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# Can Investors Benefit from the Phase Difference Between Countries and Overreaction of the Major World Markets During the Pandemics? Study on the Covid-19 Case

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**ABSTRACT**

While the Covid-19 pandemic affected the world economies and investors' behavior, it caused serious volatility in asset prices. Studies on Covid-19 in the literature generally analyzed the relationship between the number of cases, the number of deaths, and the performance of the stock markets. In this study, different from the literature, it has been tested whether investors can benefit from the phase difference between countries and overreaction in stock prices during the pandemic. In the study, which included 48 of the world's leading stock exchanges, countries were classified according to the time the epidemic progressed and the loss of stock market indices. Regardless of the country-based progression of the pandemic, it was observed that the global news flow was more effective in the pricing of different stock markets. On the other hand, it has been observed that the indices of the countries where the epidemic first spread, performed 6% worse than other indices on average, but this difference has closed over time. Another finding of the study is that the indices that lost the most during the period when the pandemic spread were the ones that showed the highest performance in the following period. This finding supports the overreaction hypothesis.

**Keywords:** COVID-19 and Stock Markets, Pandemics, Overreaction, Statistical Arbitrage.

**JEL Classification Codes:** G11, G14, G15, H12

## INTRODUCTION

The Covid-19 pandemic, which first started in China in December 2019, spread the world in a short period and has seriously affected the countries of the world in public health and economic dimensions (World Health Organization, 2020a). As of August 25, 2020, 23.5 million cases have been identified due to the Covid-19 pandemic, and 810 thousand people have been reported to have died (World Health Organization, 2020b). During the pandemic, many countries slowed down economic activities as a precaution, and this caused a serious slowdown in production and trade worldwide. The pandemic, which affects all countries regardless of the level of economic development, has caused the credit default swap premiums to rise, the world stock markets to perform very poorly and the volatility in markets to increase (El-Khatib and Samet, 2020).

In this study instead of using panel data of daily development of Covid-19 cases and market performances, a different methodology is used. When the development of Covid-19 cases and the reactions of the markets are observed, similar reaction patterns are noted in the markets during the Covid-19 pandemic. After the announcement of the global pandemic by the World Health Organization on March 11, 2020 (World Health Organization, 2020a), although it is a highly probable risk, many countries' markets reacted to the first reported case as a negative and unexpected development. The most important milestone is reaching the number of 100 cases. This milestone means that the cases of Covid-19 have spread widely and the epidemic in the country is likely to reach serious dimensions. Therefore, while the reaction of the investors is very high up to this level, after a certain level, the reaction is decreasing as the market pricing is already formed.

Although many studies in the literature examine the relationship between the daily number of COVID-19 cases and the stock market (El-Khatib and Samet, 2020; Salisu and Vo, 2020; Baig, Butt, Haroon and Rizvi, 2020; Ashraf, 2020; Narayan, Phan and Liu, 2020), there is no comparison of the cross-section of countries have been made to our knowledge.

The Covid-19 pandemic threatens not only investments but also the health of all investors. This threat becomes more evident especially when the epidemic reaches investors' home countries. Therefore, although it was

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known that the pandemic will spread to every country, facing the pandemic in their home country also affected investors psychologically. Although there was no change in the risk posed by the pandemic numerically, there was a change in ordinary investors' perception. This threat also created a situation that can be turned into an advantage for rational investors. In this study, by defining these advantages, investors are tried to gain different perspectives.

Contributions to the literature are as follows. (1) By defining the performance differences between the countries where the pandemic first spread and then spread, it was analyzed whether investors can invest with long and short strategies. (2) The validity of the overreaction hypothesis was tested by comparing the subsequent performance of the lowest-performing and high-performing country indices during the pandemic. (3) The performances of the countries according to the order of the spread of the pandemic were compared. In this way, it is defined which of the country-specific news flow and global news flows were more prominent in different country index movements.

In the ongoing parts of the article, studies on Covid-19 in the literature are presented in section 2, data and methodology in section 3, findings in section 4, and results in section 5.

## STUDIES COVERING EFFECTS OF COVID-19 ON STOCK MARKETS

Liu et al. (2020), in their studies examining the price changes caused by the Covid-19 pandemic in 21 leading world exchanges, found that these markets reacted very quickly and sharply with the spread of the epidemic. In the study, in which the date of 20 January 2020 was determined as the date of detection of the epidemic, it was observed that the markets in Asian countries with previous epidemic experiences reacted faster. According to other findings of the study, the negative impact on the markets increased as the number of Covid-19 cases increased, and the interaction in the markets worked negatively as a result of the fear of investors. Another study related to market reactions to health news of the top 20 worst affected countries from the Covid-19 pandemic, showed that there is a statistically significant and negative relation between health news and stock market returns (Salisu and Vo, 2020). Zeren and Hızarcı (2020) analyzed the response of stock markets to the pandemic in their study in countries highly affected by the Covid-19 pandemic. According to their findings, the countries' stock markets negatively reacted to the number of Covid-19 cases and deaths. Narayan, Phan, and Liu (2020) have investigated the policies of the governments and related reactions of stock markets in G7 countries. They found that all governmental policies including a lockdown of country, restriction of movements, and monetary expansion had positive impacts on stock market returns. Al-Awadhi, Al-Saifi, Al-Awadhi, and Alhamadi (2020) analyzed the relationship between the returns of the shares in the Chinese stock market and the Covid-19 outbreak. The daily increase in the number of Covid-19 cases and the increase in the number of deaths data were used as independent variables. According to the findings, the increase in the total number of cases and the number of daily cases reflected negatively on stock returns. Ashraf (2020) analyzed the response of 64 stock markets to the Covid-19 pandemic and found that stock markets quickly responded to the reported Covid-19 cases however the decline in the stock market is lower after the spread of the disease has progressed. On the other hand, the stock market response to reported deaths is lower in comparison with the reported cases. It may be due to the fact that disease detections have been reported and priced before and deaths follow the cases.

Examining the impact of the Covid-19 pandemic on different industries in the United States; Mazur, Dang, and Vega (2020) researched SP1500 shares. In the study where companies in the natural gas, food, health, and technology sectors respond positively; it has been observed that companies in the oil, real estate, entertainment, and hospitality sectors are differentiated quite negatively; and they have been found to experience abnormal price movements. In the same study, it was observed that senior executives resigned from their jobs and wage cuts were experienced, but on the other hand, new bonus payments and salary increases were realized in some companies unexpectedly. Alfaro, Chari, Greenland, and Schott (2020) studied the effects of Covid-19 on companies traded in the United States. According to the research conducted on a stock basis, it was observed that significant changes in estimates about the dimensions of the Covid-19 outbreak had a statistically significant negative effect on stock market pricing. On the other hand, it was determined that the unemployment applications were higher in states with a low rate of decrease in stocks. According to Ramelli and Wagner's (2020) study, between January 2, 2020, when the virus epidemic started, and February 27, 2020, the sectors that experienced the most loss in China were insurance, financial services, energy, banks, and transportation. On the other hand, the sectors that performed the best returns in the same period in the Chinese stock market

are telecom, healthcare, software, and technology. When the stock market in the United States is considered in the same period it is found that energy, transportation, automobiles, and materials sectors are affected at most similar to the Chinese market.

Some studies have examined the relationship between the Covid-19 pandemic and the volatility of stock markets. Lyócsa, Baumöhl, Výrost, and Molnár (2020) shown that Google researches related to the Covid-19 pandemic and the volatility of the market are correlated and it is possible to use Google search trends as an early warning indicator for sharp moves of the market. Baig, Butt, Haroon, and Rizvi (2020) investigated the trade volume and volatility of SP500 companies during the Covid-19 pandemic period and found that the liquidity of the market has been decreased significantly, on the other hand, there is a sharp increase in the volatility. When the last 120 years are examined, the volatility in the capital markets due to the Covid-19 pandemic has been higher than any previous crisis (Baker, et.al., 2020).

Sharif, Aloui, and Yarovaya (2020) have examined the relationship between the Covid -19 pandemic, oil prices, stock market, policy uncertainties, and geopolitical risks. In the study where it was determined that the geopolitical risks caused by the Covid-19 pandemic were much higher than the economic risks, it was reported that the negative effects were likely to continue in the long term. It is thought that the sharp losses in production and the drop in oil prices will seriously affect the oil-producing companies and the energy sector. On the other hand, travel restrictions and the prolongation of the impact of the pandemic pose a long-term risk for the accommodation and transportation sectors. Okorike and Lin (2020) examined the negative effects of the Covid-19 pandemic in their study involving 32 different countries and reached findings that support the fractal market hypothesis. Gormsen and Koijen (2020) investigated the impact of the Covid-19 outbreak on the growth expectations of companies, based on the amount of dividends companies are planning to distribute. At the beginning of the pandemic planned dividend distribution growth in 2020 was 28% in the United States and 25% in the European Union. On the other hand, the GDP growth forecast was 2.6% on the same date for both economies. The decline of the expected dividends was 43% in the United States and 50% in the European Union which cost about 4 to 10 years to catch up with previous GDP volumes. The study also demonstrated that the rapid decline of the stock markets can also be explained by the decrease of the dividend estimates.

## DATA AND METHODOLOGY

### Data

In this study, the index performance data of the leading markets in the world between February 21, 2020, and August 24, 2020, were used to measure the impact of the Covid-19 outbreak on the stock markets. February 21, 2020 was determined as is the date when world indices started to fall due to the pandemic. The most recent data available during the study are for 24 August 2020. Countries that are members of MSCI developed markets and emerging markets indices were selected to represent the leading stock markets in the world (MSCI, 2020). Daily data of world indices were obtained from investing.com, and the number of daily cases for Covid-19 was obtained from the European Union's https://data.europa.eu/ address. The number of developing countries included in the research is 25 and the number of developed countries is 23. The Chinese and Hongkong stocks markets were not included in the study due to the fact that the epidemic in these countries started long before other countries and because of their divergence from other countries with a 1-month phase difference. The countries included the MSCI index, the date of 1st, 100th and 1000th cases reached in each country, population, the total no of Covid-19 cases, and the max drawdown in the stock markets have been shown in Table 1.

## METHOD

Articles in the literature, which studied the effects of Covid-19 on the stock markets, focused on the relation between the number of cases and deaths and stock markets' reactions (El-Khatib and Samet, 2020; Salisu and Vo, 2020; Baig, Butt, Haroon and Rizvi, 2020; Ashraf, 2020).

All the studies have shown that there is a negative relation between Covid-19 cases and stock market performances. This study, unlike other studies, it is tried to answer whether investors can benefit from the pandemics by measuring the response rates of different stock market indices compared to each other.

The spread of the Covid-19 epidemic, the measures which are taken regarding the epidemic, and the economic effects of the epidemic started in different countries on different dates. This situation allowed investors in countries where the epidemic started late, to follow the developments in other countries, and make advance moves. In addition, with the significant increase in world trade and international investment in the 21st century, the countries of the world have become more closely interconnected. On the other hand,

**Table 1.** The Countries in MSCI Index, Covid-19 Milestone Dates, and Max Drawdown in the Stock Markets

| Country | MSCI Index | 1st Case | 100th Case | 1000th Case | Population | Total # of Cases as of 24th Aug 2020 | Max Drawdown in Stock Market |
|---|---|---|---|---|---|---|---|
| China | Emerging | 31.12.19 | 19.01.20 | 25.01.20 | 1.433.783.692 | 89.695 | -12,5% |
| South_Korea | Emerging | 20.01.20 | 21.02.20 | 26.02.20 | 51.225.321 | 17.665 | -32,6% |
| Japan | Developed | 15.01.20 | 22.02.20 | 21.03.20 | 126.860.299 | 61.754 | -29,2% |
| Italy | Developed | 31.01.20 | 24.02.20 | 01.03.20 | 60.359.546 | 259.345 | -39,4% |
| France | Developed | 25.01.20 | 01.03.20 | 09.03.20 | 67.012.883 | 242.899 | -37,7% |
| Germany | Developed | 28.01.20 | 01.03.20 | 10.03.20 | 83.019.213 | 233.575 | -37,8% |
| Singapore | Developed | 24.01.20 | 01.03.20 | 02.04.20 | 5.804.343 | 56.353 | -30,3% |
| Spain | Developed | 01.02.20 | 02.03.20 | 08.03.20 | 46.937.060 | 386.054 | -38,2% |
| USA | Developed | 21.01.20 | 03.03.20 | 11.03.20 | 329.064.917 | 5.702.611 | -33,0% |
| UK | Developed | 01.02.20 | 04.03.20 | 13.03.20 | 66.647.112 | 325.642 | -32,6% |
| Belgium | Developed | 04.02.20 | 05.03.20 | 13.03.20 | 11.455.519 | 81.842 | -38,0% |
| Switzerland | Developed | 26.02.20 | 07.03.20 | 14.03.20 | 8.544.527 | 39.802 | -26,6% |
| Netherlands | Developed | 28.02.20 | 07.03.20 | 16.03.20 | 17.282.163 | 66.490 | -34,5% |
| Norway | Developed | 27.02.20 | 07.03.20 | 16.03.20 | 5.328.212 | 10.197 | -33,1% |
| Sweden | Developed | 01.02.20 | 07.03.20 | 16.03.20 | 10.230.185 | 86.068 | -31,2% |
| Austria | Developed | 26.02.20 | 09.03.20 | 17.03.20 | 8.858.775 | 25.239 | -48,2% |
| Denmark | Developed | 27.02.20 | 10.03.20 | 18.03.20 | 5.806.081 | 16.127 | -24,9% |
| Malaysia | Emerging | 25.01.20 | 10.03.20 | 21.03.20 | 31.949.789 | 9.267 | -20,3% |
| Australia | Developed | 25.01.20 | 10.03.20 | 22.03.20 | 25.203.200 | 24.812 | -36,3% |
| Canada | Developed | 26.01.20 | 12.03.20 | 22.03.20 | 37.411.038 | 124.896 | -37,1% |
| Qatar | Emerging | 01.03.20 | 12.03.20 | 05.04.20 | 2.832.071 | 117.008 | -17,1% |
| Czechia | Emerging | 02.03.20 | 13.03.20 | 23.03.20 | 10.649.800 | 21.923 | -33,0% |
| Finland | Developed | 30.01.20 | 13.03.20 | 28.03.20 | 5.517.919 | 7.871 | -35,0% |
| Greece | Emerging | 27.02.20 | 13.03.20 | 29.03.20 | 10.724.599 | 8.664 | -45,8% |
| Portugal | Developed | 03.03.20 | 14.03.20 | 21.03.20 | 10.276.617 | 55.597 | -33,2% |
| Israel | Developed | 22.02.20 | 14.03.20 | 23.03.20 | 8.519.373 | 103.151 | -32,1% |
| Brazil | Emerging | 26.02.20 | 15.03.20 | 22.03.20 | 211.049.519 | 3.605.783 | -44,1% |
| Ireland | Developed | 01.03.20 | 15.03.20 | 24.03.20 | 4.904.240 | 27.969 | -39,7% |
| Poland | Emerging | 04.03.20 | 15.03.20 | 26.03.20 | 37.972.812 | 61.762 | -37,5% |
| Philippines | Emerging | 30.01.20 | 15.03.20 | 29.03.20 | 108.116.622 | 189.601 | -37,3% |
| Thailand | Emerging | 13.01.20 | 16.03.20 | 26.03.20 | 69.625.581 | 3.397 | -31,2% |
| Saudi Arabia | Emerging | 03.03.20 | 16.03.20 | 27.03.20 | 34.268.529 | 307.479 | -25,6% |
| Indonesia | Emerging | 02.03.20 | 16.03.20 | 28.03.20 | 270.625.567 | 153.535 | -33,1% |
| Egypt | Emerging | 15.02.20 | 16.03.20 | 06.04.20 | 100.388.076 | 97.237 | -36,2% |
| Chile | Emerging | 04.03.20 | 17.03.20 | 26.03.20 | 18.952.035 | 397.665 | -36,5% |
| Pakistan | Emerging | 27.02.20 | 17.03.20 | 26.03.20 | 216.565.317 | 292.765 | -32,3% |
| India | Emerging | 30.01.20 | 17.03.20 | 30.03.20 | 1.366.417.756 | 3.106.348 | -36,9% |
| Russia | Emerging | 01.02.20 | 18.03.20 | 28.03.20 | 145.872.260 | 956.749 | -45,4% |
| Peru | Emerging | 07.03.20 | 18.03.20 | 01.04.20 | 32.510.462 | 594.326 | -30,9% |
| UAE | Emerging | 27.01.20 | 18.03.20 | 03.04.20 | 9.770.526 | 67.007 | -36,9% |
| Turkey | Emerging | 12.03.20 | 19.03.20 | 23.03.20 | 82.003.882 | 258.249 | -27,9% |
| South Africa | Emerging | 06.03.20 | 19.03.20 | 28.03.20 | 58.558.267 | 609.773 | -35,4% |
| Mexico | Emerging | 29.02.20 | 19.03.20 | 31.03.20 | 127.575.529 | 560.164 | -26,4% |
| Colombia | Emerging | 07.03.20 | 19.03.20 | 02.04.20 | 50.339.443 | 541.147 | -45,2% |
| Taiwan | Emerging | 21.01.20 | 19.03.20 | N/A | 23.773.881 | 487 | -25,7% |
| Argentina | Emerging | 04.03.20 | 20.03.20 | 02.04.20 | 44.780.675 | 336.789 | -42,8% |
| Hungary | Emerging | 05.03.20 | 21.03.20 | 10.04.20 | 9.772.756 | 5.155 | -35,6% |
| New Zealand | Developed | 28.02.20 | 23.03.20 | 10.04.20 | 4.783.062 | 1.332 | -29,8% |

**Resource:** MSCI index, https://data.europa.eu/ and investing.com; prepared by the author

the rapid development in communication channels, especially in social media, has enabled people to access information much faster. In all these opportunities and interrelationship networks, the monetary policy decisions of the FED, the financial packages announced by the governments, and the intense news flow have been important factors affecting the world stock markets. Therefore, looking at the stock prices in daily frequency and forming a relationship with the number of cases may give wrong results. In this study, larger time frames are used to prevent this. There are two stages of the study. The first one determines the relation between the spread of the Covid-19 pandemic and stock market performances. The second one tests the overreaction hypothesis in the Covid-19 pandemic.

In the first part of the first stage of the research, countries are divided into 4 groups with an equal number of countries according to the spread dates of Covid 19. While determining the periods there were two goals. The first was to differentiate the countries where the epidemic progresses rapidly from other countries in terms of the impact of the epidemic on the stock market. The second is to measure the performances over as long as possible while doing this. When the development of the Covid-19 outbreak is monitored in different countries, slow progress is observed in the first weeks. For example, although the first cases were reported on January 25 in France, January 28 in Germany, and February 1 in Russia, the rapid increase in the pandemic started at the end of February. Although progress after the first cases is slow in many countries, it is noteworthy that a geometric increase begins after the number of 100 cases exceeds and control is lost. On the other hand, the number of 100 cases represents a statistically significant size, therefore, it has been determined as an important milestone in many similar studies (Oh et al., 2020; Phan and Narayan, 2020; Binny et al, 2020). In addition, when 100 cases have been observed in a specific country it is a material indicator for investors to be sure about the dimensions that the epidemic may reach in the future. So, the base metric when forming different quartiles of the countries is the report date of the 100th cases. Based on the time elapsed until 100 cases were seen in each of the countries in the relevant country groups, 4 different test periods were created. It has been determined whether the performances of the relevant country indices differ from the average of all countries in the periods by using t-tests. Abnormal returns are calculated by looking at the difference between the average of the group formed from the relevant country indices and the average of all country indices.

In the second part of the first stage, to strengthen the statistical results, the test in the first stage was repeated by forming two groups. The countries are divided where the pandemic first spread and later, and it was tested by t-tests whether the performances of these country groups differed in the relevant periods.

In the third part of the first stage, to understand whether the level of economic development of the countries is effective in the response of stock market indices to the pandemic, countries are divided into developed and developing countries. Later, both groups were divided into two as the countries where the pandemic spread before and the countries where it spread later. The index performances of the countries where the pandemic first spread and the countries where it spread later were compared with the t-tests and it was determined whether there was a performance difference. The hypothesis tested by the first research methodology is presented below.

H1: Pricing was not formed effectively in stock markets in countries where the Covid-19 outbreak has not started. Therefore, there was a relation between the order of countries in terms of starting Covid-19 cases and the stock market performances.

In the second stage of the research, the overreaction of the stock markets to the Covid-19 pandemic was examined. Investors can react sharply to negative news and may want to sell their shares even though prices have already dropped too much. On the other hand, while there is negative news, the desire of other investors to open new positions decreases. This increases the severity of the depreciation in securities as sellers cannot find buyers. De Bondt and Thaler (1985), who theorized this situation, put forward the overreaction hypothesis. De Bondt and Thaler (1985) calculated the performances of companies by determining different periods, especially three years. They formed winners and losers' portfolios based on past performances of the companies and monitored the performances of the two different portfolios in the following periods. They found that losers' portfolios have achieved higher returns than winners in the following periods. In this study, it was tried to determine whether the stock markets of some countries overreacted to the pandemic. For this purpose, the post-pandemic performances of the countries that suffered the most and the least losses due to the pandemic were examined. During the spread of the pandemic, the stock market performances of the countries in the 25% (50%) percentile with the highest loss in the stock market index and the countries in the 25% (50%) percentile with the

**Table 2.** The Formation of Quartiles in the Study Based on the Date of the 100th Case in Each Country

| | |
|---|---|
| **1st Quartile** based on date of 100th case; until March 5, 2020, except China | South Korea, Japan, Italy, France, Germany, Singapore, Spain, USA, United Kingdom, Belgium |
| **2nd Quartile** based on date of 100th case; since March 6, until March 13, 2020 | Switzerland, Netherlands, Norway, Sweden, Austria, Denmark, Malaysia, Australia, Canada, Qatar, Czechia, Finland, Greece |
| **3rd Quartile** based on date of 100th case; since March 14, until March 17, 2020 | Portugal, Israel, Brazil, Ireland, Poland, Philippines, Thailand, Saudi Arabia, Indonesia, Egypt, Chile, Pakistan, India |
| **4th Quartile** based on date of 100th case; since March 18, until March 23, 2020 | Russia, Peru, UAE, Turkey, South Africa, Mexico, Colombia, Taiwan, Argentina, Hungary, New Zealand |

**Resource:** Prepared by the author using the countries listed in MSCI indices and Covid-19 cases reported in https://data.europa.eu/

least loss were compared in the following period, and whether there was a difference was tested. T-tests were used in the study. The hypothesis tested by the second research methodology is presented below.

H2: World stock markets, which experienced the most loss during the Covid-19 epidemic, have achieved the highest return in the following period.

## FINDINGS

In the first methodology, countries are divided into 4 quartiles depending on the date of the spread of the Covid-19 outbreak. Accordingly, the time periods were determined as the first period between February 21st and March 5th, the second period between March 6th and March 13th, the third period between March 14th and March 17th, and the fourth period between March 18th and March 23rd. The countries included in the quartiles created are presented in Table 2.

Figure 1 shows the daily performance of country stock market indices based on the quartiles described in Table 2. As stated earlier, the SP500 reached its highest level on February 21, 2020. This figure shows the cumulative returns of country indices starting from this date. As can be seen from the graph, all country quartiles formed according to the spread order of the Covid-19 show similar performances on the same dates. This shows that global news and interaction between countries are much more effective in the performance of stock markets than the number of cases seen in a country. On the other hand, it is observed that the countries in Quartile 1 and Quartile 2, which reached the number of 100 cases before March 13, performed lower than other countries until that date. In the following period, the cumulative performance was equalized in the countries of the different quartiles as the disease spread in other countries.

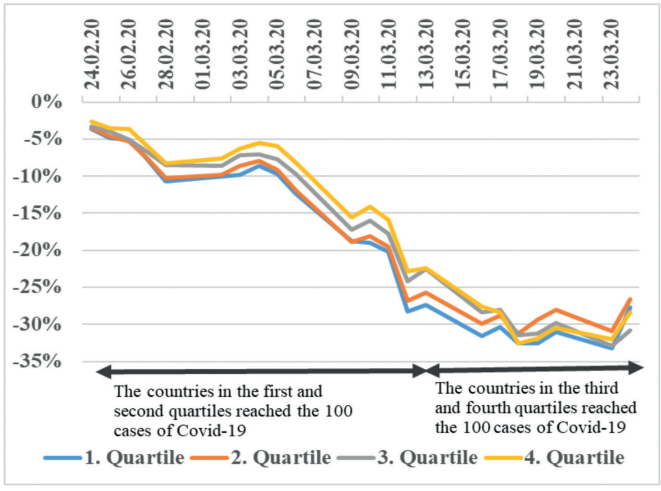



**Figure 1.** Daily Performances of the Stock Price Indices in Different Quartiles
**Source:** Prepared by author using research data.

Figure 2 shows the abnormal returns of each quartile in specific periods determined based on the date each quartile reached the number of 100 cases. The abnormal returns of the quartiles were calculated based on the difference between the average returns of all country indices within the scope of the study. In this graph, it is seen that the 1st and 2nd quartiles were negatively differentiated at the beginning compared to the overall average, and the countries in the 3rd and 4th quartiles close the difference when the virus outbreak reaches their own countries.

In Table 3, the average periodic returns of the countries in different quartiles are presented. The periods are determined based on the progress of the Covid-19 in different quartiles. The data in this table show that the country indices generally act together, but there is still a significant divergence in the countries where the epidemic first started and later started.

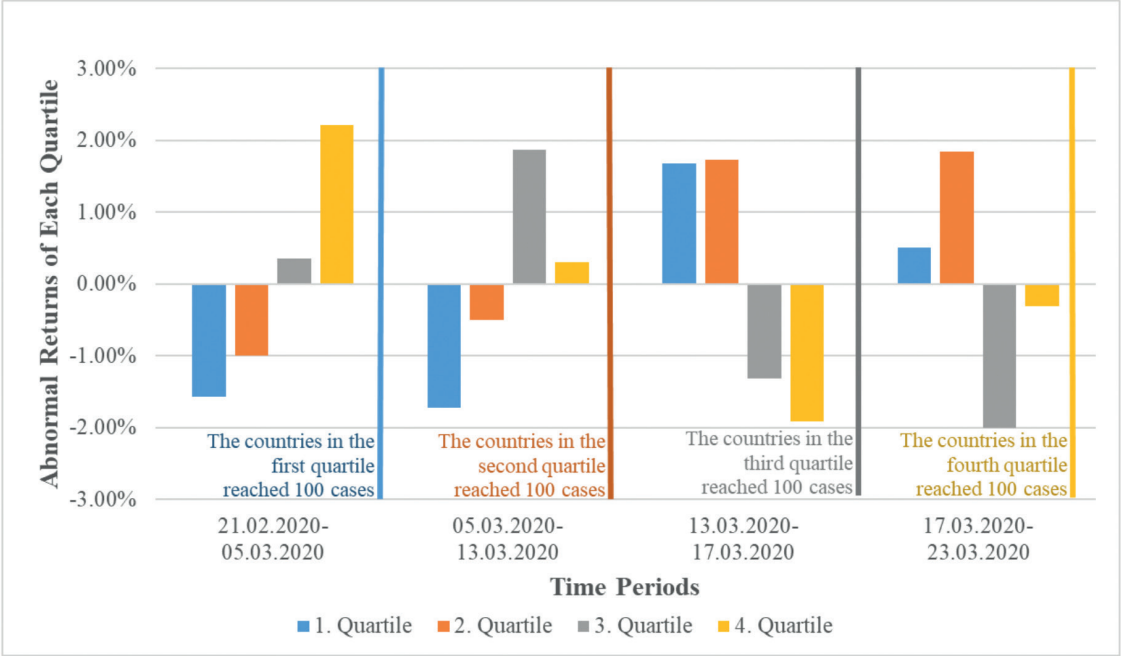



**Figure 2.** Abnormal Returns of Each Quartile During Different Periods of the Spread of The Covid-19 Pandemic
**Source:** Prepared by author using research data.

**Table 3.** The Development of Periodic Return Performance of the Stock Market Indices in Different Quartiles

| **Quartiles** (According to the starting order of the epidemic) | **21.02.2020-05.03.2020** | **05.03.2020-13.03.2020** | **13.03.2020-17.03.2020** | **17.03.2020-23.03.2020** |
|---|---|---|---|---|
| **1 (First)** | -9.7% | -19.6% | -4.2% | -4.2% |
| **2** | -9.1% | -18.4% | -4.1% | -2.9% |
| **3** | -7.8% | -16.1% | -7.1% | -6.9% |
| **4 (Last)** | -6.0% | -17.6% | -7.7% | -5.2% |

**Source:** Prepared by author using research data.

To test the statistical significance of the above-mentioned results, the countries in quartile 1 and quartile 2 are combined in group 1 and other quartiles in group 2. Afterward, it was tested whether the performances of the countries in these groups were different from each other.

The results are statistically significant in the first period between February 21 and March 5 and in the third period between March 13 and March 17. On March 11, 2020, the World Health Organization declared the Covid-19 outbreak as a pandemic, and it was clear that all countries in the world would experience the pandemic similarly. However, the results in Table 4 show that stock markets in countries where the epidemic spread late had not priced the epidemic as quickly as other countries.

Many countries in Europe are classified in the MSCI developed countries index. On the other hand, since the stock markets of developed countries are more efficient, it may be possible that they react to the Covid-19 outbreak faster. In this case, there is a bias against the finding of this study that the stock markets are falling faster in the countries where the epidemic first spread. To test this situation, developed and developing countries are separated. Each country group is also divided into two equal subgroups, where the disease is first spread and subsequently spread. Then, by looking at the development of pricing in these different groups, it was tried to find out which criterion was more effective. The results are presented in Table 5. According to the data presented in this table, it is seen that the stock market indices in the countries that experienced the epidemic first in both developed and merging country groups reacted before. The stock markets in the countries which experience the epidemic later show poor performance when the epidemic spreads, closing the gap.

In this study, to test the overreaction hypothesis, portfolios should be created first. SP500, the world's leading stock market indicator, reached its historical peak

**Table 4.** t-test Showing the Performance Differences Between the Country Indices According to the Spread Date of the Epidemic

| According to the starting order of the epidemic | | 21.02.2020 - 05.03.2020 | 06.03.2020 - 13.03.2020 | 14.03.2020 - 17.03.2020 | 18.03.2020 - 23.03.2020 |
|---|---|---|---|---|---|
| **Average** | **First 50%** | -8.9% | -18.4% | -4.1% | -3.5% |
| | **Last 50%** | -6.7% | -16.3% | -7.8% | -4.9% |
| **Variance** | **First 50%** | 0.2% | 0.3% | 0.1% | 0.3% |
| | **Last 50%** | 0.1% | 0.3% | 0.3% | 0.4% |
| **t stat** | | -1.85 | -1.33 | 2.53 | 0.93 |
| **Probability** | | 0.04 | 0.10 | 0.01 | 0.18 |

**Source:** Prepared by author using research data.

**Table 5.** The Performance of Countries in Different Indices and in Different Periods

| MSCI Index | Groups (According to the starting order of the epidemic) | 21.02.2020-05.03.2020 | 05.03.2020-13.03.2020 | 13.03.2020-17.03.2020 | 17.03.2020-23.03.2020 |
|---|---|---|---|---|---|
| Developed | First 50% | -10.2% | -20.1% | -3.4% | -3.0% |
| Developed | Last 50% | -8.6% | -18.2% | -3.8% | -6.1% |
| Emerging | First 50% | -7.0% | -15.5% | -6.3% | -3.6% |
| Emerging | Last 50% | -5.8% | -16.2% | -8.8% | -6.7% |

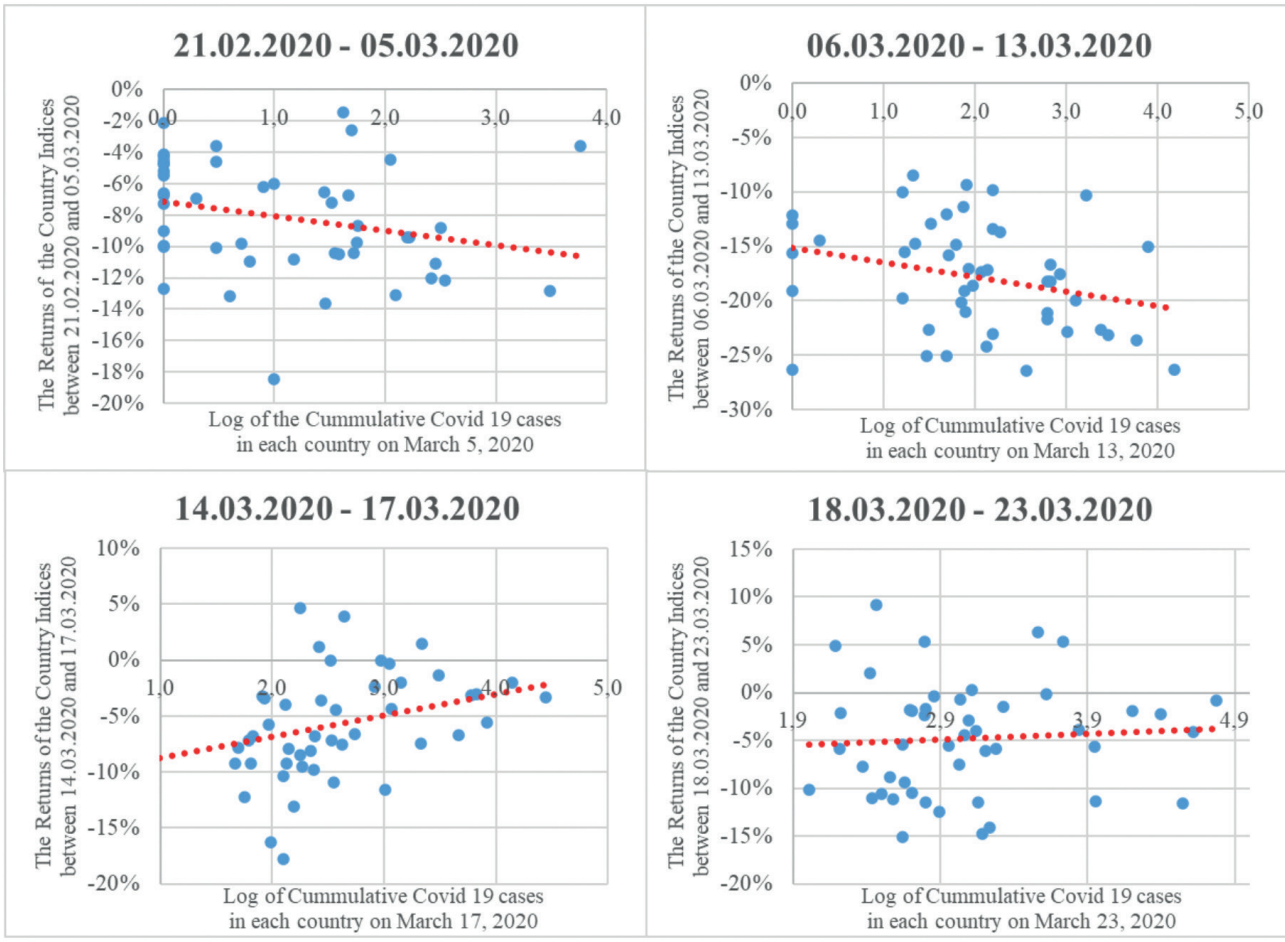
*Groups are prepared based on the spread of the covid-19 pandemic. The top 50% of the countries which reached the 100th case of Covid-19 earlier is included in Group 1 and other countries included in Group 2. Developed and emerging countries classified separately.*

**Source:** Prepared by author using research data.

on February 21, 2020, before the Covid-19 pandemic was priced. After this date, declines were observed in all world stock markets with the effect of Covid-19. On March 23, the number of Covid-19 cases exceeded the number of 100 in all leading countries of the world, and the Covid-19 outbreak was largely priced. Therefore, the time frame between February 21, 2020, and March 23, 2020, has been determined for the creation of portfolios. In this period, the 24 companies with the highest performance were used to create the winners' portfolio, and the worst-performing 24 companies were included in the losers' portfolio. Then, the performance differences of the winners and losers' portfolios between March 23, 2020, and August 24, 2020, were measured. 24 August 2020 is the date when the most up-to-date data is available as of the time this study was prepared.

In the tables and graphics presented up to this stage, the returns were calculated based on the date of reaching the 100th case. So, is there a relationship between the number of cumulative cases reached and the performance of stocks until that date? To answer this question, the analysis presented in Figure 3 was conducted. The cumulative Covid-19 cases and stock market performance in 48 countries in MSCI indices have been shown in this figure. Accordingly, between February 21 and March 13, the stock market indices in the countries where the epidemic first started were negatively differentiated. There is a negative relationship between the total number of cases and the stock market index. Later, when the epidemic reached a certain size in other countries, this relationship was disrupted, and the cumulative stock market returns in all countries approached each other. The low stock market performances between March 14 and March 17 in countries where the epidemic later spread is particularly interesting.

Studies examining behavioral finance show that people remain in control of their emotions and cannot




**Fiqure 3.** The Relation Between Cumulative Covid-19 Cases and Performance of Stock Market Indices in Each Country Listed in MSCI Developed and Emerging Markets

**Source:** Prepared by author using research data.

act rationally in many situations (Barberis and Thaler, 2003). Pandemics are events that affect large masses, disrupt human psychology, and also have serious negative effects on economies. From this point of view, pandemics may affect investors at the point of making irrational decisions. In this part of the study, the validity of the overreaction hypothesis proposed by De Bondt and Thaler (1985) was tested for the Covid-19 pandemic. For this purpose, the data of the stock market indices of 48 countries listed in the MSCI index were used, and portfolios of winners and losers were created. Before the pandemic, February 21, 2020, which was the peak level of SP500, and March 23, 2020, when the number of cases exceeded 100 in all countries, were determined as milestones. The indices of 24 countries with the highest losses among these dates were included in the losers' portfolio, while other countries were included in the winners' portfolio. The validity of the overreaction hypothesis was tested by comparing the returns of these portfolios between March 23 and August 24. The results of the overreaction hypoesthesia tests are shared in Table 6 and Table 7. According to the findings obtained, it is seen that the indices that performed the worst between February 21 and March 23, 2020, showed a performance of 35.5% in the following period. It is seen that the best performing stock market indices in the top 50% remained at 31% in the following period. However, the difference between the returns of two different portfolios is not statistically significant. Another comparison is made between the worst-performing 25% of the stock market indices and the best performing 25% of the stock market indices. The performance difference in the following period between these two different portfolios is 8.6% in favor of the losers. Besides, the results are statistically significant at the 5% level.

## CONCLUSION

In this study, the development of 48 leading world indices, including MSCI developed and emerging market indices, during the Covid-19 pandemic was examined. By comparing the performances of the countries according to the spread order of the pandemic, it has

**Table 6.** The Performances Used in the Formation of Winners' and Losers' Portfolios and Following Performances

| Portfolio | Country | 100th Case Date | Minimum Date | Loss since Feb 21, 2020 until Min Date | Loss since Feb 21, 2020 until March 23, 2020 | Gain since March 23, 2020 until Aug 24, 2020 | Average Gain since March 23, 2020 until Aug 24, 2020 |
|---|---|---|---|---|---|---|---|
| Losers | Brazil | 15.03.2020 | 23.03.2020 | -44.1% | -44.1% | 60.4% | 36.4% |
| | Colombia | 19.03.2020 | 18.03.2020 | -45.2% | -43.4% | 30.5% | |
| | Russia | 18.03.2020 | 18.03.2020 | -45.4% | -42.0% | 45.0% | |
| | Greece | 13.03.2020 | 16.03.2020 | -45.8% | -41.9% | 22.0% | |
| | Austria | 9.03.2020 | 18.03.2020 | -48.2% | -40.3% | 19.5% | |
| | Italy | 24.02.2020 | 16.03.2020 | -39.4% | -38.4% | 31.8% | |
| | Ireland | 15.03.2020 | 18.03.2020 | -39.7% | -38.2% | 44.5% | |
| | Canada | 12.03.2020 | 23.03.2020 | -37.1% | -37.1% | 47.9% | |
| | Spain | 2.03.2020 | 16.03.2020 | -38.2% | -37.0% | 14.1% | |
| | India | 17.03.2020 | 23.03.2020 | -36.9% | -36.9% | 49.3% | |
| | Australia | 10.03.2020 | 23.03.2020 | -36.3% | -36.3% | 34.8% | |
| | Chile | 17.03.2020 | 18.03.2020 | -36.5% | -36.1% | 36.7% | |
| | Philippines | 15.03.2020 | 19.03.2020 | -37.3% | -35.6% | 25.3% | 34.6% |
| | Germany | 1.03.2020 | 18.03.2020 | -37.8% | -35.6% | 49.5% | |
| | South Africa | 19.03.2020 | 23.03.2020 | -35.4% | -35.4% | 45.8% | |
| | France | 1.03.2020 | 18.03.2020 | -37.7% | -35.1% | 27.9% | |
| | Finland | 13.03.2020 | 18.03.2020 | -35.0% | -34.9% | 47.2% | |
| | Belgium | 5.03.2020 | 17.03.2020 | -38.0% | -34.7% | 26.5% | |
| | UAE | 18.03.2020 | 17.03.2020 | -36.9% | -33.8% | 30.7% | |
| | Portugal | 14.03.2020 | 19.03.2020 | -33.2% | -33.2% | 23.0% | |
| | USA | 3.03.2020 | 23.03.2020 | -33.0% | -33.0% | 53.4% | |
| | Norway | 7.03.2020 | 18.03.2020 | -33.1% | -32.9% | 38.7% | |
| | Poland | 15.03.2020 | 12.03.2020 | -37.5% | -32.7% | 31.0% | |
| | Hungary | 21.03.2020 | 18.03.2020 | -35.6% | -32.6% | 16.7% | |
| Winners | UK | 4.03.2020 | 23.03.2020 | -32.6% | -32.6% | 22.2% | 34.1% |
| | Indonesia | 16.03.2020 | 25.03.2020 | -33.1% | -32.2% | 32.3% | |
| | Israel | 14.03.2020 | 23.03.2020 | -32.1% | -32.1% | 20.4% | |
| | Argentina | 20.03.2020 | 18.03.2020 | -42.8% | -31.8% | 76.6% | |
| | South Korea | 21.02.2020 | 19.03.2020 | -32.6% | -31.5% | 57.2% | |
| | Netherlands | 7.03.2020 | 18.03.2020 | -34.5% | -31.4% | 32.4% | |
| | Czechia | 13.03.2020 | 18.03.2020 | -33.0% | -31.3% | 13.2% | |
| | Sweden | 7.03.2020 | 23.03.2020 | -31.2% | -31.2% | 38.4% | |
| | Thailand | 16.03.2020 | 23.03.2020 | -31.2% | -31.2% | 21.9% | |
| | Singapore | 1.03.2020 | 23.03.2020 | -30.3% | -30.3% | 15.1% | |
| | New Zealand | 23.03.2020 | 23.03.2020 | -29.8% | -29.8% | 40.6% | |
| | Pakistan | 17.03.2020 | 25.03.2020 | -32.3% | -29.0% | 39.3% | |
| | Peru | 18.03.2020 | 3.04.2020 | -30.9% | -28.3% | 30.1% | 27.8% |
| | Turkey | 19.03.2020 | 23.03.2020 | -27.9% | -27.9% | 31.6% | |
| | Japan | 22.02.2020 | 20.03.2020 | -29.2% | -27.8% | 36.1% | |
| | Egypt | 16.03.2020 | 18.03.2020 | -36.2% | -26.8% | 13.8% | |
| | Switzerland | 7.03.2020 | 23.03.2020 | -26.6% | -26.6% | 26.3% | |
| | Mexico | 19.03.2020 | 23.03.2020 | -26.4% | -26.4% | 15.5% | |
| | Saudi Arabia | 16.03.2020 | 16.03.2020 | -25.6% | -25.2% | 32.8% | |
| | Denmark | 10.03.2020 | 23.03.2020 | -24.9% | -24.9% | 40.8% | |
| | Taiwan | 19.03.2020 | 19.03.2020 | -25.7% | -23.9% | 42.3% | |
| | Malaysia | 10.03.2020 | 19.03.2020 | -20.3% | -17.7% | 24.5% | |
| | Qatar | 12.03.2020 | 9.03.2020 | -17.1% | -14.6% | 12.7% | |
| | China | 19.01.2020 | 23.03.2020 | -12.5% | -12.5% | 27.3% | |

**Source:** Prepared by author using research data.

**Table 7.** t Tests Showing the Comparison of Performances of the Winner and the Loser Portfolios

| | Comparison of the Performances (Top 50% and Bottom 50%) | | Comparison of the Performances (Top 25% and Bottom 25%) | |
|---|---|---|---|---|
| | Losers (Bottom 50%) | Winners (Top 50%) | Losers (Bottom 25%) | Winners (Top 25%) |
| **Mean** | 35.5% | 31.0% | 36.4% | 27.8% |
| **Variance** | 1.6% | 2.2% | 1.9% | 1.0% |
| **df** | 23 | | 11 | |
| **t Stat** | 1.036 | | 1.904 | |
| **Probability** | 0.155 | | 0.042 | |

*Losers and winner portfolios formed based on the performance of the stock market indices from Feb 21, 2020 until March 23, 2020. The values in the tables show the performance of the indices between March 23,2020 and August 24, 2020.*

**Source:** Prepared by author using research data.

been tried to understand whether there is an arbitrage opportunity for investors. Besides, due to the pandemic, the performances of the world stock markets were examined, and it was tested if they overreacted. In this way, it was tried to be understood whether cases that affect investors psychologically, such as the Covid-19 pandemic, create an investment opportunity for rational investors.

According to the research results, the main determinant affecting the performance of stock markets during the Covid-19 outbreak was the global progression of the epidemic. Because the stock markets of countries where the epidemic has not yet started or where it is behind reacted with a similar harshness to other countries in the first days. Although many studies in the literature have examined the number of Covid-19 cases and the performance of stocks and found a positive relationship (El-Khatib and Samet, 2020; Salisu and Vo, 2020; Baig, Butt, Haroon and Rizvi, 2020; Ashraf, 2020; Narayan, Phan and Liu, 2020), findings from this study do not confirm them. According to the results obtained from this study, it is seen that market pricing in most countries formed before the epidemic progressed. On the other hand, when the performances of the stock market indices in the countries where the epidemic progressed earlier and spread later have been compared, it was observed that there was a performance difference of approximately 6% between these two groups in the first 3 weeks. This performance difference was closed in the following two weeks after the epidemic spread to all countries. This shows that investors can gain an advantage by closing their positions or opening short positions in countries where the epidemic has not yet spread.

On the other hand, the index performances of the countries were analyzed after the pandemic spread to all countries. It has been tried to understand whether the indices of the lowest-performing countries overreact. For this purpose, indices were divided into groups according to their performances, and portfolios of winners and losers country indices were created. The date when the number of cases reached 100 in all countries has been determined as a milestone. In the following period, it was observed that the portfolio created from the losing country indices overperformed the winning country indices by an average of 8.6% in 5 months.

The results obtained from this study show that investors did not make rational decisions during the Covid-19 pandemic, and they reacted excessively during the beginning of the epidemic. Findings from this study provide investors with information to help them decide on similar events in the future. In future studies on this subject, it can be analyzed whether the overreaction hypothesis is valid on stock-based performances. The efficiency of investors can be measured by comparing the financial performances of the companies with the development in their prices.

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