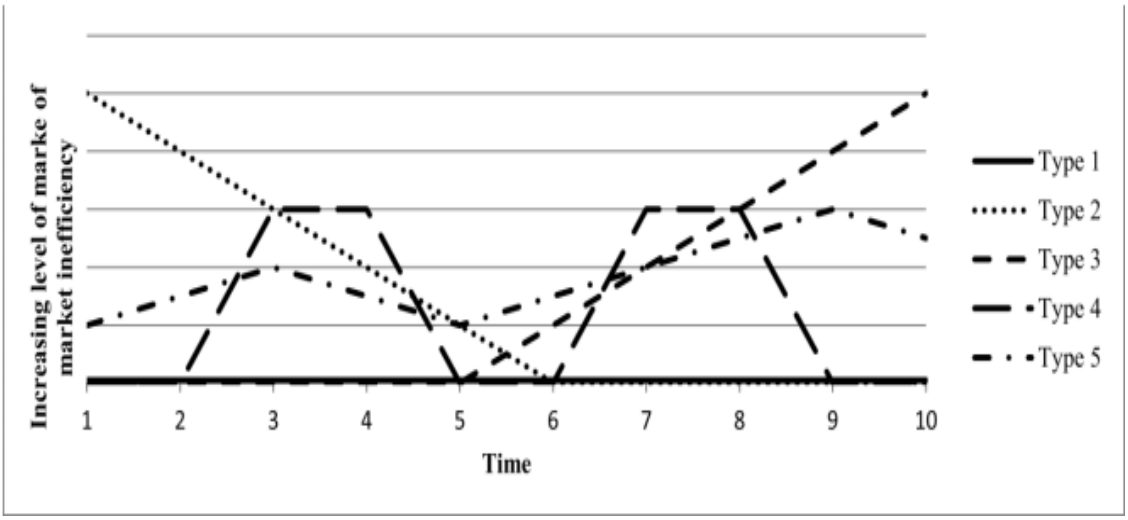

Figure 3: Classification of Stock Return Behavior

Figure 3 provides a graphical explanation of the types of market behavior over time. The y-axis is characterized as the level of market inefficiency and the x-axis as efficiency. Thus, the higher the y-axis, the more indicative of market inefficiency and the x-axis itself is an efficient market. Zero market level indicates market efficiency and it is classified as type 1. Type 2 is where the market has a level of inefficiency but has switched to market efficiency over time, so according to figure 3 the level of inefficiency is at zero but is now positive. Type 3 indicates a shift from efficiency to inefficiency, while type 4 documents the adaptive nature of returns. In this type the market has shifted between being efficient and inefficient (or vice versa) at least three times. Type 5 documents market inefficiency, so that the market becomes inefficient across all samples and above the x-axis (Urquhart, 2013).

Event Study

Event studies are part of the concept of the efficiency market hypothesis proposed by Fama (1991). Event study is a form of study to test market efficiency in semi strong form. In addition to semi-strong form of market efficiency, Fama (1970) also classifies typologies of weak form and strong form of market efficiency. This focus is on discussing event studies for testing semi-strong form of market efficiency (Tendelilin, 2017). Event studies are also used to test the evolutionary theory of market efficiency, namely the adaptive markets hypothesis, this is what Xiong et al., (2018) did, who analyzed and proved that there is AMH in the Chinese capital market by analyzing capital market behavior with the event study calendar effect since from 1996 to 2015. This study uses abnormal return calculations to determine the existence of AMH (adaptive markets hypothesis) because until now there has been no mathematical approach used to test AMH, so a computational approach is needed to test AMH.

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Event studies in the short term can be calculated by abnormal returns. According to Jogiyanto (2010), abnormal returns are the excess of actual returns over normal returns. Normal returns are expected returns or returns expected by investors. Jogiyanto, (2010) states that there is no benchmark to determine the length of this estimation period. The commonly used estimation period lengths range from 100 days to 250 days for daily data.

Actual Return or the real return that occurs at time t, is the difference in the current price relative to the previous price. The expected return is the estimated return expected by investors, which is determined by the estimation model. To determine the expected return to test market efficiency. Brown & Warner (1985) shows three models to test the efficiency framework, the three models are i) mean-adjusted returns, ii) market-adjusted returns, and iii) market model returns. In this study, the calculation model used is the mean adjusted returns model as a calculation model to test market efficiency.

In the mean-adjusted returns model, the expected return is constant, equal to the average return previously realized during the estimation period. This model assumes that if a market is efficient and stock returns vary randomly around the true value, then the average security return calculated from the previous period can be used as the expected return. The formula is as follows:

$$AR_{i,t} = R_{i,t} - R_i$$

Information:

ARi,t = abnormal return on securities on day t

Ri,t = actual return of security I on day t

Ri = average return of security i for the number of days before day t

Hypothesis

Different reactions caused by various investors from the information received make the stock market environment changeable, the stock market environment that changes frequently makes investors have to continue to adapt from the existing situation, this causes the market to become efficient at one time, then return to being ineffective. Efficient in the next period. Andrew W. Lo (2004) proposed a new framework called the adaptive markets hypothesis (AMH) in which efficiency and inefficiency can coexist consistently and intellectually. Alvarez-Ramirez et al. (2012) provide evidence in favor of AMH and find the US market more efficient during 1973 to 2003. Urquhart and Hudson (2013) document mixed results for the US, UK and Japan and conclude that AMH provides a convincing description of capital market behavior throughout the study. Then (Wibowo, 2012) revealed evidence from AMH on the Indonesia Stock Exchange in the 1999, 2004, and 2009 election periods which explained that AMH was able to explain capital market behavior better than the EMH (efficiency market hypothesis), therefore based on previous research hypotheses used in this study are as follows:

H_1: The COVID-19 pandemic strongly supports the adaptive markets hypothesis

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METHOD

The type of research used is an event study. According to Arde & Kesuma (2017), the event study approach was initially more focused on discussing corporate events. But now the discussion on the event study has developed. The tests are not limited to internal company events or corporate actions, but can also touch on macroeconomic, financial, and political aspects.

The population used in this study are companies listed on the IDX (Indonesian Stock Exchange), namely 809 companies in 2020 – 2022. The sampling technique in this study was to use purposive sampling. Sugiyono (2017) explains that purposive sampling is a sampling technique with certain considerations. The reason for using a purposive sampling technique is that not all samples have criteria that match the phenomenon under study. Based on this, the considerations for determining the criteria for determining the sample used in this study must be fulfilled. The sample in this study is 56 companies that are politically connected and heavily affected by COVID-19.

According to Sugiyono, (2017), the data analysis method is the process of grouping data based on variables, tabulating data based on variables, presenting data for each variable that is examined, and performing calculations to test the hypotheses that have been proposed in research using analytical applications. The type of data used in this research is time series data, time series is a series or series of the values of a variable or the results of observations, in this case the value of the stock price index, which is recorded in successive time periods. The calculations in this study began by collecting daily stock price data from 59 companies from January 1, 2020, to December 31, 2022, and then calculating the index using the market value-weighted average index method. Then after getting the index value, the next step is to calculate the abnormal return with the mean adjusted model and then do the normality test to see if the data is normally distributed then the last step is statistics using the variance ratio test to prove the hypothesis. The statistical test used in this study is the Variance Ratio Test. A.W. Lo & MacKinlay (1999) explain the Variance Ratio Test is a test used to determine whether an effect follows a random walk. This test is usually used to test the market efficiency hypothesis by determining whether security prices show autocorrelation or not. The variance ratio test was formulated by A. W. Lo & MacKinlay (1999). For example, Pt is the price at time t, and Xt ≡ ln Pt. The model in this study is as follows: (A. W. Lo & MacKinlay, 1999).

$$X_t = \mu + X_{t-1} + \varepsilon_t$$

Information:

μ: Free Deviation Parameters

εt: random disturbance (error)

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RESULTS

The daily stock price data obtained are then grouped according to the research events. After the daily stock price data is grouped, an index calculation is performed before calculating the abnormal return. The index calculation for the daily shares of companies that have political connections and are affected by COVID-19 is explained in the calculation below:

Market Value Weighted Average Index

The index calculation method used in this study is the market value-weighted average index. The calculation is the calculation of abnormal returns using the mean adjusted model for 5 events during the Covid-19 pandemic, namely March 2, 2020 – April 12, 2020 (Indonesia's first positive case of Covid-19 was announced), April 13, 2020 – May 17, 2020 (Covid-19 became a National Disaster), 18 May 2020 – 4 June 2020 (Prohibition of Homecoming for Eid Al-Fitr), 5 June – 20 July 2020 (Transitional PSBB), and 21 July 2020 – 28 August 2020 (Full Hospitals).

Average Returns

To estimate the mean adjusted model using the average of each company's stock using the average return (Brown & Warner, 1985) the following is the result of calculating the average return from the observation period:

Table 1: Average Return Calculation Results

No.	Event Date	Average *Returns*
1	02 March 2020 – 12 April 2020	0,006457702
2	13 April 2020 – 17 May 2020	0,000439934
3	18 May 2020 – 4 June 2020	0,000302736
4	5 June – 20 July 2020	0,000371908
5	21 July 2020 – 28 August 2020	-0,00086663

Source: Processed data, 2023

Calculation of the average daily return on politically connected company indexes. Table 1 shows that the 4 events of the COVID-19 pandemic showed a positive average return, but on 21 July 2020 – 28 August 2020 the expected return had a negative value.

Abnormal Return

Abnormal return calculations are performed on daily stock indexes of companies that have political connections during the COVID-19 pandemic. The following shows the results of the abnormal returns that have been carried out.

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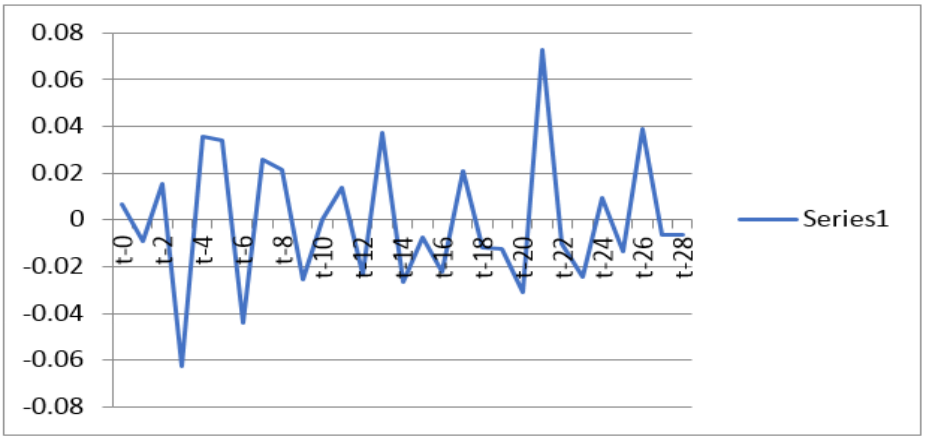

Figure 4: Graph of Abnormal Returns March 02, 2020 – April 12, 2020

Source: yahoo.finance.com, Data will be processed in 2023

At the start of the COVID-19 pandemic, March 2, 2020, was the date when the first case of Pandemic Covid-19 was announced in Indonesia. Figure 4 illustrates the results of abnormal returns in the event period that there was an abnormal return on day 3 or t-3 of -0.062 then the abnormal return became positive on t-4 and t-5 with a value of 0.0358 and 0.033 abnormal respectively This positive return does not last long because at t-6 the abnormal return returns to a negative value indicating that the result of the abnormal return fluctuates throughout the event.

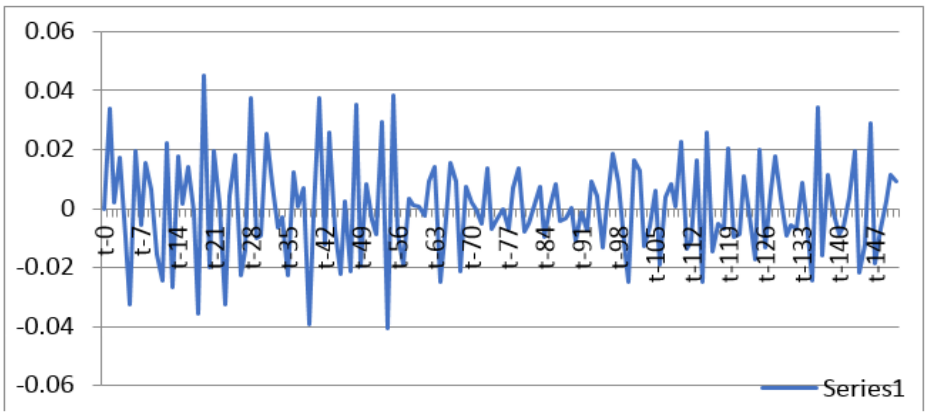

Figure 5: Graph of Abnormal Returns April 13, 2020 – May 17, 2020

Source: yahoo.finance.com, Data will be processed in 2023

During the Covid-19 Pandemic event, April 13, 2020 – May 17 2020 was the event when Covid-19 was announced as a National Disaster. The results shown in Figure 5 which illustrate the results of the abnormal return index of companies that have political connections during the Covid-19 pandemic indicate that there were abnormal returns that fluctuated throughout

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the event. The abnormal return value on this event has a positive abnormal return value that is less than the negative abnormal return value, which is 72 positive abnormal return values, while the negative abnormal return value is 77.

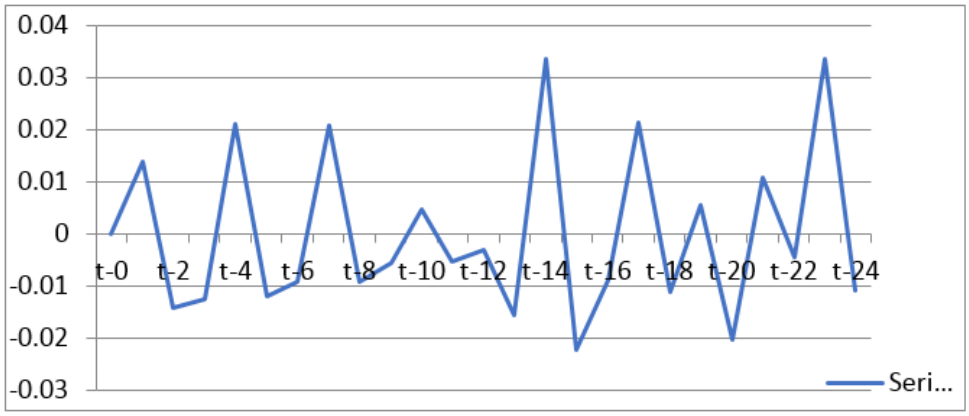

Figure 6: Graph of Abnormal Return May 18, 2020 – June 4 2020

Source: yahoo.finance.com, Data will be processed in 2023

During the Covid-19 pandemic, May 18, 2020, was the event of the Eid Mudik Ban. Figure 6 illustrates that the results of abnormal returns on the index of companies that have political connections show that there is a positive abnormal return on day 4 or t-4 of 0.021 where previously there was a negative abnormal return value on t-2 and t-3 with respective values - each of -0.014 and -0.012 this negative abnormal return did not last long because at t-7 the abnormal return returned to a positive value indicating the results of the abnormal return fluctuated throughout the event.

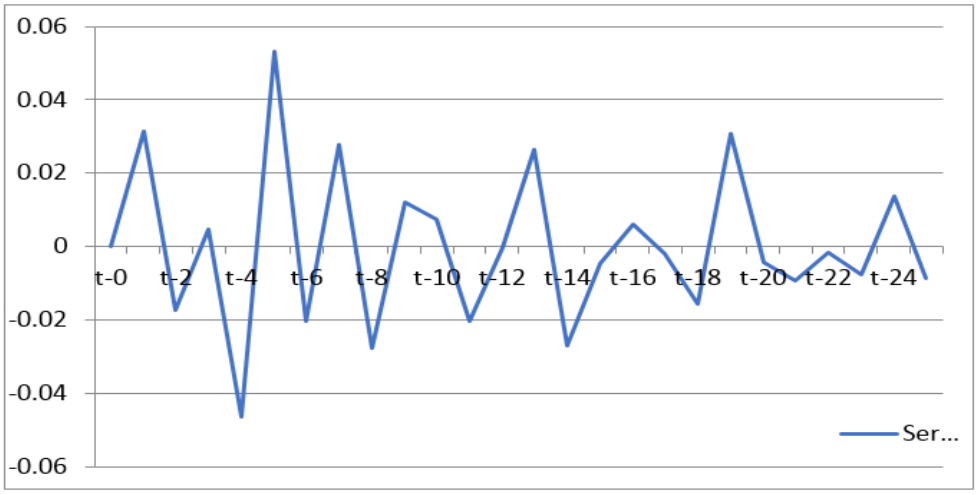

Figure 7: Graph of Abnormal Returns June 5 – July 20, 2020

Source: yahoo.finance.com, Data will be processed in 2023

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The events depicted in Figure 7 illustrate the announcement of the PBB Transition on June 5, 2020. Figure 7 illustrates that the results of abnormal returns on the index of companies that have political connections show positive abnormal returns on day 1 or t-1 of 0.031 but on the following day, namely t-2, there was a negative abnormal return value of -0.012, the largest negative abnormal return in this event was -0.0467 and the largest positive abnormal return in this event was 0.053 indicating the results of abnormal returns fluctuated throughout the event.

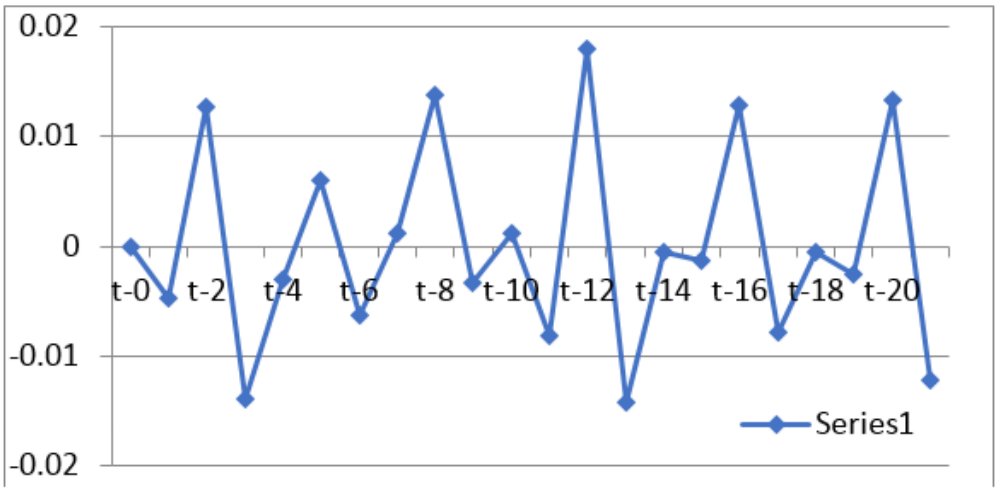

Figure 8: Graph of Abnormal Return July 21, 2020 – August 28, 2020

Source: yahoo.finance.com, Data will be processed in 2023

June 27, 2019, was an event for the full announcement of hospitals in various regions in Indonesia because every day there were additional Covid-19 victims on July 21, 2020. Figure 8 shows the results of abnormal returns on the index of companies that have political connections during the Covid pandemic -19 there is a positive abnormal return on day 2 or t-2 of 0.012 but on the following day, namely, t-2 and t-3 there are negative abnormal return values of -0.013 and -0.003 respectively, the largest negative abnormal return in this event is of -0.014 on t-13 and the largest positive abnormal return on this event is 0.017 on t-12 showing the results of the abnormal return fluctuating throughout the event.

Descriptive Analysis

Before testing the hypothesis, a descriptive analysis was first carried out. In the following, a descriptive analysis is presented to find out the value of calculating the average value, minimum value, maximum value, and standard deviation of the data which is described in the table below:

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Table 2: Results of Abnormal Return Descriptive Analysis

Statistics	Value
Sample	253
Mean	0,000029
Maximum	0,1291
Minimum	-0,0976
Std. Dev	0,03106

Source: Data processed, 2023

Based on the results of the descriptive analysis in table 2, it can be seen that the average daily abnormal return on the index of companies that have political connections is 0.000029. The standard deviation is a statistical value that is used to determine how spread out the data is in a sample, and how close individual data points are to the mean or average of the sample values. Meanwhile, it is known that the daily abnormal return standard deviation value for the index of companies that have political connections is 0.03106 with an average value of 0.000029. This indicates that the distribution of the data in the sample is quite far from the individual data points. The maximum daily abnormal return value for the index of companies that have political connections is 0.1291. The minimum abnormal return value is -0.0976 which indicates that this value is the lowest abnormal return value in the observation period of political events.

Data Requirements Test Results

The data normality test was carried out using the Jarque fallow test. The jarque falla test was carried out on daily abnormal return stock index data of companies that have political connections with the government. The following shows the results of the normality test in tabular form.

Table 3: Normality Test Results

No.	Event Date	*Jarque Bera*	Probability sig (0,05)
1	02 March 2020 – 12 April 2020	5,599406	0,0608
2	13 April 2020 – 17 May 2020	0,869230	0,6475
3	18 May 2020 – 4 June 2020	0,077108	0,962180
4	5 June – 20 July 2020	0,492519	0,781719
5	21 July 2020 – 28 August 2020	0,091428	0,955315

Source: Data processed, 2023

The results of the Jarque Bera test shown in Table 3 provide an explanation that the probability value for the 5 Covid-19 events from March 2 2020 to August 28 2020 has a greater value than the significance level of the jarque falla test which is 5% or 0.05. So from these results, the abnormal return data from March 2 2020 to August 28 2020 is normally distributed or in other words, H0 is accepted and H1 is rejected.

Hypothesis Testing Results

Testing the model in this study using the Variance Ratio Test. The variance ratio test is a test used to test the efficiency of a market. This test is carried out to see efficiency throughout the

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observation period by using abnormal return data on the index of companies that have political connections. Based on this explanation, the results of the variance ratio test are presented below:

Table 4: Exchange Nature

Period	Exchange Nature
02 March 2020 – 12 April 2020	Efficient
13 April 2020 – 17 May 2020	Not efficient
18 May 2020 – 4 June 2020	Efficient
5 June – 20 July 2020	Efficient
21 July 2020 – 28 August 2020	Not efficient

In Table 4 it can be seen that during the events of March 2, 2020 – April 12, 2023, the market was efficient, but in the following events April 13 – May 17, 2020, the market experienced inefficiency and returned to being efficient in the following events May 18, 2020 – June 4, 2020. According to Wibowo (2012), in the concept of the Adaptive market's hypothesis, this change is possible because environmental changes in a broad sense can include regulations, competitors, as well as political, and economic conditions and the COVID-19 pandemic. In the following, an explanation of the Adaptive markets hypothesis is presented on the nature of the exchange that occurs.

The following presents the results of the variance ratio test on abnormal return index data for companies that have political connections and are affected by COVID-19.

Table 5: Variance Ratio Test Results

Date	Period	*Var. Ratio*	*Std. Error*	*z-Statistic*	*Probability*
02 March 2020 – 12 April 2020	2	0,703610	0,175157	-1,69214	0,0906
13 April 2020 – 17 May 2020	2	0,412100	0,081379	-7,2242	0,00
18 May 2020 – 4 June 2020	2	0,257597	0,31231	-2,37705	0,0175
5 June – 20 July 2020	2	0,232908	0,277834	-2,76097	0,0058
21 July 2020 – 28 August 2020	2	0,534311	0,287235	-1,62113	0,105

Based on Table 5 the results of the variance ratio test were carried out on 5 important events during the Covid-19 Pandemic. In the observation period, March 2, 2020 – April 12, 2020, May 18, 2020 – June 4, 2020, and July 21, 2020 – August 28, 2020, each has a probability value of 0.0906, 0.0175, 0.105 which is greater than the significance level of 1 % or 0.01 then during the observation period March 2 2020 - April 12, 2020, May 18, 2020 - June 4, 2020, July 21, 2020 - August 28, 2020, H0 follows the martingale pattern or in other words, H0 is accepted H1 is accepted therefore the company - politically connected firms experience efficient markets. However, different results were shown in the observation period April 13 2020 - May 17 2020 and June 5 - July 20 2020 the results of the two observation periods had a sig value smaller than 0.01, namely 0.00 and 0.005 respectively, thus in the observation period April 13 2020 – May 17 2020 and June 5 – July 20 2020 H0 does not follow the martingale pattern or in other words H0 is rejected and accepts H1 this indicates that the market is not efficient in the observation period April 13 2020 – May 17 2020 and June 5 – 20 July 2020. Based on the explanation of the results of the variance ratio test that was previously described, throughout

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the observation period it supports the existence of the AMH (adaptive markets hypothesis). This will be explained further in the discussion.

DISCUSSION

The events observed in this study were when the first positive case of Covid-19 in Indonesia was announced (02 March 2020 – 12 April 2020), the Announcement of Covid-19 as a National Disaster (13 April 2020 – 17 May 2020), the Ban on Homecoming (May 18 2020 – June 4 2020), Transitional PSBB (June 5 – July 20 2020), and Full Hospitals with Covid-19 Patients (July 21 2020 – August 28 2020).

Based on the statistical variance ratio test that has been carried out, the results show that market behavior during the COVID-19 pandemic experienced efficiency and inefficiency from time to time. This can be seen in Table 4 which indicates the existence of AMH (adaptive markets hypothesis) throughout the observation period or in words Another stock market behavior that occurred in companies with political connections during the Covid-19 pandemic is in accordance with the theoretical framework of the AMH (adaptive markets hypothesis). On March 2, 2020 – April 12 2020 which is the initial process of the entry of the Covid-19 pandemic in Indonesia. On that date investors do not feel the need to take an action that can affect the stock exchange, therefore the market tends to be efficient. However, from April 13, 2020 – to May 17 2020 there was an event that the COVID-19 pandemic became a National Disaster, This had an impact on investors, because some investors waited and saw which caused transactions on the stock market to decline because investors still waiting for certainty about economic conditions, so steps taken by these investors make the market tend to be inefficient.

Then later May 18, 2020 – June 4, 2020, the government implemented a Ban on Eid Mudik. This information was well received by investors as one of the information for handling the COVID-19 pandemic and for the market to return to an efficient market. These results are in accordance with research conducted by Wibowo (2012) who tested market efficiency in 1999. Wibowo (2012) revealed that markets tended to be efficient after reforms marked by foreign investors entering the Indonesian market.

Furthermore, June 5 – July 20 2020 is the PSBB Transition date, this will cause the JCI to move flat and with a tendency to weaken on the other hand PT. Mirea Aset sekuritas stated in its note that the ongoing COVID-19 pandemic is confusing the market and has the potential to exhaust the market, market participants need positive news to become a positive catalyst for the domestic stock market. So, from this explanation of the events of 5 June - 20 July 2020, the market became efficient.

The next observation period, July 21, 2020 – August 28, 2020, is an event where hospitals are full in various regions in Indonesia because the Indonesian population who are infected with COVID-19 is always increasing, This makes investors more worried and conditions are not conducive, so during the period observation 21 July 2020 – 28 August 2020 the market is again becoming inefficient. So, the tests that have been carried out answer the hypothesis or in other words during the COVID-19 pandemic in Indonesia strongly support the existence of the

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adaptive market's hypothesis. This is in accordance with the theory presented by Lo (2004) which states that market efficiency and inefficiency can coexist consistently and intellectually. Lo, (2018) stated that the market must continue to adapt to the changing conditions that occur.

These results are consistent with research conducted by Urquhart (2013) who examined the DJIA, FT30, TOPIX indices in 1897 - 2009. The research results revealed that the three indices described the 4th category supporting AMH. Furthermore, this research is in accordance with research conducted by Xiong *et al.,* (2018) examining the adaptive markets hypothesis with the calendar effect in China where AMH exists in 4 calendar effects of the stock market, namely the monday effect, January effect, turn of the month effect (TOTM).), and Chinese lunar new year (CNLY) other studies such as Ghazani & Ebrahimi (2019) examine changes in market efficiency and the evolution of crude oil market behavior using automatic permanteu (AQ) and generalized spectral (GS) recommend that market conditions are consistent with adaptive markets hypothesis.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the anomaly that occurred during the Covid-19 Pandemic cannot be explained by the efficiency markets hypothesis, so a theory is needed that can explain the pattern and nature of the exchanges that have occurred, so the pattern and nature of these exchanges can be explained by adaptive markets. Hypothesis. The implication of the adaptive markets hypothesis is that markets can be efficient at one time and inefficient at the next, so companies must adapt to survive in any situation. This research succeeded in answering the formulation of the problem in this study, where the results of the variance ratio test in the 5 observation periods experienced varying efficiencies, thereby strongly supporting the existence of the adaptive markets hypothesis during the Covid-19 Pandemic.

This research examines the AMH on the index of companies that have political connections during the Covid-19 pandemic, but there are still very few references and previous research conducted in Indonesia so that this research is expected to be further developed by further research.

Investors are advised to first look at the information received as a consideration for making further decisions, so that investors can know clearly what to do in the future. Therefore, investors must continue to adapt to the changing stock market environment at any time. For researchers, the theory of the Adaptive markets hypothesis is an evolutionary theory that has not been studied much in Indonesia, so the development of this research must continue to be improved. In this study, the statistical variance ratio test (A. W. Lo & MacKinlay, 1999) was used to test market efficiency. Therefore, for further research, it is suggested to conduct adaptive markets hypothesis research by using different statistical tests such as autocorrelation, automatic portmanteau, and generalized spectral to enrich the research results. And for the determination of the sample so that it can pay more attention because, during the COVID-19 pandemic, the samples used were companies that were politically connected.

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