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ANALYSIS OF THE IMPACT OF THE COVID-19 EVENTS ON STOCKS ON THE LQ45 INDEX FOR THE JANUARY - MARCH 2020 PERIOD

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Abstract: In the world of capital markets, indicators are used to measure changes in stock prices. A stock index is an indicator to see information about stock price movements. The existence of various information both from within the country and abroad is one of the external factors that causes the movements of stock prices to change significantly. This study aims to analyze the price movements of the companies' shares included in the LQ45 Index from the impact of a big event that is currently happening, namely the pandemic *Covid-19*. This study uses the method of *Survival Analysis* with the approach *Kaplan Meier*, variable of this study uses stock prices. The results of the research that have been conducted found that external factors, namely information about *Covid-19* that spread throughout the world, given a negative impact on stock price movements on the LQ45 Index, namely 45 LQ45 companies experienced a decline in stock prices during the observation period, 5 of 45 companies still experienced a declined. After the observation period took place, viewed by sector, eight sectors included in LQ45 experienced a decline in stock prices at the same time during the period 02 January to 31 March 2020.
Keywords: LQ45 Index*;* Stock Price; Survival Analysis; The Kaplan Meier

INTRODUCTION

The stock price movements of companies listed on the IDX are measured using an index. The stock index is a statistical measure that describes the movement of stock prices as a whole, which is selected based on criteria and methodologies and is evaluated regularly (Bursa Efek Indonesia, 2018). A stock price movement can be affected by internal and external factors. According to Alwi (2003) in Zulfikar (2016), internal factors are aspects of the company internal that can cause stock prices to fluctuate, while external factors are aspects that are beyond the company's control, including economic conditions, changes in interest rates, inflation, regulation, and deregulation of trade. The various issues within the country and abroad became the external factors that caused stock prices to change. The rumors are currently being discussed in some parts of the world that can affect various sectors of state income, one of which is the capital market.

The world is currently facing a big event, namely the pandemic *Covid19*. A pandemic is the spread of a disease that has spread throughout the world and occurs continuously (Winarno, 2020). Some efforts have been made by the government to prevent the spread of COVID-19, one of which is in the health sector, namely the policy to reduce routine practices in public hospitals. The decline in hospital revenues hurt the capital market. It can show from the six major hospital issuers listed on the IDX experiencing a decline in stock prices.

Covid-19 not only affects the health sector but also affects the economy and markets in Indonesia. Some of the information and policies submitted by the government related to Covid-19 harmed the market, which was the IHSG was in a downward trend in January 2020 due to negative Covid-19 sentiment spreading in China. News of the entry of *Covid-19* into Indonesia in March 2020, caused the IHSG to continue to experience a significant decline. As in trading on March 9, 2020, the IHSG was down to

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6.5%. On March 12, 13, 17, 19, 22, and 30, the IHSG fell to more than 5% (Praditya, 2020).

In the World Health Organization (WHO) in March 2020, officially announced that *Covid19* was categorized as a pandemic. That was seen based on the number of infections from the virus worldwide which reached more than 121,000. More than a month after the statement, the IMF provided information that there was a substantial decline in its growth forecast for 2020, stemming from the revised GDP (Gross Domestic Product) growth outlook of ASEAN countries. The same is the case in Indonesia, where the initial estimate of GDP growth was 5.3% which was estimated in August 2019 but experienced a reduction in the GDP growth forecast to 2.3 which was estimated in April 2020 (Brief, 2020).

In the world of capital markets, an event that is happening or has already occurred will have an impact on stock price movements, such as research on stock price movements as a result of the pandemic *Covid-19* has been carried out by Topcu and Gulal, with research results showing that the pandemic *Covid-19 has an* effect on negative on stock markets in developing countries (Topcu & Gulal, 2020). Therefore, a researcher was interested in analyzing how the reaction of stock price movements of companies included in the LQ45 Index to a big rumor happening, namely the pandemic *Covid-19,* using the method of *Survival Analysis.* This study uses a sample of 45 companies listed in the LQ45 Index from August 2019 to January 2020, with an observation period from January to March 2020. The LQ45 Index was chosen as the object of research because the LQ45 Index represents 60.5% of trading capitalization on the IHSG. This research uses the period of January to March because the information related to Covid-19 already scattered around the world at the end of December 2019, where at first this virus was not known as *Covid-19* instead of a case of pneumonia, then in early January 2020, announced that this virus was *Covid-19* and b detected in various parts of the world, in Indonesia itself *Covid-19* began to infect 2 Indonesian citizens (WNI) in March 2020, so a lot of information and policies issued by the government to reduce the spread of *Covid-19*.

Research on external factors that influence the movement of company stock prices has been carried out by previous researchers, such as research conducted by Anh & Gan in August 2020 which aims to determine the effect of the Covid-19 pandemic on daily stock returns in Vietnam by using the panel data regression method, the results of the study prove that the Covid-19 pandemic affects the movement of daily stock returns in Vietnam (Anh & Gan, 2020). Another study was conducted by Baker et al. (2020) to analyze the reaction of the stock market in the United States to the Covid-19 pandemic and compare it with the impact of previous pandemics using a text-based method, and the results of the study concluded that the United States reacted more strongly to Covid-19 compared to past pandemics (Baker et al., 2020). Another study was conducted by Junaedi & Salistia (2020) to analyze the effect of the pandemic on capital market developments in Indeks Harga Saham Gabungan (IHSG). The results of the study concluded that the IHSG movement was influenced by internal and external conditions (Junaedi & Salistia, 2020). Another study was conducted by Putri in May 2020 to know the difference in the price of banking shares with the largest assets before the Covid-19 outbreak. The results of the study stated that there was a significant decline in stock prices in the banking industry in Indonesia before and during the Covid-19 pandemic (Putri, 2020). This study aims to analyze the price movements of the companies' shares included in the LQ45 Index from the impact of a big event that is currently happening, namely the pandemic *Covid-19.*

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METHODS

This study was conducted to analyze the reaction of the capital market to inform a major event that is currently happening, namely the Covid-19 pandemic. The aim of this research is descriptive research, namely research conducted to describe in detail the relevant aspects of the phenomenon that attracts researchers to conduct this research (Solimun et al., 2020). The method used in this study is a quantitative research method. Quantitative research is a development of the positivism approach, which is an approach that views social problems or social phenomena as they are based on existing real conditions, without questioning the causes of these social problems, and how they affect people's lives (Seran, 2020).

The populations in this research were companies that were included in the LQ45 Index, which consisted of 45 companies that changed every six months according to predetermined criteria. The sample in this research was the entire stock price of companies included in the LQ45 Index for the January 2020 period. The data analysis method used descriptive statistics. Descriptive statistics were used to describe the variables that have been collected. The data analysis method used in this research was the Survival Analysis technique. Survival Analysis is a data analysis technique where the variable that is taken into consideration is the period starting from the beginning of the observation until a certain event occurs by observing the variables that affect the event (Parmonangan & Rahadi, 2020). The survival analysis technique used in this research was The Kaplan Meier technique, the result of data processing using The Kaplan Meier technique in the form of a survival graph that can analyze the probability of survival of the research object. The formula used to generate the standard error and confidence interval estimates of the probability of survival was:

$$SE(S_t) = St\sqrt{\Sigma}\frac{D_t}{N_t\,(N_t - D_t)}$$

Where SE(St) indicated the margin of error, which was used to calculate the estimated confidence interval, Nt indicated the number of companies that were the object of research, in this research, 45 companies LQ45 and Dt showed the number of days where the stock stopped decreasing.

To calculate each event time from each object, the researcher also used The Logrank Test to compare the number of observed events, with the following formula:

$$x^2 = \sum_{i=1}^{g}\left(\frac{O_1 - E_i}{E_i}\right)$$

Where Oi denotes treatment group i, g denotes the number of groups, and Ei denotes group i.

RESULTS AND DISCUSSION

n	events	median	0.95LCL	0.95UCL
45	40	51	49	56

Figure 1. Overall LQ45 Survival Analysis
Source: Data that has been processed by the author (2021)

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From the results of the descriptive calculations in Figure 1, it can be seen the results of the Survival Analysis LQ45 as a whole, of the 45 companies listed in the LQ45 Index for the period January to March 2020, 40 companies have stopped experiencing a decline in stock prices on March 31, 2020, and 5 companies still were experiencing share price declines after March 31, 2020, 20 of the 40 companies on average stopped declining on the 51st day as shown in the median, of the 40 companies 95% experienced a decline between 49 - 56 days. Based on the results of the analysis, the impact of this information related to Covid-19 gave negative sentiment to the movement of the company's stock prices on the LQ45 Index that is as many as 45 company stock prices simultaneously decreased after the information related to Covid-19, and 5 other company stock prices were still decreasing over the observation period.

time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
23	45	1	0.9778	0.0220	0.9356	1.000
24	44	1	0.9556	0.0307	0.8972	1.000
27	43	1	0.9333	0.0372	0.8632	1.000
40	41	1	0.9106	0.0427	0.8306	0.998
42	40	1	0.8878	0.0473	0.7998	0.986
43	39	1	0.8650	0.0513	0.7702	0.972
45	38	2	0.8195	0.0578	0.7137	0.941
48	36	2	0.7740	0.0629	0.6600	0.908
49	34	7	0.6146	0.0733	0.4865	0.777
50	27	5	0.5008	0.0754	0.3729	0.673
51	22	2	0.4553	0.0751	0.3295	0.629
53	18	1	0.4300	0.0751	0.3054	0.605
54	17	3	0.3541	0.0735	0.2358	0.532
55	14	1	0.3288	0.0725	0.2135	0.506
56	12	3	0.2466	0.0681	0.1435	0.424
58	9	5	0.1096	0.0508	0.0442	0.272
59	4	1	0.0822	0.0449	0.0282	0.240
60	3	1	0.0548	0.0374	0.0144	0.209
63	1	1	0.0000	NaN	NA	NA

Figure 2. Overall LQ45 Survival Data
Source: Data that has been processed by the author (2021)

Figure 2, it can be seen the results of the survival analysis of the companies in LQ45 as a whole. Time shows the day of stock decline, risk shows the number of companies that were still experiencing a decline, event shows companies that stopped experiencing a decline in stock prices, survival shows the probability of companies that were still experiencing a decline in stock prices. As of the 23rd day, 45 companies were still experiencing a decline in share prices, and on those 23 days there was one company that stopped experiencing a decline in share prices, so the percentage of other companies experienced a decrease in share prices after the 23rd day was 0.9778 or 97.78%. As of the 24th day, 44 companies were still experiencing a decline in share prices, and on those 24 days there was one company that stopped experiencing a decline in share prices, so the percentage of other companies experienced a decrease in share prices after the 24th day was 0.9556 or 95.6% obtained from the calculation of the number of companies whose share prices were still declining (43) divided by the total companies (45). Based on the results of the analysis, it can be seen that stock prices were formed from information that was widely spread, such as the market efficiency theory presented by (Handini & Dyah, 2020), the information related to Covid-19 caused

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a fairly high probability of the price declines, where it could be used as a reference for investors who will invest in stocks on the LQ45 Index. Survival, in this case, is seen in how long the company survives the decline in its share price.

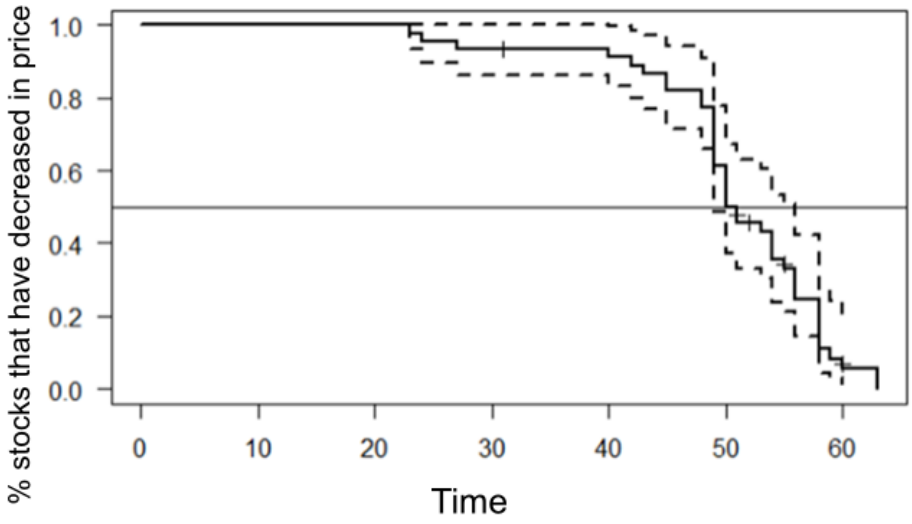

Figure 3. Overall LQ45 Survival Chart
Source: Data that has been processed by the author (2021)

In Figure 3, it can be seen that the overall LQ45 survival chart shows that 50% of the 45 companies in LQ45 experienced a decline in stock prices on the 50th day starting from January 2, 2020. The vertical line shows the percentage of stocks that experienced a decline in stock prices. (in the form of multiplication of 100%), and the horizontal line shows the time (in days) at which the stock begins to decline and stops experiencing a decline in stock prices.

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```
                group=2
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  49      7       3    0.571   0.187       0.3008        1.000
  50      4       1    0.429   0.187       0.1822        1.000
  54      3       2    0.143   0.132       0.0233        0.877
  56      1       1    0.000     NaN           NA           NA

                group=3
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  40      7       1    0.857   0.132       0.6334        1.000
  45      6       1    0.714   0.171       0.4471        1.000
  48      5       1    0.571   0.187       0.3008        1.000
  53      4       1    0.429   0.187       0.1822        1.000
  56      3       1    0.286   0.171       0.0886        0.922
  59      2       1    0.143   0.132       0.0233        0.877
  63      1       1    0.000     NaN           NA           NA

                group=4
time  n.risk n.event survival std.err lower 95% CI upper 95% CI
        50       2        2         0          NaN           NA

                group=5
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  49      7       3    0.571   0.187        0.301            1
  51      4       1    0.429   0.187        0.182            1
  54      2       1    0.214   0.178        0.042            1
  55      1       1    0.000     NaN           NA           NA

                group=6
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  50      6       1    0.833   0.152       0.5827        1.000
  51      5       1    0.667   0.192       0.3786        1.000
  56      4       1    0.500   0.204       0.2246        1.000
  58      3       2    0.167   0.152       0.0278        0.997
  60      1       1    0.000     NaN           NA           NA

                group=7
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  45      4       1     0.75   0.217        0.426            1
  48      3       1     0.50   0.250        0.188            1
  58      2       2     0.00     NaN           NA           NA

                group=8
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  24      6       1    0.833   0.152        0.583            1
  42      4       1    0.625   0.213        0.320            1
  50      3       1    0.417   0.222        0.147            1

                group=9
time n.risk n.event survival std.err lower 95% CI upper 95% CI
  23      6       1    0.833   0.152        0.583            1
  27      5       1    0.667   0.192        0.379            1
  43      4       1    0.500   0.204        0.225            1
  49      3       1    0.333   0.192        0.108            1
  58      1       1    0.000     NaN           NA           NA
```

Figure 4. Survival Analysis LQ45 Sectoral
Source: Data that has been processed by the author (2021)

In Figure 4, it can be seen the survival results of 45 companies in the LQ45 Index by sector, the 45 companies are divided into eight sectors on the IDX, that is the mining sector (group 2), basic & chemical industry (group 3), various industries (group 4), consumer goods industry (group 5), property, real estate & construction (group 6), infrastructure, utilities & transportation (group 7), finance (group 8), and trade, services & investment (group 9). Until the 50th day, four companies were still experiencing a decline in share prices whereas on the 50th day there was also one company's share price that stopped falling, so the probability of other companies was still experiencing a decline in share prices was 0.429 or 42.9. Until the 50th day, four companies were still

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experiencing a decline in share prices whereas on the 50th day there was also one company's share price that stopped falling, so the probability of other companies was still experiencing a decline in share prices was 0.429 or 42.9. Until the 54th day, three companies were still experiencing a decline in stock prices whereas on the 54th day there were also two companies' share prices that stopped falling, so the probability of other companies still experiencing a share price decline was 0.143 or 14.3%. On the 56th day, there was one company's stock price which was still down, and this was the last day for companies in the mining sector to experience a decline in share prices, so the probability was 0.00 or 0% because there were no more companies listed in that sector.

In the basic & chemical industry sector, the minimum day on which stock prices stopped falling was the 40th day and the maximum was the 63rd day, in the miscellaneous industry sector, both companies stopped falling on the 50th day, in the consumer goods industry, the minimum day where the stock price stopped falling was the 49th day and the maximum was the 55th day, in the property, real estate & construction sector, the minimum day where the stock price stopped falling was the 50th day and the maximum was on the 60th day, in infrastructure, utilities & transportation, the minimum day on which the stock price stopped falling was the 45th day and the maximum on the 58th day, in the financial sector, the minimum day on which the stock price stopped falling was the 24th day and the maximum on the 50th day and in the trading, services sector & investment, the minimum day on which the stock price stopped falling was the 23rd day and the maximum on the 58th day. The standard error is a measure to find out how precise the mean value we get, the smaller the calculation, the more accurate it is, judging from the whole sector, the standard error value shows the accuracy of the calculation is quite good because it is close to 0. Based on the results of the analysis, the information obtained can be a reference for investors related to stock price movements of 45 companies from eight sectors contained in the LQ45 Index, where investors can see the probability of a decline in the company's stock price and the origin of the company sector.

Table 1. Sectoral LQ45 Matrix

No	Sector	Total	Length of Days and Number of Stocks That Stopped Down						Desc.
1.	Agriculture	0				-			
2.	Mining	7	47 3	50 1	54 2	56 1	-	-	-
3.	Basic & Chemical Industry	7	40 1	45 1	48 1	53 1	56 1	59 1	63 1
4.	Various Industries	2	50 2	-	-	-	-	-	-
5.	Consumer Goods Industry	7	49 3	51 1	54 1	55 1	-	-	-1 is still down
6.	Property, Real Estate & Construction	6	50 1	51 1	56 1	58 2	60 1	-	-
7.	Infrastructure, Utilities & Transportation	4	45 1	48 1	58 2	-	-	-	-
8.	Finance	6	24 1	42 1	50 1	-	-	-	-3 is still down
9.	Trade, Services & Investment	6	23	27	43	49	58	-	-1 is still down

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		1	1	1	1	1

Source: Data that has been processed by the author (2021)

Based on Table 1, it can be seen that the conclusion of the survival analysis test by sector in the form of a matrix, it can be seen that there are 8 of 9 sectors included in the LQ45 Index. In the mining sector, of the 7 companies listed in it, the seven companies stopped experiencing a decline in share prices up to the limit of the observation period, which is March 31, 2020, of which the seven companies stopped experiencing a decline in share prices on the 47th day as 3 companies, on the 50th day as one company, on the 54th day as many as two companies and the 56th day as many as one company. Likewise, explanations for other sectors, in the consumer goods industry sector, there was one company that was still experiencing a decline in stock prices beyond the observation period, in the financial sector as many as three companies and in the trade, services & investment sector as many as one company.

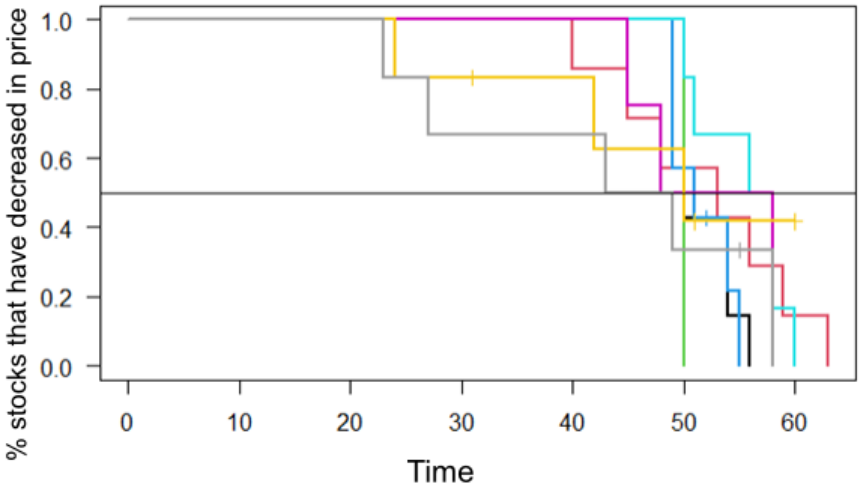

Figure 5. Sectoral LQ45 Survival Chart
Source: Data that has been processed by the author (2021)

In Figure 5, it can be seen the survival graph of the LQ45 Company seen by the sector. In the chart, the colored line indicates the movement of the stock price of the company that is in a similar sector and the time at which the stock price stopped falling. The prices of these stocks started stopping falling as early as the 20th day and the maximum on the 63rd day, and overall, 50% of LQ45 companies stopped falling in price around the 50th day as seen from the intersection of the colored lines on the midline. (median). The vertical line shows the percentage of stocks that experienced a decline in stock prices (in the form of a multiplication of 100%), and the horizontal line shows the time (in days) when the stock began to decline and stopped experiencing a decline in stock prices. Based on Figure 5, it can be seen that on the day before the 10th day, the percentage of stocks that experienced a price decline was 100% which was seen from the location of all the colored lines that is eight sectors were at point 1.0, 80% of the shares experienced a decline in stock prices on that day. 20th, and so on, and until the 60th day the percentage of shares that experienced a decline was 0%, i.e. there were no shares that experienced further declines.

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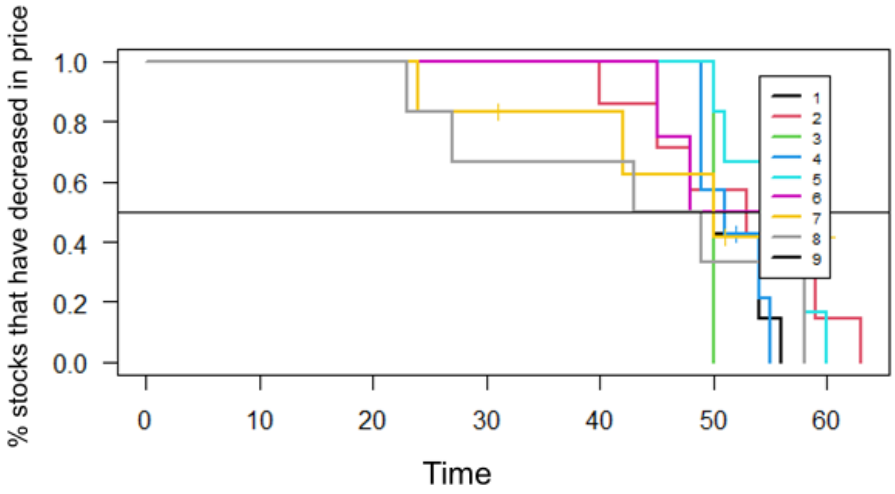

Figure 6. Sectoral LQ45 Survival Chart
Source: Data that has been processed by the author (2021)

In Figure 6, it can be seen the survival graph of the LQ45 Company which consists of eight sectors. On the graph, there are 9 lines with different colors to show the differences in each sector, the dark brown line with the number 1 indicates the agricultural sector, the pink line with the number 2 shows the mining sector, the light green line with the number 3 shows the basic & chemical industry sector, the dark blue line with the number 4 indicates the various industrial sectors, the light blue line with the number 5 indicates the consumer goods industry sector, the purple line with the number 6 indicates the property, real estate & construction sector, the yellow line with the number 7 indicates the infrastructure sector, utilities & transportation, the gray line with the number 8 shows the financial sector and the black line with the number 9 shows the trade, services & investment sector.

The financial sector was the sector that has experienced the longest decline in share prices in its companies, which started on the first day of observation starting (January 2, 2020) and ended on the day before the observation time ends, which was around the 50th day, the share price of companies in this sector included into companies that stopped experiencing a decline in stock prices the fastest around the 20th day, followed by the infrastructure, utilities & transportation sectors whose share prices stopped falling the fastest around the 20th day. Based on the percentage, on the day before the 10th day, the percentage of stocks that experienced a price decline was 100% as seen from the location of all the colored lines that is eight sectors were at point 1.0, 80% of the shares experienced a decline in stock prices on the 20th day, and so on and until the 60th day the percentage of shares that experienced a decline was 0%, i.e. there were no stocks that experienced further declines. The graph of the company's stock price movement can be used for other companies as a reference to anticipate external factors that can affect the rise and fall of stock prices, such as information that is spreading widely, such as information related to Covid-19 which gave negative sentiment to the company's stock price movements in the LQ45 Index.

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	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
group=2	7	7	5.23	0.59735	0.80134
group=3	7	7	8.80	0.36837	0.70960
group=4	2	2	1.28	0.39787	0.47383
group=5	7	6	4.84	0.27748	0.37080
group=6	6	6	8.44	0.70539	1.12321
group=7	4	4	4.13	0.00422	0.00606
group=8	6	3	3.70	0.13211	0.17471
group=9	6	5	3.57	0.57257	0.75280

Chisq= 4 on 7 degrees of freedom, p= 0.8

Figure 7. LQ45 Survival Analysis Data by Sectoral
Source: Data that has been processed by the author (2021)

In Figure 7, the results of the survival analysis of 45 companies in LQ45 can be seen by sector. In the mining sector, it consisted of seven companies, and the seven companies can be analyzed because no censored data was the stock price stopped falling no more than the time of observation (January 31, 2020). In the basic & chemical industry sector, there were seven companies and these seven companies could be analyzed because there were no censored data. In the various industry sectors, there were two companies and both companies could be analyzed because there were no censored data. In the consumer goods industry sectors, it consisted of seven companies and only six companies that could be analyzed, because one company was still experiencing a decline in stock prices after the observation period ended, so it was included in the censored data. In the property, real estate & construction sectors, there were six companies, and these six companies could be analyzed because there were no censored data. In the infrastructure, utilities & transportation sector, there were four companies, and these four companies could be analyzed because there were no censored data. The financial sector consisted of six companies and three companies could not be analyzed because the company was still experiencing a decline in stock prices after the observation period ended, so it was included in the censored data. In the trade, services & investment sectors, there were six companies and only five companies that could be analyzed, because one company was still experiencing a decline in stock prices after the observation period ended so it was included in the censored data. The Chi-square test was used to determine whether the analyzed sample data support the hypothesis that the original population of the sample follows a specified distribution, if the measurement results show similarities between the observed value and the expected value, the working hypothesis is accepted and vice versa. Based on the results of the analysis using R programming with the help of RStudio software, the chi-square showed $p = 0.8 > 0.05$, it can be seen that the eight sectors analyzed using survival analysis experienced a decline in stock prices at the same time as the impact of a major event that was happening that is Covid-19 with an observation period from January 2 to March 31, 2020.

Based on the results of the analysis and discussion described above, this Covid-19 phenomenon had a negative impact on the movement of company stock prices included in the LQ45 Index, information related to Covid-19, and policies submitted by the government to reduce the spread of Covid-19 resulting in the company's stock prices in the LQ45 Index decreased simultaneously that is eight sectors which recorded a significant decline in share prices from the impact of information related to Covid-19. This is in line with the market efficiency theory presented by Handini & Dyah (2020) which

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stated that stock prices are formed because of information that is yet unknown when it will come, both good information (good news) and bad information (bad news). Such information cannot be predicted when it comes and is included as good or bad information, in this regard, companies should always know the hottest information being discussed around the world to be able to deal with unwanted things quickly, such as the decline in stock prices due to information that is currently being discussed around the world.

CONCLUSION

Based on the analysis and research results that have been found, it can be concluded that the existence of information about Covid-19 had a negative impact on stock price movements, 40 of 45 company stock prices reached the maximum value that is the time when stock prices began falling and reached the minimum value that is the time where stock prices stopped falling before March 31, 2020, while five other companies were included in the censored data because they were still experiencing a decline in stock prices beyond the observation period. Seen by sector, information spread around the world regarding Covid-19 gave negative sentiment to stock price movements, there were eight sectors recorded in the LQ45 Index that experienced the same decline in stock prices in the observation period. Based on the explanation in the conclusions, the advice that can be given to companies is companies must be able to understand that many things can disrupt stock price movements, including health conditions, to maintain the confidence of investors who invest in associated companies. For investors, it is better to always pay attention to the condition of the company, both with fundamental and technical analysis so that investors do not decide anything hastily such as doing panic selling when they find out that the stock price of an issuer has decreased. Also, further researchers are expected to be able to conduct other research to find out what factors can assist companies to quickly overcome the decline in stock prices so that stock prices stop falling rapidly.

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