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Impact of COVID-19 on Stock Market - Evidence from S&P500 Firms

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Abstract

This study analyzes the impact of COVID-19 on the stock market during 2019–2020 using an event study methodology on 446 S&P 500 firms. Abnormal returns are calculated to capture stock price reactions before and after the COVID-19 outbreak across three event windows. The results show that COVID-19 had heterogeneous effects on stock returns: the impact was most severe in periods close to the event day and tended to diminish over longer-term windows. Industry-level analysis indicates that Mining, Manufacturing, and Retail Trade experienced positive abnormal returns over 252-day horizons.
Keywords: COVID-19; Abnormal Returns; Study Event

1.Introduction

The COVID-19 pandemic has severely affected both the global economy and human lives. Since the outbreak, economies worldwide have faced unprecedented challenges. According to real-time statistical data published by Johns Hopkins University[‡], more than 171 million COVID-19 cases and approximately 3.56 million deaths had been reported globally as of June 2, 2021.

The COVID-19 pandemic has generated unprecedented disruptions to the global economy and financial markets. Following the rapid global spread of the virus in early 2020, governments implemented a wide range of containment measures, including lockdowns, travel restrictions, and social distancing policies, which severely affected economic activity and corporate performance. Financial markets responded sharply to these developments, experiencing extreme volatility and historic price declines, particularly during March 2020[§]. This period marked one of the most turbulent episodes in modern financial history, comparable to major financial crises in terms of both speed and magnitude of market reactions.

A growing body of literature examines the impact of COVID-19 on financial markets. Prior studies document significant increases in market risk and uncertainty (Zhang et al., 2020), sharp declines in stock returns (Ashraf, 2020; Khan et al., 2020), and deteriorating market liquidity (Baig et al., 2021). Other studies report heterogeneous effects across industries and asset classes,

[‡] https://coronavirus.jhu.edu/map.html
[§] https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200131-sitrep-11-ncov.pdf

with certain sectors, such as pharmaceuticals and technology, exhibiting relatively resilient or even positive performance during specific phases of the pandemic (Alam et al., 2020; Behera and Rath, 2021). Despite these important findings, existing evidence remains mixed, and most studies focus primarily on short-term market reactions or aggregate indices, providing limited insight into firm-level and industry-level dynamics over longer horizons.

Importantly, the COVID-19 pandemic was not a single, isolated event but rather a prolonged global shock characterized by continuous information arrivals and evolving investor expectations. As a result, stock prices may not have adjusted instantaneously to pandemic-related news. Instead, market participants may have gradually reassessed firm values as the economic consequences of the pandemic unfolded. This raises an important question that remains underexplored in the literature: how did stock market performance differ before and after a key phase of the COVID-19 crisis, and to what extent did these effects vary across industries?

Motivated by this gap, this paper employs an event study framework to examine the stock market impact of COVID-19 on firms included in the S&P 500 index, with a particular focus on industry-level heterogeneity. We use Feb 20th, 2020, as a reference date representing a critical stage of the pandemic during a period of severe market stress and heightened uncertainty. Using daily stock price data, we estimate abnormal returns (AR) and then calculate different abnormal returns (DAR) to compare stock performance before and after the reference date. Firms are classified into industries based on the Standard Industrial Classification (SIC) system, allowing us to investigate how different sectors responded to the pandemic.

To capture both short-term reactions and longer-term market adjustments, we analyze multiple event windows, including (−30, +30), (−182, +182), and (−252, +252). These windows enable us to assess not only immediate market responses but also persistent abnormal performance associated with gradual information diffusion and investor reassessment during the pandemic. By examining abnormal returns across industries over different horizons, the study provides a comprehensive view of how the COVID-19 shock affected firm valuations within the U.S. equity market.

This study contributes to the literature in three important ways. First, it extends existing COVID-19 event studies by explicitly comparing stock market performance before and after a key pandemic-related reference date using firm-level data. Second, by classifying firms according to the SIC system, the paper documents substantial heterogeneity in industry-level responses to the COVID-19 shock. Third, by considering multiple event windows, the study sheds light on both short-term reactions and longer-term adjustment processes in equity markets during an unprecedented public health crisis. The findings offer valuable insights for investors, policymakers, and researchers seeking to understand sectoral risk exposure and capital reallocation during periods of extreme uncertainty.

The remainder of this paper is structured as follows. Section 2 reviews the related literature. Section 3 describes the data and methodology. Section 4 presents the empirical results, and Section 5 concludes the paper.

2.Literature review

A rapidly expanding literature examines the impact of the COVID-19 pandemic on financial markets, with a large number of studies employing event study methodologies and abnormal returns to assess market reactions. Overall, existing evidence documents substantial disruptions to stock markets following the outbreak of COVID-19, although the magnitude and direction of market responses vary across countries, industries, and time horizons.

Early studies primarily focus on short-term stock market reactions and report predominantly negative effects. Ramelli and Wagner (2020) investigate firm- and industry-level stock price responses to COVID-19, with a particular emphasis on global supply chain exposure. Their findings show significantly negative cumulative abnormal returns for firms with greater trade exposure to China and more complex international supply chains, suggesting that investors were highly concerned about pandemic-induced disruptions to global production networks. Similarly, Harabida and Bouchra (2020) examine the Moroccan stock market and document pronounced negative abnormal returns around COVID-19-related events, with market reactions concentrated within short event windows. These studies highlight the immediate adverse impact of pandemic-related news on equity markets.

Other studies reinforce the importance of firm-specific exposure and industry characteristics in shaping market reactions. Davis et al. (2020) employ textual analysis of firms' risk factor disclosures in 10-K filings to measure exposure to COVID-19-related risks. Their results indicate that firms with higher pandemic-related risk exposure experienced significantly more negative abnormal returns, particularly in severely affected industries such as travel, hospitality, and lodging. This evidence underscores the role of industry-specific vulnerability in explaining heterogeneous stock market responses during the pandemic.

In contrast to the predominantly negative short-term evidence, a strand of the literature reports mixed or even positive market reactions associated with government policy interventions and containment measures. Alam et al. (2020) find that while investor panic prior to lockdown announcements was reflected in negative abnormal returns, stock markets exhibited significantly positive average abnormal returns during lockdown periods. Their findings suggest that policy interventions may have reduced uncertainty and stabilized investor expectations. Using an event study approach, Behera and Rath (2021) provide further industry-level evidence, showing that the pharmaceutical sector experienced positive abnormal performance during the COVID-19 period, despite negative effects observed in other sectors. These results indicate that the impact of COVID-19 on stock markets was not uniformly negative and depended critically on industry characteristics and policy responses.

Cross-country evidence further demonstrates substantial heterogeneity in market reactions to COVID-19. Yan and Qian (2020) analyze stock market responses in China and other international markets and find significantly negative abnormal returns for Chinese consumer industry stocks following COVID-19-related events. At the same time, certain Islamic stock

indices exhibited relatively resilient or positive market responses compared to broader market indices. This line of research highlights the importance of institutional settings, market structures, and industry composition in shaping pandemic-related stock market outcomes.

Despite the growing volume of research on COVID-19 and financial markets, several important gaps remain. First, most existing studies focus on short-term event windows surrounding specific announcements, providing limited evidence on how stock prices adjust over longer horizons. Second, although industry heterogeneity has been acknowledged, relatively few studies systematically examine industry-level differences using firm-level data over extended pre- and post-event periods. Third, the prolonged nature of the COVID-19 pandemic suggests that market reactions may reflect gradual information diffusion and ongoing investor reassessment rather than instantaneous price adjustments.

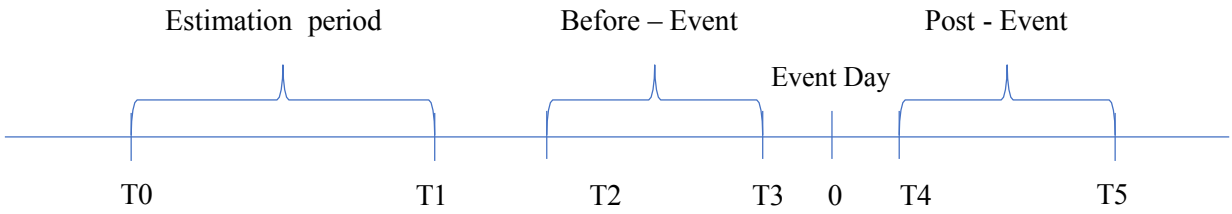
This study seeks to address these gaps by employing an event study framework to examine firm-level stock market performance before and after a key COVID-19 reference date, with a particular focus on industry-level heterogeneity among S&P 500 firms. By classifying firms according to the Standard Industrial Classification system and analyzing abnormal returns across multiple event windows, this paper extends the existing literature by providing new evidence on both short-term reactions and longer-term adjustment processes across industries during the COVID-19 pandemic.

3. Data and Methodology

3.1 Data

This study examines firms included in the Standard & Poor's 500 (S&P500) index over the period from 2018 to 2021. To ensure data consistency, firms added to the S&P 500 after the estimation window are excluded. These screening criteria result in a final sample of 446 firms. To analyze the impact of COVID-19, this study employs daily stock price data obtained from Thomson Reuters DataStream, covering the period from February 2018 to February 2021. To examine the role of leverage, firm-level financial data are also collected from Thomson Reuters DataStream, spanning the period from 2018 to 2020.

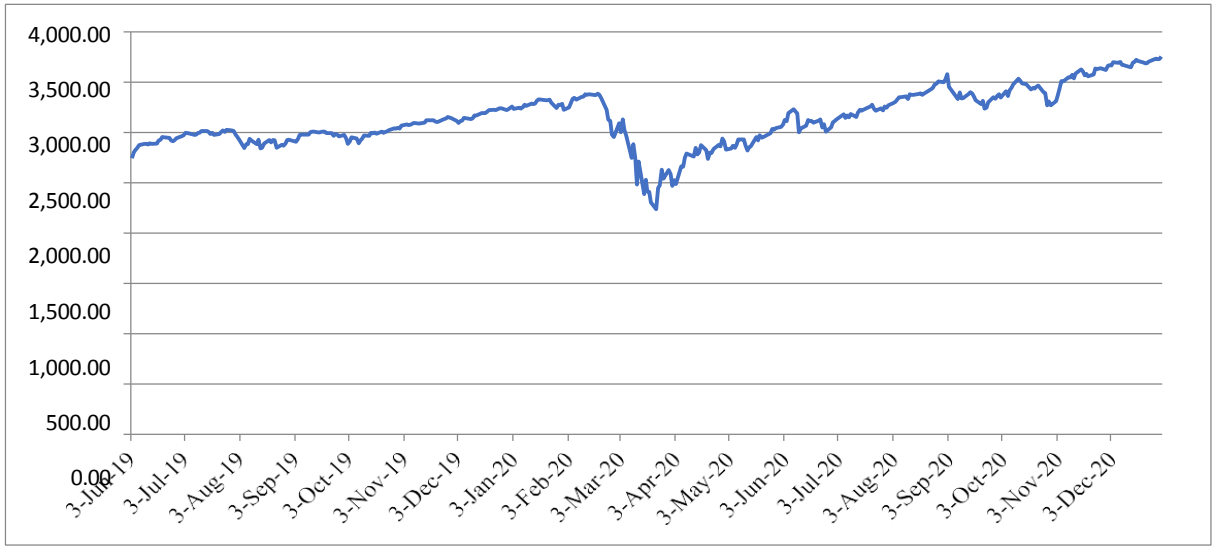
3.2 Event study



- The interval T0-T1 is the estimation window
- The interval T2-T3 is the before event window
- Time 0 is the event day in calendar time
- The interval T4-T5 is the post-event window

In this study, the estimation window will range from 252 trading days one year before the event day. The event day selected in this research is the first day the global stock market crashed on 20th Feb 2020. The event windows used are [-252, 252], [–182, 182], and [–30, 30].

A – Standard & Poor's 500 Index



B – Dow Jones Industrial Average Index

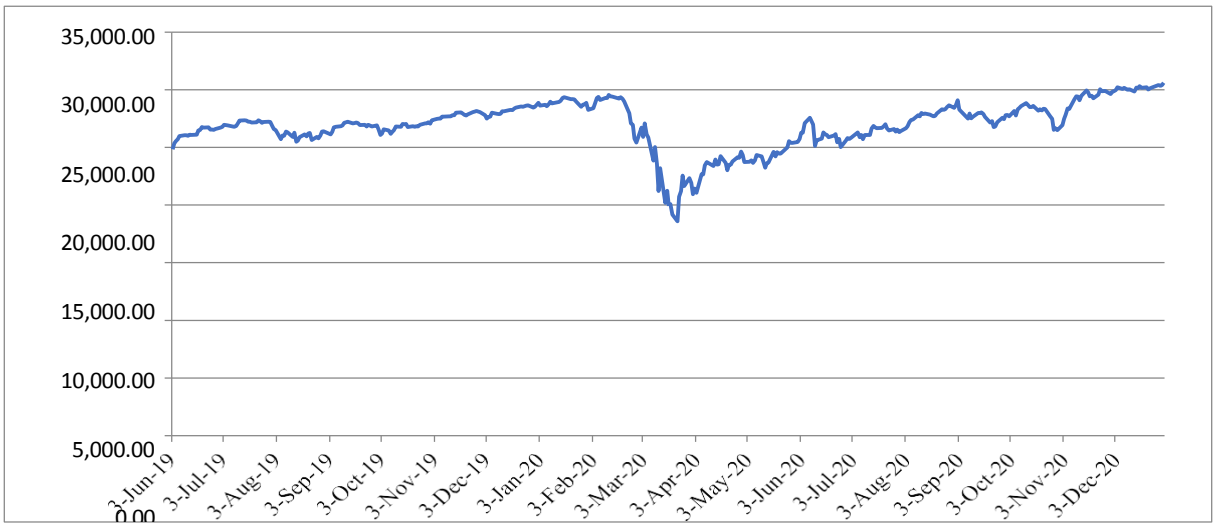


Figure 3.1: S&P 500 Index and Dow Jones Industrial Average Index from June 2019 to December 2020

3.3 Event study methodology

To obtain the different abnormal return ($DAR_{i,t}$), first this paper calculates the abnormal return ($AR_{i,t}$) is the difference between the actual return and the normal return based on the market model method using an estimation window. It is computed following as bellow:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t})$$

where $R_{i,t}$ is s the return of stock i on day t, $R_{m,t}$ is the return of S&P 500 index during the estimation period, and α_i and β_i are achieved from using an Ordinary Least Squares

regression.

Next, the study calculates the average abnormal returns before and after the event day ($AR\_B_{i,t}$) as follows:

$$AR\_B_{i,t} = \left(\frac{1}{T}\right)\sum_{t=1}^{T} AR_{i,t}$$

where $AR\_B_{i,t}$ is the average abnormal return of the firm i before the event days during the interval [–252, -1], [–182, -1], [–30, -1].

Similarly, the average abnormal return after the event day ($AR\_P_{i,t}$) is calculated as:

$$AR\_P_{i,t} = \left(\frac{1}{T}\right)\sum_{t=1}^{T} AR_{i,t}$$

where $AR\_P_{i,t}$ is the average abnormal return of the firm i after the event days during interval is [1, 252], [1, 182], [1, 30].

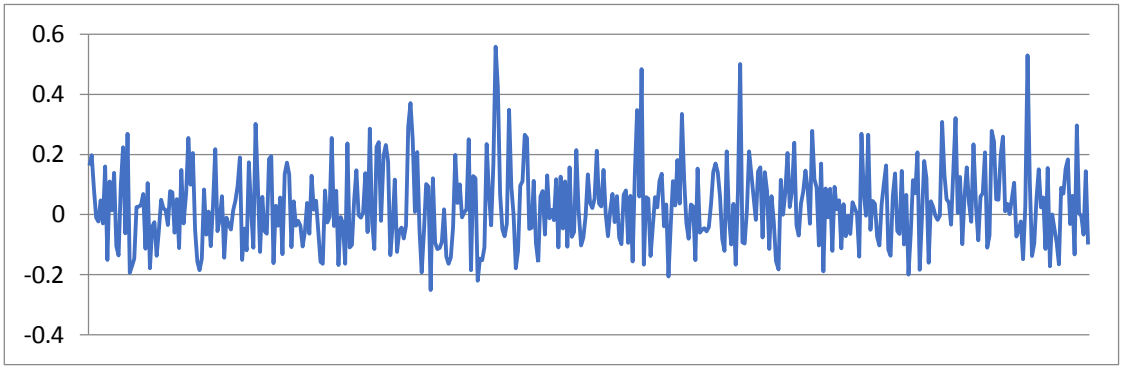
The different abnormal return ($DAR_{i,t}$) is the difference between after and before the event day which is calculated as follows:

$$DAR_{i,t} = AR\_P_{i,t} - AR\_B_{i,t}$$

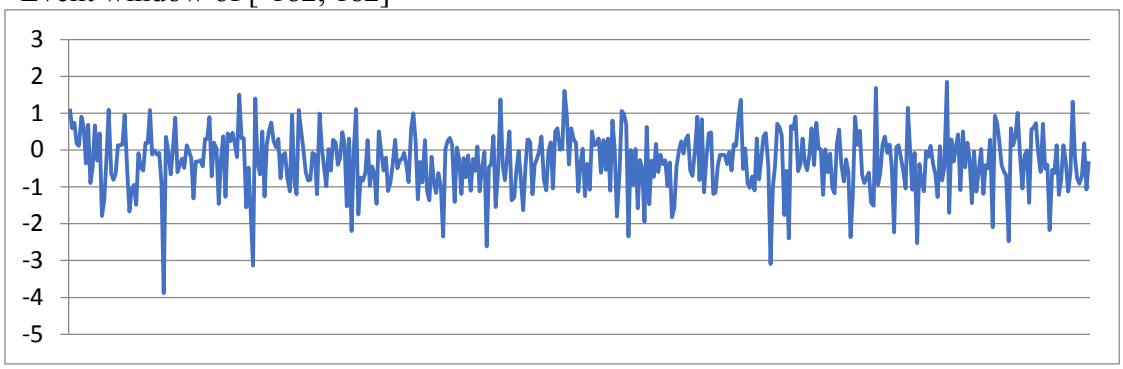
Finally, a t-test is employed to examine whether the differential abnormal return is statistically significant.

4.Empirical results and discussions

A – Event window of [-252, 252]



B – Event window of [-182, 182]



C – Event window of [-30, 30]

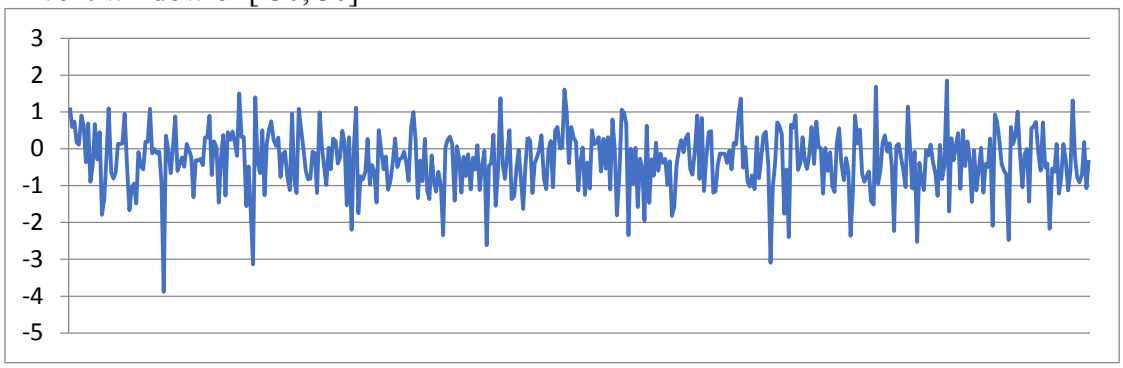


Figure 4.1: Different abnormal return during 3 event windows of [-252, 252], [-182, 182], and [-30, 30]

Table 4.1 reports the results of the one-tailed t-test for the differential abnormal returns before and after the event day, calculated using the market model for a total of 446 observations across three event windows: [−252,252], [−182,182], and [−30,30]. Across the three designated event windows, the data reveals a complex market reaction that shifts from an immediate negative shock to a gradual long-term recovery. All observed differences in abnormal returns (DAR) are statistically significant at the 1% level, providing robust evidence of the event's influence on market performance.

In the shortest observation period, the [-30, 30] day window, the market exhibited a profound negative response. The average abnormal return plummeted from -0.04 in the pre-event phase to -0.36 in the post-event phase, culminating in a highly significant ADR of $-0.31 (1% level). This drastic decline suggests that the event acted as a severe negative catalyst, triggering immediate capital erosion and reflecting a possible state of investor panic or a rapid reassessment of firm value. This downward trajectory persisted into the medium-term [-182, 182] window, where the DAR remained negative at -0.02 (1% level) indicating that the adverse effects of the event were not merely transitory but sustained for at least an individual semester.

However, a notable reversal in market sentiment is observed when extending the analysis to a one-year horizon. In the [-252, 252] window, the average abnormal return improved from a pre-event level of -0.02 to a post-event level of 1%, resulting in a positive DAR of 0.03 (1% level).

This transition from a short-term negative shock to a long-term positive differential is indicative of a mean-reversion process or a successful structural adaptation by the sampled firms. The significant long-term recovery suggests that while the initial market reaction was characterized by overreaction or acute distress, the long-term equilibrium reflects a more stabilized, and even improved, performance relative to the year preceding the event.

Table 4.1: One-tailed test results for the different abnormal returns during 3 event windows of [-252, 252], [-182, 182], and [-30, 30]

Event window	**No. of obs**	**AR_B (Before)**	**p-value**	**AR_P (Post)**	**p-value**	**DAR (Difference)**	**p-value**
[-252, 252]	446	-0.02	0.00***	0.01	0.03**	0.03	0.00***
[-182, 182]	446	-0.01	0.06*	-0.03	0.00***	-0.02	0.00***
[-30, 30]	446	-0.04	0.02**	-0.36	0.00***	-0.31	0.00***

Note: * 10%, ** 5%, *** 1%

Based on One-tailed t-test, this table shows the mean of abnormal returns before and after the event day, and the mean of difference abnormal return during 3 event windows of [-252, 252], [-182, 182], and [-30, 30]. The abnormal returns are obtained by using expected returns calculated with the market model. AR_B is the average abnormal returns before the event day for 446 observations of S&P 500 calculated in the 3 event windows of [-252, -1], [-182, -1], and [-30, -1]. AR_P is the average abnormal returns after the event day for 446 observations of S&P 500 calculated during the 3 event windows of [+1, +252], [+1, +182], and [+1, +30]. DAR is the difference abnormal returns before and after the event day for 446 observations of S&P 500 calculated during the 3 event windows of [-252, 252], [-182, 182], and [-30, 30].

Table 4.2 provides a detailed analysis of the impact of COVID-19 across three event windows: [−252,252], [−182,182], and [−30,30]. The results indicate that the market was most severely affected during the 30-day window. Overall, during the 30-day post-event window, most industries performed worse than before the event. One-tailed t-test results show significantly negative abnormal returns across seven industries during this window, except for Manufacturing. The significance levels are 1% for Transportation & Public Utilities and Finance, Insurance, Real Estate, 5% for Wholesale Trade and Retail Trade, and Services. The results show that these industries are suffering the impact of COVID-19 the most seriously. Over the [−252,252] window, Mining, Manufacturing, and Retail Trade show significant positive abnormal returns, whereas across the [−182,182] window, Transportation & Public Utilities and Finance, Insurance & Real Estate continue to exhibit significant negative effects at the 1% level.

The changes in COVID-19's impact may reflect increasing awareness of the pandemic and the implementation of measures to mitigate its effects. Notably, the emergence of vaccines and the application of information technology in the workplace helped reduce the adverse effects. In late November 2020, Pfizer partnered with BioNTech to submit an emergency use authorization request for their vaccine, planning rapid distribution of the first batch of 2.9 million doses.

Information and Communication Technologies (ICT) have played a key role in supporting economic resilience. ICT improves efficiency, reduces costs, and promotes digital transformation in sectors such as agriculture and manufacturing. Service-based digitization has enhanced supply chains, export capabilities, and overall economic recovery post-pandemic. Additionally, in many countries, registry offices, service centers, and restaurants reopened after lockdowns, improving business operations during the second wave compared to the first.

Social distancing, remote work, business closures, rising unemployment, and decreased travel caused substantial losses for the U.S. economy, particularly in Mining and Transportation & Public Utilities. Energy companies, especially those involved in oil and petroleum, play a crucial role in the economy. Decreased oil demand and prices significantly affected the Mining sector. The International Energy Agency (IEA) estimated that oil demand fell by 30% in April 2020 compared to the previous year, reaching the lowest level since 1995 (IEA Oil Market Report, April 2020). Excess supply forced producers to find storage solutions, with inventories reaching record highs in June 2020. Subsequent production cuts helped ease storage pressures and rebalance the market (IEA Oil Market Report, August 2020[**]).

Transportation & Public Utilities were also severely affected. Commercial flight operations dropped by over two-thirds compared to the same period in 2019. By late October 2020, ACI Europe reported that 193 of Europe's 740 airports (mainly regional) were at risk of bankruptcy[††]. Epidemics and government restrictions disrupted transportation networks, including shipping, railways, aviation, and trucking. Gössling et al. (2020) noted that overall mobility dropped by 76%, with public transport use declining by 93%. Luke and Rodrigue (2008) highlighted that trade restrictions, demand limitations, and labor shortages significantly impact supply chains and freight volumes.

The Finance, Insurance, and Real Estate sectors also suffered. COVID-19 led to reduced repayments, potential bank failures, and increased costs of bank liabilities. Real estate sales declined, mortgage repayments became challenging, and interest rate changes affected insurance operations, particularly life insurance and annuities. The Fed responded with emergency rate cuts, lowering the federal funds rate by 50 basis points on March 3, 2020, and subsequently to near zero on March 15, 2020[‡‡]. Insurance companies adjusted their portfolios to mitigate risks associated with historically low interest rates, while property insurers remained vulnerable to stock market fluctuations.

The retail sector experienced heterogeneous effects. Social distancing forced non-essential retail stores to close, disrupted labor and supply chains, and caused severe operational challenges. Wholesale trade was particularly affected due to reliance on imports and energy prices, as global transportation disruptions directly impacted supply chains. Field services,

[**] https://www.iea.org/reports/oil-market-report-august-2020
[††] https://www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-monthly-analysis---december-2020/
[‡‡] https://www.federalreserve.gov/monetarypolicy/files/monetary20200303a1.pdf

including restaurants, hotels, and resorts, were forced to close, leading to high unemployment in these industries.

Table 4.2: One-tailed test results for the different abnormal returns during 3 event windows as [-52, 252], [-182, 182], and [-30, 30] in industries

Industry	**Event window**	**AR_B (Before)**	**AR_P (After)**	**DAR (Difference)**	**p-value**
Mining	[-252, 252]	-0.07	0.13	0.19	0.00***
	[-182, 182]	-0.05	-0.11	-0.06	0.31
	[-30, 30]	-0.38	-0.96	-0.59	0.07*
Construction	[-252, 252]	0.09	0.10	0.01	0.86
	[-182, 182]	0.08	0.11	0.03	0.71
	[-30, 30]	0.28	-0.75	-1.03	0.07*
Manufacturing	[-252, 252]	-0.02	0.03	0.05	0.00***
	[-182, 182]	-0.00	0.01	0.01	0.27
	[-30, 30]	-0.11	-0.08	0.04	0.50
Transportation & Public Utilities	[-252, 252]	-0.03	-0.05	-0.02	0.40
	[-182, 182]	-0.024	-0.09	-0.07	0.00***
	[-30, 30]	0.03	-0.78	-0.81	0.00***
Wholesale Trade	[-252, 252]	-0.01	0.02	0.03	0.15
	[-182, 182]	-0.02	-0.01	-0.01	0.751
	[-30, 30]	-0.02	-0.35	-0.33	0.05**
Retail Trade	[-252, 252]	-0.03	0.03	0.06	0.03**
	[-182, 182]	-0.03	0.04	0.07	0.01***
	[-30, 30]	-0.04	-0.40	-0.36	0.05**
Finance, Insurance, Real Estate	[-252, 252]	-0.00	0.00	0.00	0.509
	[-182, 182]	-0.01	-0.09	-0.08	0.00***
	[-30, 30]	-0.02	-0.71	-0.69	0.00***
Services	[-252, 252]	-0.00	0.00	0.00	0.21
	[-182, 182]	-0.02	-0.00	0.02	0.53
	[-30, 30]	0.08	-0.03	-0.11	0.05**

Note: * 10%, ** 5%, *** 1%.

Based on One-tailed t-test, this table shows the mean of abnormal returns before and, after the event day, and the mean of difference abnormal return in each industry during 3 event windows of [-252, 252], [- 182, 182], and [-30, 30]. The abnormal returns are obtained by using expected returns calculated with the market model. AR_B is the average abnormal returns before the event day for each industry calculated during the 3 event windows of [-252, -1], [-182, -1], and [-30, -1]. AR_P is the average abnormal returns after the event day for each industry calculated during the 3 event windows of [+1, +252], [+1, +182], and [+1, +30]. DAR is the difference abnormal returns before and after the event day for each industry calculated during the 3 event windows of [-252, 252], [-182, 182], and [-30, 30].

5.Conclusions

This study examines the impact of the COVID-19 pandemic on stock market performance using an event study methodology with multiple event windows. The results indicate that COVID-19 exerted both negative and positive effects on stock returns on average, with the magnitude and direction of the impact varying across event windows and industries. In particular, adverse effects were most pronounced in periods close to the event date and tended to diminish over longer horizons, suggesting that market reactions to pandemic-related information were strongest in the short term and gradually adjusted over time. At the industry level, Transportation and Public Utilities as well as Finance, Insurance, and Real Estate experienced the most severe negative abnormal returns, while Mining, Manufacturing, and Retail Trade exhibited significantly positive abnormal returns over longer event windows.

These findings have several important implications. For investors, the results highlight the importance of industry-level analysis and investment horizon when managing portfolios during large-scale crises. The pronounced short-term losses in certain industries and the subsequent recovery or outperformance in others suggest that sector rotation strategies and longer-term investment horizons may help mitigate downside risk during periods of extreme market stress. From a policy perspective, the heterogeneous industry responses documented in this study imply that uniform market-wide interventions may be less effective than targeted support measures. Policymakers and regulators may need to pay particular attention to highly vulnerable sectors, such as transportation and financial services, when designing stabilization policies during future public health or economic crises. For corporate managers, the findings underscore the importance of building industry-specific resilience, including liquidity management and risk diversification, to better withstand prolonged periods of uncertainty and market disruption.

This study is subject to several limitations. Due to constraints in time and data availability, the analysis is based on a sample of 446 firms from the S&P 500 index, which may have reduced statistical power in some industry-level tests. Future research could extend this framework by examining a broader set of firms, alternative event dates, or multiple countries to explore whether the stock market impact of COVID-19 differs across regions and institutional environments. Such extensions would provide a more comprehensive understanding of how financial markets respond to global crises and offer further guidance for investors and policymakers.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request**.**

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