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# Covid-19 on stock market performance: evidence from Italy

Marianna Mauro[a]*, Monica Giancotti[a], Vito Pipitone[b]* and Riccardo Tiscini[c]

[a]Department of Clinical and Experimental Medicine, Magna Graecia University, Catanzaro, Italy;
[b]National Research Council of Italy, Institute for Studies on the Mediterranean, Palermo, Italy;
[c]Department of Economics, Universitas Mercatorum of Rome, Rome, Italy

**ABSTRACT**

This paper has explored the impact of the Covid-19 pandemic on the Italian stock market at an industry level, analysing companies listed in the two major stock indexes: MIB 30 and STAR. Using daily firm-level stock prices (from December 2019, until October 31, 2020), we employed an event-study approach to analyse short-term stock market reactions, considering different pandemic windows period. Results showed that stocks reacted negatively to the announcement of the first case in the country, with deep reversal effects when the country was locked down. Monetary policy measures showed potential to ease stock markets: the announcement of Next Generation Agreement highlights the reversed role of Market Capitalization. Firm-specific variables were included in order to make inferences about firm characteristics that emerged as value drivers during the pandemic: in the first lockdown period, a greater company's capitalization ensured a greater resilience to the Covid-19 shock. Reversals at both an industry and a company level are observed. Results allow to understand how an outbreak of contagious disease affects stock returns in various sectors, helping investors to develop trading strategies to protect their wealth from future epidemics and providing inputs into the assessment of economic vulnerability to pandemic crises.

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## 1. Introduction and objective

The year 2020 was characterized by extraordinary events. The outbreak and spread of novel coronavirus (Covid-19) disease across the world has seriously affected people's production and life in general (He et al., 2020). Economies around the world faced severe challenges due to the Covid-19 outbreak.

CONTACT Vito Pipitone vito.pipitone@cnr.it
*Co-First author

Stock markets around the world saw great declines because of uncertainty around the global Covid-19 pandemic. With the spread of the virus, central governments 'paused' economies, requiring households to stay home in order to slow the spread of the virus and non-essential businesses to slow or stop their activities. This pause has affected household demand, the financial stability of firms, and the financial sector. Particularly in Europe, the COVID-19 pandemic caused unprecedented volatility in the stock market (Chowdhury et al., 2022; Su et al., 2022).

In this context, the impact of Covid-19 on financial markets has become the focus of various research. Studies results showed that stock markets have been influenced by the pandemic in different ways and at different times, given that Covid-19 spread to different countries/regions at different times (Bai et al., 2021). Governments around the world have been preparing their contingency plans, and aid packages to sustain their economies, with different strategies and different responses (Fernandes, 2020). The effect of the Covid-19 outbreak on the stock performance of European markets could also depend on the sectoral and industrial composition: countries with a larger tourism sector (as a % of GDP) were more severely affected than countries more industrial focused (Fernandes, 2020). Also, the countries more reliant on exports suffered disproportionately more.

In this framework, despite the urgent need of global policy makers to have a coordinated policy response to the virus and its economic effects, comparisons are currently dangerous, and prone to errors: the impact of Covid-19 is likely to vary across stock markets so that lumping all countries in a regression might lead to aggregation bias (Fernandes, 2020; Topcu & Gulal, 2020). The impact of Covid-19 on the stock markets can only be assessed with reference to single countries, as investors across sectors and countries responded differently during the outbreak.

In summary, the use of data available for single countries could be a more appropriated starting point, before formulating generalized key assumptions as generic as possible.

This study is justified by the low presence of literature more focused on data for single countries. The aim is to offer evidence from Italy and to provide a perspective on how to interpret movements in the stock market using the event-study approach.

The case of Italy could be considered as particularly relevant, a country whose economy is dependent on travel and tourism will be more vulnerable to economic disruption from potential pandemics than those based on, for example, primary resources such as mining or energy. In effect, Italy was one of the first European countries to be severely affected by the outbreak as well as to implement extraordinary measures to limit viral transmission, such as lockdown and stay-at-home orders (Remuzzi & Remuzzi, 2020). This situation has led to extensive concerns towards Italy, leading to country reputation damage, loss of investments and tourism flows.

The pandemic affected the country, increasing stock market volatility. Italy is the second country after Germany that recorded the highest abnormal return. Although abnormal returns have been insignificant for the country in the initial period, it became significant due to prolonged lockdown (Chowdhury et al., 2022). The spread of the virus led to declines in stock prices, increases in stock-price volatility, decreases in nominal interest rates and contractions of real economic activity, as reflected in real GDP.

In this study, we analysed the impact of the pandemic on the Italian stock market at an industry level, analysing companies listed in the two major stock indexes: MIB 30 (*Milan Stock Exchange Index*) and STAR (*securities segment with high requirements*). We also include firm specific variables in order to understand whether the pre-pandemic conditions that characterized each individual company may have amplified or mitigate the anomalous returns following the shock.

The early impact of the Covid-19 outbreak on stock returns was examined using daily firm-level stock prices from December 2019, when the outbreak of novel coronavirus diseases in Wuhan, China began to spread quickly, until October 31, 2020.

The paper is organized as follows: Section 2 reviews the literature, Section 3 provides an overview of the Italian market's reaction to the Covid-19 pandemic, Section 4 presents the research design, Sections 5 and 6 summarize and interpret the findings, Section 7 concludes.

## 2. Literature review

Since 2020, the number of papers discussing the impact of COVID-19 on stock markets has increased (Harjoto et al., 2021; He et al., 2020; Liu et al., 2020; Mezghani et al., 2021; Rahman et al., 2021; Yan & Qian, 2020). Studies show that the pandemic has affected all financial markets worldwide, producing a fluctuating trend as a consequence of expected adverse economic outcomes (AlAli et al., 2020; Al-Awadhi et al., 2020; Ali et al., 2020; Corbet et al., 2021; Goodell, 2020; Haroon & Rizvi, 2020; McKibbin & Fernando, 2021; Phan & Narayan, 2020; Topcu & Gulal, 2020; Zhang et al., 2020). The increasing number of lockdown days, monetary policy decisions and international travel restrictions severely affected the level of economic activities and the closing, opening, lowest and highest stock price of major stock market indices (Ozili & Arun, 2023).

Stock returns were significantly negatively related to both the daily growth in total confirmed cases and the daily growth in total deaths caused by Covid-19 (Al-Awadhi et al., 2020; Alfaro et al., 2020; Ashraf, 2020a; Bash, 2020; Li et al., 2022a). Government actions - such as social distancing measures and quarantining policies - resulted in heavy global economy recession and huge fluctuations in international stock markets due to their expected adverse impact on economic activity (Abdullah et al., 2022; Aharon & Siev, 2021; Ashraf, 2020b; Caporale et al., 2022; Contessi & De Pace, 2021; Frezza et al., 2021; Kheni & Kumar, 2021; Yu & Xiao, 2023). Overall, COVID-19 has reduced the stock market returns in all affected countries, increasing their volatility and illiquidity (Albulescu, 2021; Baig et al., 2021; Baker et al., 2020; Basuony et al., 2021; Chung & Chuwonganant, 2023; Gao et al., 2022; Li et al., 2022b; Liu et al., 2020; Lopatta et al., 2020; Naik et al., 2022; Onali, 2020; Xu, 2022; Zaremba et al., 2020; Zhang et al., 2020).

The overall trend of the stock market in response to COVID-19 is consistent with the previous literature on the topic of stock prices determinants, which are traditionally a matter of debate (Cutler et al., 1988). The factors identified from the studies and reviews may be grouped into three major categories: macroeconomic factors, accounting information, and investor sentiment. Studies focused on the relationship

between stock prices and *macroeconomic factors* offer conflicting conclusions: some of them found a positive correlation between stock prices and factors like the money supply (Hamburger & Kochin, 1972; Mukherjee & Naka, 1995), the gross national product (Fama, 1981) and industrial production (Chakravarty, 2005; Mukherjee & Naka, 1995; Nishat & Shaheen, 2004). Also, monetary and fiscal policy instruments seem to significantly affect stock prices (Erdoğan, 2003; Muradoglu & Onkal, 1992; Ozili & Arun, 2023), with a significant positive effect on the stock returns in the long run (Sohail & Hussain, 2009).

In other studies, the existence of an inverse relationship between stock prices and macroeconomic factors was found (Caporale & Jung, 1997; Chatrath et al., 1997; Durai & Bhaduri, 2009; Humpe & Macmillan, 2009; Nishat & Shaheen, 2004; Sohail & Hussain, 2009; Zhao, 1999). In this framework, the recent studies on Covid-19 confirm the high correlation of the macroeconomic risk coming from the change of the economic factors with the stock market prices at long-term (Bouzgarrou et al., 2023; McKibbin & Fernando, 2021).

A large body of accounting literature has explored the relation between *accounting information* and stock returns (Ball & Brown, 1968; Beaver, 1968; Chaney & Lewis, 1995), suggesting that individual investors increase their accounting information acquisition and processing efforts for firms with poor information environments (Lerman, 2018). In this context, the COVID-19 pandemic has reduced the availability of clear and precise information; this will force investors to increase their use of accounting metrics (Ely & Waymire, 1999; Francis & Schipper, 1999). As regards their choice of accounting data, multiple financial statement items are relevant in the valuation of firms (Abarbanell & Bushee, 1997; Lev & Thiagarajan, 1993).

Accounting items such as the expected corporate earnings, cash, revenues, net asset value per share and earning per share garner individual investors' attention and affect their behaviour (Lerman, 2018; Nagy & Obenberger, 1994; Zhu & Niu, 2016). Numbers in financial reporting could also affect investor confidence in financial markets: previous studies show a significant positive relationship between financial ratio performance and stock price trends (Arkan, 2016; Ball & Brown, 1968; Robbie et al., 1996). In this framework, recent studies showed that the quality of accounting information and related disclosures in the financial statements was more important for capital markets and investors in the Covid-19 pandemic period; firms reporting more conditionally conservatively have had lower declines in stock return performance during the Covid-19 stock market crash (Cui et al., 2021).

*Investor's sentiments* influence the stock markets and stock prices significantly (Baker & Wurgler, 2007; Brown & Cliff, 2005; He et al., 2020; Lemmon & Portniaguina, 2006, Baker & Wurgler, 2006; Mian & Sankaraguruswamy, 2012). When the market is trending upwards and there is less perceived risk, then the investor behaves more optimistically. When the market is trending downwards, then investors' sentiments become relatively pessimistic and investors will tend to wait to enter the market until a revival begins (Burns et al., 2012; Donadelli et al., 2017; Lee et al., 2002; Lu & Lai, 2012; Shu, 2010; Zouaoui et al., 2011). In this sense, the outbreak of COVID-19 caused an unprecedented upheaval in global stock markets, affecting investor sentiment and causing stock price changes (Costola et al., 2023; He

et al., 2020; Kamal & Wohar, 2023; Shaikh, 2021). The reasons for this impact can be attributed to the great speed with which news about the pandemic spread, with an immediate effect on the stock market, triggering daily stock market jumps and high levels of market volatility (Costola et al., 2021; Smales, 2021; Wang et al., 2022; Zhang et al., 2020). The markets reflected expected damage from healthcare containment policies (Klose & Tillmann, 2023) and react to governmental measures, such as fiscal support or decreases in interest rates. This is in line with studies showing that stock prices reflect the stock market reaction to factors such as the government intervention or political issues (Gao et al., 2022; Kao et al., 2013; Weng et al., 2018). In this regard, the recent studies analysed how COVID-19 related government policies (such as stimulus package, lockdown, and travel ban) influenced stock markets; many of these studies show that the effect on stock returns was negative, because while on the one hand policies, such as lockdown and travel ban, help mitigate the spread of the virus, on the other hand, they reduce economic activity (Bannigidadmath et al., 2022; Caporale et al., 2022; Martins & Cró, 2022; Mishra et al., 2022; Yu & Xiao, 2023).

Building on the recently emerging literature which reports that stock markets around the world have reacted to the COVID-19 pandemic with strong negative returns (Abdullah et al., 2022; Aharon & Siev, 2021; Al-Awadhi et al., 2020; Ashraf, 2020b; Baker et al., 2020; Caporale et al., 2022; He et al., 2020; Kheni & Kumar, 2021; Ramelli & Wagner, 2020), we argue that if strict government actions reduce the intensity of local outbreaks, then they weaken the negative market reaction to the growth in COVID-19 confirmed cases.

## 3. Italian market reactions: the underlying events

In response to decisions by governments in the EU to impose some form of lockdowns, stock markets around the world declined by 10% or more. The Italian stock index FTSE MIB has suffered significant losses since the outbreak of Covid-19 in Italy. Between February 17 and March 18, the worst day for the Italian stock market was March 12, when the index fell by 16.92%. In search of safety, investors' demand for long-term government bonds issued by the US and Germany increased. Over the same period, the yield on 30-year US treasuries decreased by almost one percentage point, driving prices on 30-year bonds up by approximately 30%. We see a similar rally in German Bunds, which are considered being safe assets in the Euro area. Studies suggest that each macro shock had important effects on real stock prices (Rapach, 2001).

In this study, we investigate Italian stock market reactions to the outbreak and containment of Covid-19. The reaction of Italian markets has been influenced by certain significant facts, which in our study constitute the *underlying events*, with reference to which the analysis will be conducted. They are:

- *The spread of the virus in China (called 'Incubation')*: it refers to the beginning of the viral spread in China until the first Italian case.

- *The first Italian citizen with Covid–19 ('Phase 1' start).* The outbreak of Covid-19 in Italy officially started on 31 January 2020, with two cases imported from China. On February 21, the first Italian citizen with Covid-19 was confirmed. This date represents, in our analysis, the '*event date*'. After a few weeks, the infections begin to increase uncontrollably, and the Italian government implements a rigid lockdown. It ends on May 3.
- *Economy restarting ('Phase 2' start):* After about two months of lockdown, which has led to a decrease in the spread of new coronavirus infections, Italy set the date for the partial reopening of the economy, allowing businesses in different sectors to restart on May 4 (DPCM 26/04/2020). In our analysis, we present an event window starting on Monday 4 May and closing on July 31.
- *The Pandemic Second wave (called 'Phase 3').* Analysing data extracted from Johns Hopkins University, referred to the spread of infection in Italy from the first case recorded up to 31.10, the lowest weekly increase in cases emerges in the month of July 2020. On the contrary, starting from August 2020, there is a gradual increase in cases. Therefore, for the purposes of the analysis, we have identified the period that, based on the data, could be traced as the start of a *second wave*, starting on August 1.
- *Policy responses*. European Union has put in place a series of initiatives to control and mitigate the economic consequences of the health crisis. The first massive intervention in support of the economy was that of the European Central Bank (ECB), which on March 24 established the pandemic emergency purchase program (PEPP) (Decision 2020/440), with a total allocation of €750 billion. The ECB announced the purchase program on March 19. To help repair the economic and social damage caused by the coronavirus pandemic, the European Commission, the European Parliament and EU leaders have agreed on a recovery plan aimed at leading the way out of the crisis. The EU's long-term budget coupled with the Next Generation EU initiative will be the largest stimulus package ever financed through the EU budget: a total of €1.8 trillion will help rebuild a post-COVID-19 Europe. Italy will benefit from around 209 billion of euros. The announcement of the agreement reached by the Italian prime minister (May 27, 2020) had an immediate effect on the financial markets. In order to understand the degree to which economic policy interventions are effective tools to support the economy in the event of health emergencies, in our analysis we add two event windows: the first one opens on March 19 and closes 15 days after (April 3); the second one opens on May 27 and closes 15 days after (July 16).

## 4. Research design

### 4.1. Methodology

We employed an event-study approach to analyse short-term stock market reactions. This method has been widely used to measure the effects of an economic event on the value (or stock returns) of a firm and is widely applied in the fields of accounting, finance and economics (Agrawal & Kamakura, 1995; Brown & Warner, 1980; 1985; Campbell et al., 1997; Gaver et al., 1992; Thompson, 1993). The methodology has

been used in previous studies aimed at analyzing the impact of the SARS outbreak on the stock performance of Taiwanese hotels (Chen et al., 2007).

The method entails the following steps:

1. Estimation of stock returns if the Covid-19 event had not occurred. The event-study methodology allows us to separate the component of stock price movement due to firm specific events from that due to market-wide movements. The component attributed to firm-specific events like the Covid-19 event is called an "abnormal" return (AR), which is computed as the difference between actual return (R) and expected return (ER) around the time of the event. If an event announced is good news, ARs are expected to be positive, indicating that the market believes that the event will increase the firm's value. On the contrary, a negative AR signals bad news and the market expects that the event would decrease the firm's future profitability.

   In formal terms, the AR of a generic firm $i$ in the time $t$ is computed as

$$AR_{it} = R_{it} - ER_{it} \tag{1}$$

$$ER_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \tag{2}$$

   where $R_{it}$ is the return of firm stock $i$ in the time $t$, $ER_{it}$ is the expected return of the same firm stock at the same time, $R_{mt}$ is the market return $m$ in the time $t$, $\alpha_i$ and $\beta_i$ are the parameters estimated over the estimation window.
   The estimation of the parameters $\alpha$ and $\beta$ is carried out using the single-index model (MacKinlay, 1997; Sorokina et al., 2021) as represented in

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{3}$$

$$R_{it} = \ln\left(P_{it}/P_{i(t-1)}\right) \tag{4}$$

$$R_{mt} = \ln\left(Index_{mt}/Index_{m(t-1)}\right) \tag{5}$$

   where $P_{it}$ is the closing price of firm stock $i$ in the time $t$, $Index_{mt}$ is the market index $m$ in the time $t$, $\varepsilon_{it}$ is a random error term and the $\alpha$ and $\beta$ are regression parameters to be estimated.
   Since we analysed the two major segments of the Italian Stock Exchange, we have used a different index for each of them. For the 40 firms with the largest capitalizations, we used the MIB 30 index, while for the 77 medium-sized listed companies (with capitalization between 40 million and 1 billion euros) we used the STAR index.
2. Accordingly, it is necessary to calculate the average abnormal return (AAR) and the cumulative average abnormal return (CAAR) on an event date for sampled firms experiencing the same firm-specific events to capture the valuation impact

of that event. Finally, the statistical significance of the CAARs will be tested. If the cumulative abnormal return is statistically different from zero, it is possible to say that the event significantly influences stock prices.

In formal terms, CAAR is computed as

$$CAAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t \tag{6}$$

$$AAR_t = \frac{1}{n}\sum_{1=i}^{n} AR_{it} \tag{7}$$

where $t_1$ and $t_2$ represent the observed period interval and $n$ is the firm's population by economic sector.

To determine whether CAARs are statistically significant, we used the parametric test suggested by Boehmer et al. (1991). The test captures the different standard deviations between the event-period and estimation-period residuals. It prevents the stock of firms with large variance from heavily influencing the outcome and it accounts for possible cross-sectional increases in the variance of the returns that may occur within the event window. If the Covid-19 outbreak caused abnormal returns, the Boehmer et al. (1991) test should be significantly different from zero. Thus, we test the null hypothesis $H_0$: CAAR $=$ 0 against the alternative hypothesis $H_1$: CAAR $\neq$ 0. If we accept the null hypothesis, the Covid-19 outbreak had no impact on the return of firms' stocks; if we reject the null hypothesis, the Covid-19 outbreak had a significant impact on the return of firms' stocks.

To focus attention on main the drivers affecting ARs during the pandemic period, we also performed a regression analysis at the firm level. In particular, we estimated the following regression:

$$CAR_{i[t_1,\ t_2]} = \gamma + \delta X_i + \varepsilon_i \tag{8}$$

where $CAR_{i[t_1,\ t2]}$ is a time-series aggregation of the ARs by firms, $X_i$ is a set of firms' variables, $\gamma$ and $\delta$ are regression parameters to be estimated, and $\varepsilon_{it}$ is a random error term. The set of variables includes Earnings per Share (EPS), Book Value (Per Share Annual), Tangible Book Value (Per Share Annual), Cash Flow (Per Share Annual) and Market Capitalization. The CARs are obtained as described by:

$$CAR_{i[t_1,\ t_2]} = \sum_{t=t_1}^{t_2} AR_{it} \tag{9}$$

### 4.2. Sample selection

We used data from the aggregate equity market to quantify how investors' expectations about economic growth across horizons evolved in response to the coronavirus outbreak and subsequent policy responses.

At the end of April 2020, there were 369 companies listed on the Borsa Italiana markets with a total capitalization of €490 440.79 million (www.borsaitaliana.it).

In particular, the survey involves securities included in the following Italian stock exchange indexes:

- the Financial Times Stock Exchange (FTSE) - Milan Stock Exchange Index (FTSE MIB 30): they represent the 40 more liquid and more capitalized listed companies; their capitalization on April 30, 2020, amounts to €409 931.8 million (www.borsaitaliana.it);
- the FTSE Italia STAR index, which includes medium-sized joint-stock companies (with capitalization up to one billion Euros). It includes 78 companies.

The two indexes include the most important companies on the Italian stock exchange and together provide a representation of the backbone of the Italian economy. They also offer an opportunity to analyse the impact of the pandemic across a broader range of economic sectors.

The day 0—event day - is February 21: the day the first Italian citizen was discovered to have Covid-19. For the period around the event, a maximum of 79 daily return observations will be used.

### 4.3. Data collection

We organize our primary analysis along four event windows:

1. Incubation (from January 22 to February 21): [-22, 0].
2. Phase 1 (from February 22 to May 3): [1, 47].
3. Phase 2: (from May 4 to July 31): [48, 112].
4. Phase 3: (from August 1 to October 30): [113, 177].

The description of these four event windows was discussed in detail in the preceding section. If these four event windows, taken together, describe the spread of the pandemic in Italy, each one is unique. Each window was followed by a different population's psychological reaction and by different legislative measures to contain the pandemic. Given the uniqueness of each window, we saw fit to analyse them individually.

Moreover, we analysed policy responses impact, referring to the two main adopted measures. In particular, we added the two following sub event periods:

a. Announcement of BCE pandemic emergency purchase program (from March 19 to April 3): [19, 30].
b. Announcement of Next Generation Agreement – Recovery fund (from May 27 to June 16): [64, 76].

We described the timeline of events characterizing each of these periods in 3. Corporate managers and analysts clearly started paying attention to (or at least openly

talking about) Covid-19 in the Outbreak period. Many governments and central banks announced and implemented measures to counteract the crisis and lessen its effects on the real economy and financial markets.

### 4.4. Firm specific variables: selection of abnormal returns drivers

Previous studies based on an event approach identified drivers for explaining results and the variability in abnormal returns, such as earnings per share, market to book value, market capitalization (Binder, 1998; Kolari & Pynnönen, 2010; Strong, 1992). The identification of the drivers for the analysis and interpretation of the abnormal results is based on the assumption that: a) the amount of accounting could support firm value measurement; b) investors' decisions are influenced by the information available to them.

In this study, we assume that share prices—and consequently abnormal returns—are influenced by accounting attributes, in the assumption that they summarize information that could affect investors' decisions. Even if markets are not totally efficient in absorbing and reacting to the information available, share prices could reflect the consensus belief of investors (Barth, 2000). For this study, we selected, as drivers for explaining abnormal returns, the following measures: *earnings per share excluding extraordinary elements* (EPS); *cash flow per share* (CFPS); *book value per share* (BVPS) and *tangible book value per share* (TBVPS). These ratios are the ones that investors tend to look at on a daily basis and they change whenever the price of the stock changes. These allow to compare a company to others in a specific industry (Arkan, 2016). The combined analysis of the last two drivers will allow us to be able to evaluate how intangibles influence market prices. Data were collected from the *Reuters* website and are referred to the year 2019.

## 5. Data and empirical results

The spread of Covid-19 in Italy had a significant psychological impact on the population, shaping their expectations, decisions and behaviour.

The strong limitations on individual mobility have been accepted as a social antidote but have also generated profound transformations in a brief period. They have changed the production levels and expected profitability of companies, with immediate repercussions on the prices of listed securities.

The method used (described in the previous section) allows us to measure the anomalous trends that occurred following the Covid-19 shock. In particular, the Table 1 offers a summary representation of the anomalous trends, distinguishing between the MIB 30 segment and the STAR segment.

At the beginning of infection in the Chinese city of Wuhan [-22, 0], both segments of the Italian stock market began to register anomalous negative returns: −1.42% the MIB 30, −4.10% the STAR.

This was due to the negative effect of the slowdown on the Chinese economy, which was expected to influence Italian companies, especially those most exposed to

**Table 1.** Effects of Coronavirus on the Italian stock exchange market, by market segments.

| Panel | n | CAAR [-22,0] | CAAR [1,47] | CAAR [48,112] | CAAR [113,177] | CAAR [19,30] | CAAR [64,76] |
|---|---|---|---|---|---|---|---|
| MIB30 | 40 | −1.42%* | 0.1%* | −4.39%*** | −0.71* | 1.44%*** | −0.99% |
| STAR | 77 | −4.10%*** | −7.08%*** | −3.58% | −7.06%*** | 3.37%*** | 5.09%*** |

Note: The parametric test suggested by Boehmer et al. (1991) has been used to analyze whether CAARs are statistically significant.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.
Source: Authors elaboration.

the Chinese market (such as the fashion, precision components, chemical and pharmaceutical sectors).

The first Italian Covid-19 case, in Codogno, Lombardy, produced a very significant shock on the capital market. The STAR segment stocks were the most affected: overall [1, 47] the model records anomalous returns of −7,08% over a period of about three weeks. In the same period, the anomalous returns of the MIB 30 segment mark a substantial stability (0.1%).

A turnaround got after the announcement of the BCE pandemic emergency purchase program. The declaration of an expansive monetary policy [19, 30] had immediate effects on market trends: the MIB 30 segment records anomalous returns of + 1.44%, the STAR segment of + 3.37%.

The situation changed and diversified with the beginning of the easing of social containment measures. If the segment with the largest capitalization on the Italian stock exchange (MIB 30) records negative trends (-4.39%), the segment with the smallest capitalization (STAR) shows anomalous trends statistically not significant.

Furthermore, the STAR segment has the best positive effects on the announcement of the Next Generation Agreement [64, 76] by the European Union.

The second wave of infection [113, 177] brings out the presence of anomalous negative returns in both segments of the Italian Stock Exchange: −0.71% for the MIB 30, −7.06% for the STAR. As in Phase 1, the STAR segment records the largest losses.

Table 2 offers a different perspective on the effects produced by the shock on the Italian stock exchange, according to business sectors. It reports anomalous returns over the entire period of observation [1, 117]. In particular, in the MIB 30, the shock generated negative anomalous returns in insurance, financial services, public services, oil and natural gas sectors. Positive anomalous returns arise only in cars and components sector.

As the table shows, all sectors of the STAR segment recorder anomalous negative returns, with the exception of the telecommunications sector. Negative anomalous returns are particularly strong in real estate, consumer services, and public services.

Tables 3 and 4 offer a different perspective by segment of the Italian stock exchange, sector, and time.

In particular, Table 3 shows results related to the greatest capitalization segment of the Italian stock exchange, the MIB 30.

Fashion and household products, financial services, oil, and natural gas record negative anomalous returns since the first days of the spread of Covid-19 in China.

**Table 2.** Effects of Coronavirus on the Italian stock exchange market, by sector of activity.

| | MIB30 | | STAR | |
|---|---|---|---|---|
| MIB30, sectors | *n* | *CAAR(1,177)* | *n* | *CAAR(1,177)* |
| Consumer goods (food) | 1 | 16,59% | 5 | 4,71% |
| Consumer goods (cars and components) | 3 | 31.40%** | 2 | −12,86% |
| Consumer goods (fashion, household and personal products) | 2 | 10,48% | 7 | −29.59%* |
| Chemistry and raw materials | 1 | −30,70% | 3 | −3,55% |
| Finance (insurance) | 3 | −24.94%*** | | |
| Finance (banks) | 8 | −3,76% | 1 | −17,74% |
| Finanza (real estate) | | | 1 | −75.67%*** |
| Finance (financial services) | 3 | −26.47%** | 8 | −16,19% |
| Industry (construction and materials) | 1 | 9,83% | 2 | −16,25% |
| Industry (industrial products and services) | 5 | −7,05% | 27 | −17.74%*** |
| Oil and natural gas | 3 | −25.01%*** | | |
| Health | 3 | 18,02% | | |
| Consumer services (trade) | | | 4 | −36.29%*** |
| Consumer services (media) | | | 6 | −10,50% |
| Public services | 5 | −18.38%* | 2 | −51.43%** |
| Technology | 1 | 26,31% | 8 | −18.88%* |
| Telecommunications | 1 | −11,68% | 1 | 47.33%* |

Note: The parametric test suggested by Boehmer et al. (1991) has been used to analyze whether CAARs are statistically significant.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.
Source: Authors elaboration.

**Table 3.** Effects of Coronavirus in the MIB 30 segment, by business sector.

| MIB30, sectors | n | CAAR [-22,0] | CAAR [1,47] | CAAR [48,112] | CAAR [113,177] | CAAR [19,30] | CAAR [64,76] |
|---|---|---|---|---|---|---|---|
| Consumer goods (food) | 1 | −2,42% | −4,37% | 14,02% | 6,94% | −4,08% | 2,31% |
| Consumer goods (cars and components) | 3 | −5,47% | 15.69%** | −3,88% | 19.59%** | −13.45%*** | −3,77% |
| Consumer goods (fashion, household and personal products) | 2 | −13.25%** | 10,12% | −7,74% | 8,09% | 7,30% | 6,71% |
| Chemistry and raw materials | 1 | −11,04% | 4,72% | −29.09%** | −6,33% | 11.13%** | 3,50% |
| Finance (insurance) | 3 | 1,08% | −11.98%*** | −6,00% | −6,96% | 11.19%*** | 0,05% |
| Finance (banks) | 8 | 0,91% | −6,02% | 2,88% | −0,62% | −3,54% | 7.06%** |
| Finanza (real estate) | 3 | −7.35%* | −4,82% | −13.48%** | −8,17% | 1,74% | −4,17% |
| Finance (financial services) | 1 | −3,01% | 11,92% | −2,79% | 0,69% | −1,10% | −3,71% |
| Industry (construction and materials) | 5 | 1,77% | −1,38% | −7,11% | 1,44% | 7.07%*** | −4.76%* |
| Oil and natural gas | 3 | −9.21%*** | −2,04% | −15.36%*** | −7.61%* | 8.81%*** | −0,98% |
| Health | 3 | −0,25% | 11.34%** | 4,98% | 1,71% | −1,00% | −15.80%*** |
| Public services | 5 | 5,44% | −7,83% | −0,16% | −10.39%* | −0,16% | −0,68% |
| Technology | 1 | 2,91% | 33.65%** | −19,83% | 12,48% | 10,20% | −9,24% |
| Telecommunications | 1 | 3,51% | −0,47% | −7,77% | −3,43% | −1,45% | −1,09% |

Note: The parametric test suggested by Boehmer et al. (1991) has been used to analyze whether CAARs are statistically significant.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.
Source: Authors elaboration.

The fear of a potential slowdown in Chinese economic growth negatively affected the entire world economy. Greatly affected were the companies most exposed to international trade, the world demand for oil and the financial sector. While the spread of Covid-19 in China had already affected some Italian sectors, the spread of

**Table 4.** Effects of Coronavirus in the STAR segment, by business sector.

| STAR, sectors | n | CAAR [-22,0] | CAAR [1,47] | CAAR [48,112] | CAAR [113,177] | CAAR [19,30] | CAAR [64,76] |
|---|---|---|---|---|---|---|---|
| Consumer goods (food) | 5 | −0,83% | −7,98% | 4,82% | 7,86% | 7.79%*** | 10.39%*** |
| Consumer goods (cars and components) | 2 | −1,81% | −32.95%*** | 17,31% | 2,78% | −1,92% | 8.47% |
| Consumer goods (fashion, household and personal products) | 7 | −7.37%* | −11.45%* | −1,77% | −16.37%** | −1,66% | 7.34%** |
| Chemistry and raw materials (chemistry) | 3 | −8,03% | −21.16%*** | 6,38% | 11,23% | 9.35%** | 11.77%*** |
| Finance (banks) | 1 | 15.97%** | −21.65%* | 14,16% | −10,26% | −0,25% | 6,98% |
| Finance (real estate) | 1 | 1,64% | −34.61%*** | −19.42%** | −21.64%** | −8.69%** | 9.55%** |
| Finance (financial services) | 8 | 4,39% | −7.75%* | −0,96% | −7,47% | 2,09% | 5.86%*** |
| Industry (construction and materials) | 2 | −4,23% | 3,22% | −9,23% | −10,24% | −10.90%** | 8,51% |
| Industry (industrial products and services) | 27 | −5.55%*** | −3,39% | −4,82% | −9.53%*** | 0,87% | 5.53%*** |
| Consumer services (trade) | 4 | −6.24%* | −26.14%*** | −5,18% | −4,98% | 2,65% | 3,91% |
| Consumer services (media) | 6 | −14.51%*** | 12.40%* | −10,76% | −12,14% | 17.93%*** | 1,07% |
| Public services | 2 | 3,15% | −19.92%** | −7,24% | −24.28%** | −2,05% | 2,26% |
| Technology | 8 | −1,82% | −5,07% | −12.01%** | −1,80% | 10.06%*** | −3,23% |
| Telecommunications | 1 | −6,00% | 18,59% | 16,14% | 12,60% | 4,10% | 5,90% |

Note: The parametric test suggested by Boehmer et al. (1991) has been used to analyze whether CAARs are statistically significant.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.
Source: Authors elaboration.

the virus in Italy expanded these effects to a wider economic base. In the three weeks following the first Italian case, most of the economic sectors represented in the MIB 30 recorded anomalous negative returns, but the capacity for resilience of the Italian companies with more capitalization was particularly strong in the subsequent weeks. A few sectors, on the other hand, took clear advantage of the Covid-19 shock, recording only anomalous positive returns. This is the case for cars, components, technology, and the health sector.

In phase 2, the previous push wears off and the negative signs in anomalous returns in the chemical, financial services and oil sectors coming back. Since the infections had decreased, trends may appear counterintuitive. However, they represent the economic negative expectations of many operators about the autumn months.

The Phase 3 growth of infection reproduces the same trends as in Phase 1.

The positive effects of the BCE pandemic emergency purchase program are particularly evident [19, 30], while the announcement of the Next Generation Agreement—Recovery fund produces unclear effects [64, 76].

Table 4 shows the results of the STAR segment by sub-periods and economic sectors. The data shown the presence of anomalous returns already in the early stages of the spread of the virus in China [-21, 0]. Fashion, home products, industrial products and services, consumer services immediately recorded anomalous negative effects. In contrast, the banking sector recorded positive anomalous returns (+ 15.97%). This scenario substantially changed in the days following the spread of the virus in Italy [1, 47]. The effects of the shock become symmetrical among all sectors. Statistically significant anomalous returns show a negative sign, although their intensity varies

considerably among sectors (from −34.61% in real estate to −7.75% in financial services).

The BCE pandemic emergency purchase program had notable consequences. After the declarations of the ECB President on 19 March 2020, the performance of the companies listed in the STAR segment of the Italian stock exchange become positive.

Only the real estate management and public services did not benefit from the new phase of monetary policy. The easing of social containment measures of the Phase 2 increased the degree of social complexity and uncertainty: negative anomalous returns reappeared. In addition to the real estate management (equal to −19.42%), technology was also affected by negative values .

It is important to point out the positive effects of the announcement of the Next Generation Agreement. It has, in fact, determined a positive trend reversal. Particularly noteworthy are anomalous trends in food, consumer goods, chemistry and raw materials, financial services, industrial products, and services. After the announcement of the Next Generation Agreement, the real estate sector also recorded anomalous positive returns (equal to +9.55%). The second wave of infections (Phase 3) generates a came back to negative anomalous returns. Negative performance is particularly strong in public services, real estate, and consumer goods sectors.

## 6. Discussion

The results allow us to analyse the effects of Covid-19 on the two major segments of the Italian stock market. However, as the results are diversified by segment, sectors and time, some general considerations are possible. In Phase 1, the Covid-19 shock had a significant symmetrical negative effect on the equity returns of listed companies in the two market segments. A similar symmetry can be found in the stock market trends that followed the new course of expansionary monetary policy.

On the contrary, there is evidence of asymmetric effects in the Phase 2 (with an easing of restrictive measures) and after the announcement of the Next Generation Agreement.

The Phase 3 finally marks a return to symmetrical trends: both market segments return to record anomalous negative returns.

To understand and interpret anomalous returns, we tried to correlate these with a set of variables linked to the capitalization and returns of individual listed companies. The aim is to verify whether the pre-virus conditions that characterized each individual company may have amplified or attenuated the anomalous returns recorded following the Covid-19 shock.

Tables 5 and 6 present the results of the Eq. (8) described in section 'Methodology'. In particular, Table 5 refers to companies in the MIB 30 segment, while Table 6 refers to companies in the STAR segment. Each of the two tables presents four different estimated models, each of which refers to one observation period.

Table 5 shows that during the first phase [1, 47] some of the independent variables considered had a statistically significant effect on anomalous trends. Higher values in the Tangible Book Values and in the Cash Flow favoured the formation of positive

**Table 5.** Determinants of anomalous returns in the MIB30 segment.

| Variables | Model 1 [-22, 0] | Model 2 [1, 47] | Model 3 [48, 112] | Model 4 [113, 177] | Model 5 [19, 30] | Model 6 [64, 76] |
|---|---|---|---|---|---|---|
| EPS | −0.0231 | 0.0484 | −0.0151 | 0.0161 | −0.00732 | −0.0348* |
| | (0.0183) | (0.0393) | (0.0220) | (0.0202) | (0.0178) | (0.0191) |
| Book value | 0.00191 | −0.00521 | −0.00118 | 0.00113 | 0.00348 | 0.00214 |
| | (0.00202) | (0.00450) | (0.00234) | (0.00342) | (0.00502) | (0.00155) |
| Tangible book value | −0.00160* | 0.00156** | 0.000890 | −0.000867 | −0.00301** | 0.00152** |
| | (0.000781) | (0.000708) | (0.00136) | (0.000689) | (0.00114) | (0.000599) |
| Cash flow | −0.00789** | 0.0133** | −0.00109 | −0.00114 | −0.00907 | −0.00408 |
| | (0.00327) | (0.00587) | (0.00436) | (0.00504) | (0.00705) | (0.00234) |
| Market capitalization | −1.54e-07** | −3.78e-07*** | 6.48e-08 | −2.18e-07*** | 2.43e-08 | 2.90e-08 |
| | (5.95e-08) | (6.35e-08) | (8.43e-08) | (5.25e-08) | (4.46e-08) | (5.43e-08) |
| Constant | 0.0146 | −0.0244 | −0.0200 | −0.0207 | 0.0163 | 0.0105 |
| | (0.0321) | (0.0525) | (0.0389) | (0.0396) | (0.0220) | (0.0225) |
| Observations | 40 | 40 | 40 | 40 | 40 | 40 |
| R-squared | 0.113 | 0.115 | 0.034 | 0.027 | 0.071 | 0.227 |

Robust standard errors in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.
Source: Authors elaboration.

**Table 6.** Determinants of anomalous returns in the STAR segment.

| Variables | Model 1 [-22, 0] | Model 2 [1, 47] | Model 3 [48, 112] | Model 4 [113, 177] | Model 5 [19, 30] | Model 6 [64, 76] |
|---|---|---|---|---|---|---|
| EPS | 0.00300 | −0.0809 | 0.0296 | −0.113* | 0.0211 | −0.00387 |
| | (0.0392) | (0.0793) | (0.0489) | (0.0554) | (0.0286) | (0.0399) |
| Book value | 0.00181 | 0.00812 | −0.00245 | −0.00424 | 0.00381 | −0.00285 |
| | (0.00224) | (0.00639) | (0.00502) | (0.00326) | (0.00251) | (0.00255) |
| Tangible book value | 0.000849 | −0.00865 | 0.00354 | 0.00420 | −0.00896*** | 0.00400 |
| | (0.00247) | (0.00508) | (0.00384) | (0.00385) | (0.00204) | (0.00312) |
| Cash flow | −0.0112 | −0.00907 | −0.0129 | 0.0819*** | −0.0269 | 0.0225 |
| | (0.0195) | (0.0344) | (0.0234) | (0.0218) | (0.0180) | (0.0179) |
| Market capitalization | 3.39e-05 | 0.000145** | 2.25e-06 | 6.46e-05 | −1.32e-05 | −4.73e-05*** |
| | (2.26e-05) | (6.20e-05) | (2.74e-05) | (5.41e-05) | (1.44e-05) | (1.12e-05) |
| Constant | −0.0585* | −0.108** | −0.0332 | −0.117*** | 0.0609** | 0.0557*** |
| | (0.0304) | (0.0488) | (0.0363) | (0.0309) | (0.0274) | (0.0144) |
| Observations | 76 | 76 | 76 | 76 | 76 | 76 |
| R-squared | 0.076 | 0.110 | 0.013 | 0.079 | 0.067 | 0.102 |

Robust standard errors in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.
Source: Authors elaboration.

anomalous returns, while higher values in the Market Capitalization acted in the opposite direction, that is, they favoured the formation of negative anomalous returns.

The situation substantially changes after the announcement of BCE pandemic emergency purchase program [19, 30]. The sign of the statistical relationships between independent variables and anomalous returns disappeared and the Tangible Book Values effect was reversed. A higher value of Tangible Book Values favoured the formation of anomalous negative returns. No statistically significant relationship seems to characterize the second phase [48, 112]. For MIB 30 companies, the significant anomalous returns are attributable to other factors, different from the companies' capital and income structure. However, announcement of the EU Recovery fund agreement [64, 76] highlights the different role of EPS and Tangible Book Value: the

first negative correlated to anomalous returns, the second positively correlated. If we focus on Phase 3 [113, 177], the statistically significant effect of the dependent variables changes greatly: Tangible Book Values and Cash Flow lose statistical significance, compared to a greater statistical relevance of the Market Capitalization.

Table 6 supports the analysis of anomalous trends in companies belonging to the STAR segment. In Phase 1, the statistically significant variable in the determination of anomalous returns is Market Capitalization. A greater company's capitalization ensured lower anomalous negative returns: in other words, a greater resilience to the Covid-19 shock. In the period following the declaration of an expansive monetary policy, the picture becomes, and the anomalous returns are correlated with the Tangible Book Value.

As observed for MIB 30, no statistically significant relationship seems to characterize the Phase 2 [48, 112] of the STAR segment. However, the announcement of Next Generation Agreement [64, 76] highlights the reversed role of Market Capitalization.

Only in the last observed sub-period [113, 177], EPS and Cash Flow are statistically significant, although they recorder opposite directions.

### 6.1. Discussion of findings in relation to prior research

In this section, we compare our study with prior research, in order to explain how this paper contributes to the literature.

First, most of the studies published on this topic are focused on the global stock markets (Bannigidadmath et al., 2022; Chowdhury et al., 2022; Scherf et al., 2022). Unlike these, the starting point of this research was that the vulnerability of financial markets could depend on sectoral composition.

Indeed, some authors concluded that the impact of COVID-19 is likely to vary across stock markets so that lumping all countries in a regression might lead to aggregation bias (Topcu & Gulal, 2020). Our study differs from prior research in that it explores the impact of the pandemic on the stock market, offering evidence from Italy.

Secondly, there is limited industry-level research on the effect of COVID-19 on stock prices in the existing literature (Iyke, 2020; Reilly, 2020; Saadat et al., 2020; Sobieralski, 2020). For example, He et al. (2020) use an event-study approach to study empirically the market performance and response trends of Chinese industries to the COVID-19 pandemic. The study found that transportation, mining, electricity and heating, and environment industries have been adversely affected by the pandemic. On the contrary, manufacturing, information technology, education and health-care industries have been resilient to the pandemic.

Moreover, we find that all these latest researchers studied the immediate and short-term effects of COVID-19 on majors affected countries' stock markets due.

Our study contributes to the literature exploring the impact of the pandemic on the stock prices of various sectors and exploring the responsiveness of each industry. We also delved into the different changes in the stock prices of various industries during different pandemic window periods to discover the ability of different industries to respond to the pandemic.

Finally, to understand and interpret anomalous returns during the different pandemic window periods, we correlated these with a set of variables linked to the capitalization and returns of individual listed companies. We showed that some pre-virus conditions that characterized each individual company contributed in some cases to amplify or attenuate the anomalous returns recorded following the Covid-19 shock.

## 7. Conclusions and policy implications

This paper analysed the effect of the pandemic on companies belonging to several sectors, offering evidence from Italy.

By observing the cumulative abnormal returns (CARs) of these companies, results firstly allow to document which sectors behaved abnormally during the Covid-19 outbreak.

The conclusion is twofold:

- overall, companies belonging to the MIB 30 seem to have benefited from the shock and show anomalous positive returns, especially driven by the sectors of health, technology, consumer goods (cars and components);
- all sectors of the STAR segment show anomalous negative returns with varying intensity. Particularly evident are the negative anomalous returns in the real estate, consumer goods (cars and components), consumer services, banks and chemistry sectors. Secondly, study's results allow to conclude about the effectiveness of measures adopted in response to the pandemic. We can observe that the reaction to the BCE Announcement created positive effects; accordingly, we can conclude that, even in the event of a health shock, public interventions produce positive effects, as these give new confidence to investors.

Finally, considering the variables linked to the capitalization and returns of individual listed companies used and correlated with the anomalous returns, we can conclude that the pre-pandemic conditions that characterize each company must be taken into account as they will contribute to amplify or mitigate the anomalous returns recorded following a shock. Indeed, we found that in the first lockdown period, a greater company's capitalization ensured a greater resilience to the Covid-19 shock.

This study provides some interesting policy recommendations for policymakers, financial institutions, investors, and other stakeholders in the stock markets.

Especially during the early phase of any future pandemic, sector analysis can help policymakers evaluate the benefits and harms of their interventions. For instance, governments should implement differentiated or selective pandemic containment policies, i.e., take into account the different effects that the interruption of activities can have on different economic sectors.

For central banks and other financial institutions, we provide evidence that timely responses, such as an increase in the money supply, have positive effects. However, the different responses from different sectors need to be considered.

Our results provide empirical support for understanding how an outbreak of contagious disease affects stock returns in various sectors, also helping investors to develop trading strategies to protect their wealth from future epidemics and providing a first and crucial input into the assessment of economic vulnerability to pandemic crises.

The results can also support the development of industry sector-specific coefficients of vulnerability to infectious diseases. They can be used to develop an overall picture of the degree to which a country's economic activity is susceptible to the impact of infectious diseases. According to this, the implications of our study are important for stock market main players to understand and predict the behaviour of stock market returns during pandemic disease. The article expanded on the research field of COVID-19 and explored the heterogeneous reaction of industries to major emergencies.

The conclusions of this article can also provide a reference for countries across the world in their fight against the pandemic and resume economic production.

## Authors' contributions

All authors were involved in the research design and contributed to writing the manuscript. Marianna Mauro conceived the study and wrote Sections 1 and 3. Monica Giancotti wrote Section 6. Vito Pipitone conducted the analysis and wrote Sections 4 and 5. Riccardo Tiscini wrote Section 2. All authors provided comments to the various drafts and approved the final version.

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