STOCK PRICE REACTIONS TO THE FIRST WAVE OF THE COVID-19 PANDEMIC: EVIDENCE FROM GREECE

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ABSTRACT

This study investigates stock price performance at the industry level during the first wave of the COVID-19 pandemic in Greece. We identify five periods from January to May 2020, namely the pre-incubation, incubation, outbreak, lockdown, and lockdown lift periods. We provide evidence that industry-level stock returns witnessed their largest drop during the outbreak period. In particular, the travel and leisure, construction, telecommunications, industrial goods, real estate, technology and utility sectors had, on average, highly negative cumulative returns. The results also reveal a partial recovery in equity prices during the lockdown period, possibly due to the announcement of fiscal stimulus measures by the Greek government along with the initiation of the ECB's pandemic emergency purchase programme (PEPP). The telecommunications, construction, technology, and travel and leisure sectors exhibited the highest performance over that period. We then evaluate the reaction of industry-level stock returns relative to the market index, performing an event study analysis. The empirical findings show that the utilities, telecommunications, personal goods and retail sectors experienced less losses compared with the market index during the outbreak period in Greece. Finally, despite the partial recovery of equity prices in the lockdown period, the results show that the basic raw materials, food and beverage, industrial goods and retail sectors underperformed compared with the market index in the short run.

Η ΑΝΤΙΔΡΑΣΗ ΤΩΝ ΤΙΜΩΝ ΤΩΝ ΜΕΤΟΧΩΝ ΣΤΟ ΠΡΩΤΟ ΚΥΜΑ ΤΗΣ ΠΑΝΔΗΜΙΑΣ COVID-19: ΕΥΡΗΜΑΤΑ ΑΠΟ ΤΗΝ ΕΛΛΑΔΑ

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ΠΕΡΙΛΗΨΗ

Η παρούσα μελέτη αναλύει την απόδοση των τιμών των μετοχών σε επίπεδο κλάδου στη διάρκεια του πρώτου κύματος της πανδημίας COVID-19 στην Ελλάδα. Αναγνωρίζουμε πέντε περιόδους από τον Ιανουάριο μέχρι και το Μάιο του 2020, και συγκεκριμένα την περίοδο πριν από την επώαση του κορωνοϊού, την περίοδο της επώασης, την περίοδο εκδήλωσης του ιού, την περίοδο του lockdown και την περίοδο άρσης του lockdown. Τα ευρήματα δείχνουν ότι οι αποδόσεις των μετοχών σε επίπεδο κλάδου υπέστησαν τη μεγαλύτερη πτώση την περίοδο εκδήλωσης του κορωνοϊού. Συγκεκριμένα, οι κλάδοι ταξιδιών και αναψυχής, κατασκευών, τηλεπικοινωνιών, βιομηχανικών αγαθών, ακινήτων, τεχνολογίας και κοινής ωφέλειας είχαν κατά μέσο όρο αρνητικές σωρευτικές αποδόσεις. Τα αποτελέσματα αποκαλύπτουν επίσης ότι την περίοδο του lockdown παρατηρήθηκε μερική ανάκαμψη των τιμών των μετοχών, η οποία πιθανόν να οφείλεται στην ανακοίνωση των δημοσιονομικών μέτρων στήριξης από την ελληνική κυβέρνηση σε συνδυασμό με τη θέσπιση του έκτακτου προγράμματος αγοράς στοιχείων ενεργητικού λόγω πανδημίας (PEPP) από την Ευρωπαϊκή Κεντρική Τράπεζα. Οι κλάδοι τηλεπικοινωνιών, κατασκευών, τεχνολογίας και ταξιδιών και αναψυχής παρουσιάζουν τις μεγαλύτερες αποδόσεις την περίοδο του lockdown. Στη συνέχεια, αξιολογούμε την αντίδραση των αποδόσεων των μετοχών σε επίπεδο κλάδου με βάση την ανάλυση της μελέτης γεγονότων (event study). Τα εμπειρικά ευρήματα δείχνουν ότι οι κλάδοι κοινής ωφέλειας, τηλεπικοινωνιών, προσωπικών αγαθών και λιανεμπορίου έχουν υποστεί λιγότερες ζημίες σε σχέση με το γενικό δείκτη της αγοράς την περίοδο εκδήλωσης του COVID-19 στην Ελλάδα. Τέλος, παρά τη μερική ανάκαμψη των τιμών των μετοχών την περίοδο του lockdown, τα αποτελέσματα δείχνουν ότι οι κλάδοι βασικών πρώτων υλών, τροφίμων και ποτών, βιομηχανικών αγαθών και λιανεμπορίου βραχυπρόθεσμα υποαποδίδουν σε σχέση με το γενικό δείκτη της αγοράς.

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1 INTRODUCTION

The outbreak of COVID-19 came as a surprise to the world economy. The spread of the new coronavirus disease in China's Hubei Province at the end of December 2019 was initially considered a regional crisis and received little attention. Indicative of the latter was that in the World Economic Forum's (2020) *Global Risks Report* published on 15 January 2020, none of the five-top rated risks were associated with public health. Instead, they were all linked to environmental issues.

As the coronavirus spread beyond China, the COVID-19 pandemic attracted a great deal of attention. There is a rapidly growing literature that investigates the impact of the COVID-19 pandemic on firms' stock returns. Davis et al. (2021) document that value-weighted global stock prices fell by 40% between 17 February and 23 March 2020. Focusing on the two largest economies, they find that the pandemic had greater effects on stock market levels and volatilities in the United States than in China. Using text-based methods, Baker et al. (2020) find that newspapers attribute 18 market jumps to COVID-19 and policy responses to the pandemic from 24 February to 24 March 2020. Ramelli and Wagner (2020) analyse stock price reactions focusing on the role of firms' exposure to international trade, corporate debt and cash holdings. They find that firms with greater export or supply chain exposure to China exhibit lower returns during the COVID-19 pandemic. Also, they show that firms with high leverage and little cash perform worse in reaction to bad news about the pandemic. This has also been documented in Alfaro et al. (2020) and Ding et al. (2020). Davis et al. (2020) provide evidence that bad COVID-19 news is associated with lower returns for firms with high exposures to travel, traditional retail, aircraft production, and energy supply, but with higher returns for firms with high exposures to health-care policy, e-commerce web services, drug trials, and materials that feed into supply chains for semiconductors, cloud computing and telecommunications.

In this study we provide evidence from the Greek stock market on how the COVID-19 pandemic impacted on stock returns across industries, focusing on the first wave of the pandemic. Our analysis is organised along five periods that are associated with the first phase of the COVID-19 pandemic in Greece, namely the pre-incubation period (1 January-30 January 2020), the incubation period (31 January-25 February 2020), the outbreak period (26 February-22 March 2020), the lockdown period (23 March-3 May 2020) and the lockdown lift period (4 May-31 May 2020).

We first investigate the performance of industry-level stock returns in the five identified periods of the first wave of the pandemic in Greece, focusing on the mean cumulative returns (MCRs). To this end, we use daily stock return data for 112 Greek listed firms from January to May 2020. We find that all industries performed well prior to the incubation period, as the COVID-19 pandemic was not considered a high-risk event at that time. In particular, the technology, industrial goods, basic raw materials and real estate sectors exhibit highly positive and statistically significant MCRs. In the incubation period, industries delivered negative returns, mainly because the COVID-19 pandemic captured considerable attention as the probability of an outbreak in Greece had increased. Basic raw materials, retail, industrial goods, technology, construction and real estate exhibit negative and significant MCRs.

We provide evidence that firms experienced the largest drop in their equity prices during the outbreak period, as investors perceived the real shock of the COVID-19 pandemic and the

effects of the evolving health crisis on economic activity. The MCRs of Greek industries suggest that the travel and leisure, construction, telecommunications, industrial goods, real estate, technology and utilities sectors were the big losers. In the lockdown period, equity prices rebounded. This is possibly due to the announcement of the fiscal stimulus measures by the Greek government and the ECB's intervention in the bond market via the pandemic emergency purchase programme (PEPP). Telecommunications, construction, technology, and travel and leisure yielded the highest MCRs during the lockdown period. In the lockdown lift period, they had much lower positive MCRs than in the lockdown period, with the construction and food and beverage sectors having a positive and statistically significant performance.

Finally, we perform an event study to assess how industry-level stock returns reacted during the five periods of the early stages of the COVID-19 pandemic in Greece, with a focus on the mean cumulative abnormal returns (MCARs). We show that in the pre-incubation period most industries outperformed the market index, i.e. the Athens Exchange Composite Index. More specifically, the technology, industrial goods, real estate and basic raw materials sectors have positive and significant MCARs. In addition, we do not find any significant reaction of stock returns for most industries during the incubation period. In the outbreak period, that is the period in which the Greek stock market crashed, we find based on a 10-day event window that the retail, food and beverage, personal goods and industrial goods sectors experienced significantly smaller losses than the market index. However, during the lockdown and the lockdown lift periods most industries underperformed compared with the market index.

The remainder of the study is organised as follows. The next section describes the timeline of events, the data and the methodology used. Section 3 analyses the performance of industry-level stock returns for the five identified periods of the first wave of the COVID-19 pandemic in Greece. Section 4 evaluates how industry-level stock returns responded in each of the five periods using the event study methodology. Section 5 concludes.

2 TIMELINE OF EVENTS, DATA AND METHODOLOGY

The coronavirus (COVID-19) disease was first detected in Wuhan, China in late December 2019. On 20 January 2020, the Chinese health authorities confirmed the human-to-human transmission of COVID-19 and on 23 January, Wuhan city was closed. On 24 January, France announced the first confirmed COVID-19 cases in Europe referring to three people who had recently travelled to China. On 30 January, the World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern (PHEIC). The period extending from 1 January to 30 January 2020 is labelled as the "pre-incubation period", as COVID-19 received very little attention in Greece and in most European countries at the time.

On 31 January, the first confirmed COVID-19 case in Italy was reported. Since that day, the Greek health authorities had been worrying about COVID-19-related developments, stressing that the probability of having COVID-19 cases in Greece in the following weeks had considerably increased. On 23 February, Italy imposed a strict lockdown for almost 50,000 people in two regions close to Milan, i.e. Veneto and Lombardy. We label the period from 31 January to 25 February 2020 as the "incubation period".

On 26 February, Greece confirmed its first COVID-19 case, and the first restrictive measures were introduced at the beginning of March 2020. On 10 March, with 84 confirmed cases and no deaths in the country, the Greek government decided to suspend the operation of educational institutions at all levels nationwide. On 13 March, all leisure, entertainment

and cultural activities were suspended and on 18 March, all retail stores (excluding supermarkets, groceries and banks) were closed. The period from 26 February to 22 March 2020 is labelled as the "outbreak period".

Mention should be made on the response of the Greek government and the ECB to the COVID-19 pandemic during this period of time. In particular, on 18 March 2020 the Greek government announced a package of fiscal measures amounting to 14% of GDP, or EUR 24 billion. On that same day, the ECB announced the pandemic emergency purchase programme (PEPP) to counter the serious risks to the monetary policy transmission mechanism and the outlook for the euro area posed by the COVID-19 outbreak. The PEPP foresees purchases of eligible private and public sector securities at a volume of EUR 750 billion, including bonds issued by the Greek government.

On 23 March 2020 the Greek government announced a national lockdown that lasted until 3 May 2020. This period is labelled as the "lockdown period". On 4 May, the Greek government implemented a gradual re-opening of the economy in three stages until the end of May 2020. On 4 May, less crowded retail businesses (such as bookstores, opticians/eyewear shops and sports retailers) as well as businesses offering services by appointment only (such as hairdressers) reopened. On 11 May, all the remaining retail businesses except shopping malls were permitted to reopen. On 18 May, some cultural and leisure activities were allowed, such as visits to archaeological sites, zoos and botanical gardens. We label the 4 May-31 May 2020 period as the "lockdown lift period".

Our final dataset comprises 112 Greek listed firms and was obtained from Thomson Datastream, while the sample period is January-May 2020. We exclude finance and insurance companies as well as companies with missing data and non-traded shares. We retrieve daily stock prices for common shares from Thomson

Table 1 Allocation of firms into industry groups

Industry	Number of firms	MV share (%)
Basic raw materials	13	2.74
Construction	11	4.91
Food and beverage	7	3.73
Healthcare	4	1.33
Industrial goods	21	11.63
Personal goods	10	12.73
Real estate	7	6.69
Retail	9	1.74
Technology	12	1.58
Telecommunications	6	24.39
Travel and leisure	7	16.95
Utilities	5	11.58
Total	112	

Notes: This table shows the allocation of Greek Athex-listed firms into twelve industry groups. The second column shows the market value (MV) share for each industry as of 31 December 2019.

Datastream from 2 January to 29 May 2020. Prices are adjusted for dividends. We also obtain daily data on the returns of the Athens Exchange composite share price index (Athex composite index) for the same trading period. Based on the Thomson Datastream industry classification, we classify firms into twelve industry groups: Basic Raw Materials;[1] Construction; Food and Beverage; Healthcare; Industrial Goods; Personal Goods; Real Estate; Retail; Technology; Telecommunications; Travel and Leisure; and Utilities. We exclude industries in which less than four firms are included.[2] Table 1 describes in detail the distribution of firms across these industry groups. The table also shows the market value shares as of 31 December 2019 for each industry in our sample. Telecommunications, travel and leisure, personal goods, industrial goods, and utilities have the largest market value shares.

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1 The basic raw materials sector comprises companies involved in the discovery, extraction and processing of raw materials, such as aluminium, iron, steel, coal, etc.
2 In particular, the energy, fisheries and farming, and media sectors are excluded as they include less than four firms.

To investigate stock price reactions during the first wave of the COVID-19 pandemic, we perform an event study analysis based on the seminal works by Fama et al. (1969), Brown and Warner (1980, 1985). In particular, for each of the five identified periods associated with the COVID-19 pandemic in Greece we define the date of the event and the period over which the impact on stock prices will be examined, that is the event window. We calculate the abnormal returns based on the Market Adjusted Model for each day of the event window as follows:

$$AR_{i,\tau} = R_{i,\tau} - R_{m,\tau} \qquad (1)$$

where the daily abnormal return $AR_{i,\tau}$ is defined as the daily actual stock return $R_{i,\tau}$ minus the daily market return $R_{m,\tau}$, i.e. the return on the Athex composite index.[3] For each firm we then calculate the cumulative abnormal return (CAR) for a specific event window associated with the pre-defined five periods used in our study as follows:

$$CAR_{i,\tau} = \sum_{\tau=0}^{n} AR_{i,\tau} \qquad (2)$$

where $\tau = 0$ is the date of the event and n the days post the event.

Finally, we calculate the mean CAR (MCAR) for each industry group to evaluate how stock prices reacted during the five periods of the COVID-19 pandemic.

Chart 1 depicts the number of COVID-19 cases (left-hand scale) and the number of deaths (right-hand scale) in Greece from January to September 2020. In the outbreak period, that is 26 February-22 March 2020, the number of COVID-19 cases came to 530. The first death from COVID-19 in Greece was reported on Thursday, 12 March and the total number of deaths during the outbreak period was 8. Finally, the maximum daily number of new confirmed COVID-19 cases over the outbreak period was 103 and it was registered on Monday, 16 March.

During the lockdown period, from 23 March to 3 May 2020, the total number of COVID-19 cases increased significantly to 2,620, whereas the total number of deaths was 143. The number of COVID-19 cases in the first ten days of the lockdown more than tripled. The maximum daily number of new COVID-19 cases for the lockdown period stood at 156 and was recorded on Wednesday, 22 April. Since 25 April, the daily number of COVID-19 cases had decreased and, as a result, the lockdown was gradually lifted from 4 May onwards. Throughout the three stages of the lockdown lift period from 4 May to 31 May 2020, the rate of increase in the number of cases continued to decline along with the number of deaths. More specifically, at end-May, the total number of COVID-19 cases and deaths came to 2,915 and 175, respectively.

Following the pattern of May 2020, the daily number of COVID-19 cases and deaths dropped in June and July. At the end of July the total number of COVID-19 cases was 4,401, whereas the corresponding number of deaths was 203. In August and September the numbers of COVID-19 cases and deaths rose sharply. By the end of September, the total number of COVID-19 cases had reached 18,123, that is four times higher than in July, whereas the total number of deaths was 388, that is two times higher than in July.

Chart 2 illustrates the performance of the Athex composite index during the first wave of the COVID-19 pandemic in Greece. The four red vertical lines of the chart refer to the starting dates of the incubation, outbreak, lockdown and lockdown lift periods, i.e. 31 January, 26 February, 23 March and 4 May 2020, respectively. We observe that the Athex composite index fell in the incubation period as the COVID-19 pandemic started to attract atten-

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3 We have also used the market model to calculate the abnormal returns. We regress daily stock returns on the daily returns on the market index for the estimation period, defined as the period between 175 and 25 trading days prior to the event. Then we use the estimated alphas and betas to calculate the abnormal return. In particular, we calculate the abnormal returns as the actual returns minus alpha minus the stock's beta times the market return. The market model approach yields similar results.

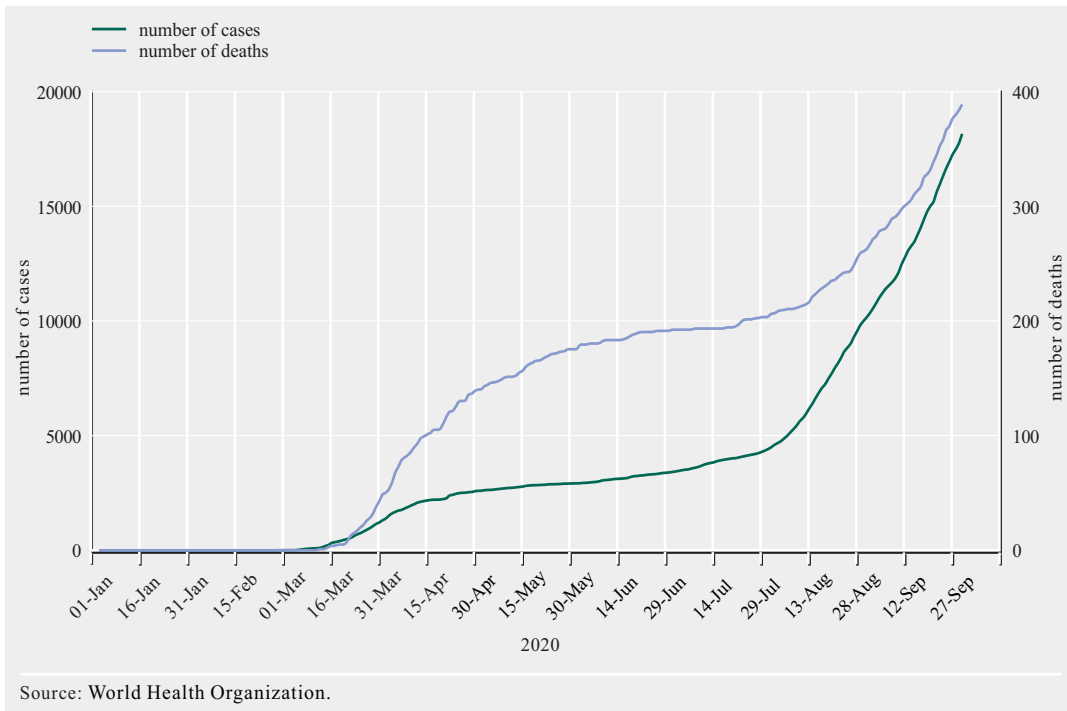## Chart 1 Number of COVID-19 cases and deaths in Greece

- number of cases
- number of deaths

number of cases (left axis): 0, 5000, 10000, 15000, 20000

number of deaths (right axis): 0, 100, 200, 300, 400

x-axis: 01-Jan, 16-Jan, 31-Jan, 15-Feb, 01-Mar, 16-Mar, 31-Mar, 15-Apr, 30-Apr, 15-May, 30-May, 14-Jun, 29-Jun, 14-Jul, 29-Jul, 13-Aug, 28-Aug, 12-Sep, 27-Sep

2020

Source: World Health Organization.

Chart 2 Athens Exchange Composite Index during the first wave of the COVID-19 pandemic

Athens Exchange Composite Index: 400, 500, 600, 700, 800, 900, 1000

Pre-incubation | Incubation | Outbreak | Lockdown | Lockdown lift

x-axis: 01-Jan, 16-Jan, 31-Jan, 15-Feb, 01-Mar, 16-Mar, 31-Mar, 15-Apr, 30-Apr, 15-May, 30-May, 14-Jun, 29-Jun, 14-Jul, 29-Jul, 13-Aug, 28-Aug, 12-Sep, 27-Sep

2020

Source: Thomson Reuters.
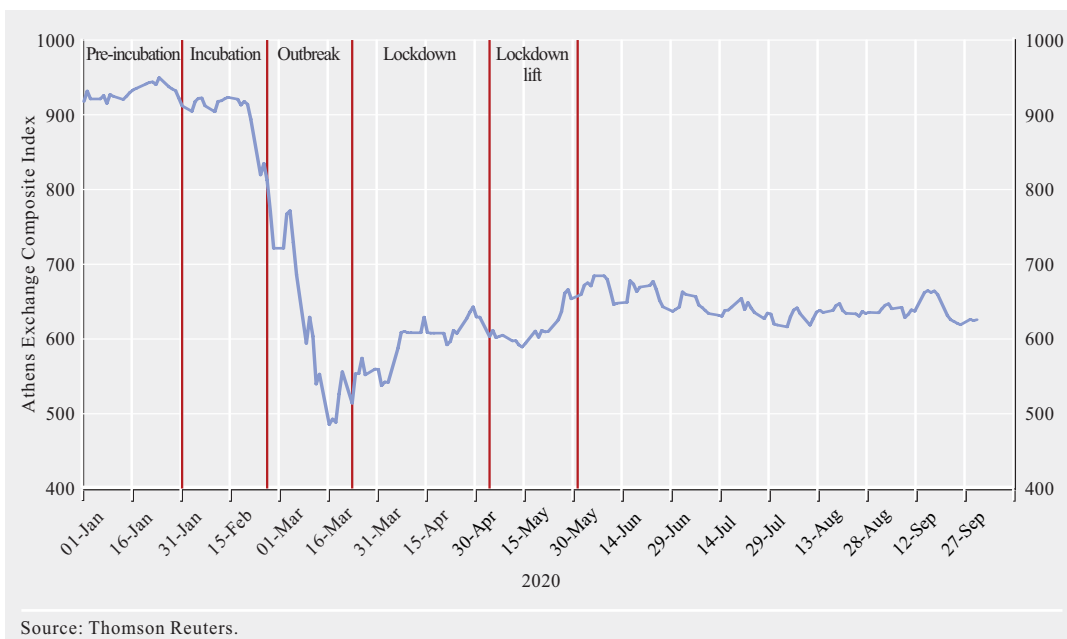
tion in Greece. However, the Athex composite index experienced its sharpest declines throughout the outbreak period, dropping to its lowest level on 16 March. During the lockdown period we observe that the Athex composite index partly recovered thanks to the fiscal support provided by the Greek government and the PEPP introduced by the ECB. The positive performance of the Athex composite index continued into the lockdown lift period, especially from the second half of May onwards.

3 STOCK PERFORMANCE DURING THE COVID-19 PANDEMIC

We evaluate how Greek listed firms performed during the COVID-19 pandemic, focusing on industry-level cumulative stock returns. Table 2 presents the mean cumulative return (MCR) by industry for each period associated with the first wave of the COVID-19 pandemic in Greece, i.e. the pre-incubation, incubation, outbreak, lockdown and lockdown lift periods. We observe that Greek stock returns were not negatively affected in the pre-incubation period, from 1 January to 30 January 2020. Apart from telecommunications and utilities, all the remaining industries exhibited positive stock returns. In particular, technology (10.5%), industrial goods (8.1%), real estate (5.1%) and basic raw materials (4.6%) have the highest and statistically significant MCRs. Personal goods and healthcare have also positive MCRs, albeit not statistically significant.

In the incubation period, between 31 January and 25 February 2020, the performance of Greek stocks deteriorated. This can be explained by the fact that the COVID-19 pandemic attracted the attention of the Greek media, which placed emphasis on news related to COVID-19 developments on a daily basis. At the same time, many newspaper articles and media reports had been pointing out that the probability of a COVID-19 outbreak in Greece had increased dramatically. Looking at the second column of Table 2, all groups of industries

have negative MCRs. On the basis of the MCRs, basic raw materials (-10.3%), retail (-10.1%), industrial goods (-10%), construction (-8.3%) and technology (-7.7%) were most strongly affected in the incubation period. The MCRs in the travel and leisure, telecommunications, food and beverage, and healthcare industries were also affected, but the effect on these industries is not statistically significant.

During the outbreak period (26 February-22 March 2020), the COVID-19 pandemic had a severe impact on Greek stock returns. This is possibly driven by a surge in economic uncertainty as concerns about the COVID-19 pandemic grew dramatically throughout this period. The cumulative return on the Athex composite index plummeted by 32%. The third column of Table 2 shows that all industry groups have highly negative and statistically significant MCRs. Travel and leisure (-36.2%), construction (-35.1%), telecommunications (-30.7%), industrial goods (-23.1%) real estate (-22.4%), technology (-22.2%), personal goods (-21.8%) and utilities (-21.1%) exhibited the highest negative MCRs during the outbreak period. The large decline in equity prices observed in the Greek stock market for this period is in line with that observed in the US and the global stock markets in reaction to the COVID-19 pandemic. By way of illustration, between 19 February and 23 March 2020 the S&P 500 stock market index lost 34% of its value, while global stock prices fell by 40%.

Turning to the lockdown period, i.e. 23 March-3 May 2020, a recovery in Greek stock returns is observed. This recovery could be attributed, to some extent, to the intervention of the Greek government to provide a fiscal package of income support and debt relief measures amounting to 14% of GDP. The Athex composite index recouped one-third of its losses over the lockdown period. At the industry level, except the MCRs in the basic raw materials, healthcare and real estate sectors, which are positive but statistically insignificant, the MCRs of all the remaining sectors are positive and statistically significant. Telecommunica-

Table 2 Mean cumulative returns (MCRs) by industry

(%)

Industry	Pre-incubation period	Incubation period	Outbreak period	Lockdown period	Lockdown lift period
Basic raw materials	4.60**	-10.26***	-25.74***	12.33	12.33
Construction	3.31	-8.29**	-35.09***	30.40***	5.81***
Food and beverage	2.38	-5.71	-19.77***	10.14*	5.48*
Healthcare	9.42	-5.58	-18.04*	13.06	4.69
Industrial goods	8.07**	-10.02***	-23.10***	15.24***	3.02
Personal goods	11.29	-4.37	-21.76***	15.45***	-1.34
Real estate	5.06*	-5.82***	-22.41***	16.11	2.56
Retail	3.40	-10.07***	-20.74***	12.82**	4.19
Technology	10.51**	-7.68**	-22.21***	27.59***	-2.32
Telecommunications	-3.94	-6.52	-30.66***	34.46**	-4.65
Travel and leisure	1.53	-6.98	-36.18***	21.51**	5.47
Utilities	-1.18	-1.42	-21.13**	17.97**	19.37***

Notes: This table shows the mean cumulative returns for the twelve industries during the pre-incubation (1 January-30 January 2020), incubation (31 January-25 February 2020), outbreak (26 February-22 March 2020), lockdown (23 March-3 May 2020) and lockdown lift (4 May-31 May 2020) periods. ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

tions (34.5%), construction (30.4%), technology (27.6%) and travel and leisure (21.5%) yielded the highest positive MCRs during the lockdown period.

In the lockdown lift period, i.e. 4 May-31 May 2020, most industries exhibited positive MCRs. However, only utilities (19.4%), construction (5.8%) and food and beverage (5.8%) exhibited positive and statistically significant MCRs. Travel and leisure, basic raw materials, healthcare, retail and industrial goods have positive but statistically insignificant MCRs. Conversely, MCRs in telecommunications, technology and personal goods are negative but statistically insignificant.

4 STOCK PRICE REACTIONS TO COVID-19 PANDEMIC EVENTS

We proceed to investigate how Greek equity prices reacted to the five event periods of the first wave of the COVID-19 pandemic in Greece, focusing on the mean cumulative abnormal returns (MCARs) across industries. Table 3 presents the MCARs of the twelve industries along with the statistical inference for the pre-incubation period. We observe that between 1 January and 30 January 2020, except telecommunications, all the remaining sectors outperform the Athex composite index, exhibiting positive MCARs. The technology (11.7%), industrial goods (9.2%), basic raw materials (6.2%) and real estate industries have positive and statistically significant MCARs. Healthcare, personal goods, retail, construction, food and beverage, and travel and leisure have positive MCARs, which however are not statically significant. With respect to the incubation period, we do not find statistically significant MCARs across the sectors of the Greek stock market, with the exception of utilities (see Table 4). This means that most firms neither overperformed nor underperformed compared with the market index during the incubation period.

Despite the aforementioned Greek stock market crash during the outbreak period, we provide evidence that some industries experienced smaller stock price losses relative to the market index losses. In particular, Table 5 shows that retail (10.7%), food and beverage (9.1%),

Table 3 Mean cumulative abnormal returns for the pre-incubation period by industry

(%)

Industry	MCAR	t-stat
Basic raw materials	**6.21****	3.14
Construction	4.75	1.47
Food and beverage	3.61	1.70
Healthcare	10.53	1.89
Industrial goods	**9.22*****	3.40
Personal goods	6.52	1.05
Real estate	**6.28***	2.34
Retail	5.28	1.21
Technology	**11.73*****	3.06
Telecommunications	-2.72	-0.72
Travel and leisure	3.05	1.27
Utilities	0.05	0.05

Notes: This table shows the mean cumulative abnormal returns (MCARs) for the twelve industries during the pre-incubation period (1 January-30 January 2020). ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

Table 4 Mean cumulative abnormal returns for the incubation period by industry

(%)

Industry	MCAR	t-stat
Basic raw materials	-1.77	-0.82
Construction	-0.11	-0.03
Food and beverage	2.04	0.50
Healthcare	2.59	0.68
Industrial goods	-2.41	-1.06
Personal goods	4.90	1.52
Real estate	2.23	1.89
Retail	-1.58	-0.66
Technology	0.60	0.15
Telecommunications	1.69	0.26
Travel and leisure	0.75	0.11
Utilities	**6.84***	2.41

Notes: This table shows the mean cumulative abnormal returns (MCARs) for the twelve industries during the incubation period (31 January-25 February 2020). ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

personal goods (7.6%) and industrial goods (6.6%) exhibit positive and statistically significant MCARs in a 10-day event window. Also, healthcare and real estate have highly

positive MCARs but these are not statistically significant. Looking at the fourth column of Table 5, the utilities, telecommunications, personal goods and retail sectors yield positive

Table 5 Mean cumulative abnormal returns for the outbreak period by industry

(%)

Industry	MCAR (0.10)	t-stat	MCAR (0.17)	t-stat
Basic raw materials	-1.42	-0.29	2.94	0.76
Construction	-8.61	-1.78	3.49	1.57
Food and beverage	**9.05****	2.07	3.11	1.15
Healthcare	11.88	1.59	3.08	1.19
Industrial goods	**6.57****	2.22	1.41	0.76
Personal goods	**7.60****	2.43	**5.22****	2.31
Real estate	5.18	1.40	3.81*	2.03
Retail	**10.73****	2.51	**4.31***	1.84
Technology	3.21	0.77	3.12	1.95
Telecommunications	-0.96	-0.11	**5.52****	3.87
Travel and leisure	-6.64	-0.88	3.37	0.81
Utilities	-0.75	-0.08	**10.74*****	6.84

Notes: This table shows the mean cumulative abnormal returns (MCARs) for the twelve industries during the outbreak period (26 February-22 March 2020). MCAR(0.10) refers to a 10-day event window since the beginning of the outbreak period, whereas MCAR(0.17) refers to the entire outbreak period. ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

Table 6 Mean cumulative abnormal returns for the lockdown period by industry

(%)

Industry	MCAR (0.10)	t-stat	MCAR (0.28)	t-stat
Basic raw materials	**-9.97****	-2.52	-4.17	-0.59
Construction	-3.82	-1.05	**10.73***	1.83
Food and beverage	**-9.73****	-4.85	**-7.53***	-1.83
Healthcare	**-4.05***	-0.92	-0.59	-0.60
Industrial goods	**-8.03*****	-4.94	-2.05	-0.86
Personal goods	-2.04	-0.46	-1.02	-0.18
Real estate	-3.81	-0.66	-2.84	-0.41
Retail	**-9.60***	-1.85	-3.32	-0.64
Technology	-4.17	-1.42	**8.13***	2.54
Telecommunications	0.21	0.03	14.06	1.64
Travel and leisure	**-6.16***	-1.69	3.75	1.05
Utilities	-0.91	-0.23	-0.47	-0.09

Notes: This table shows the mean cumulative abnormal returns (MCARs) for the twelve industries during the lockdown period (23 March-3 May 2020). MCAR(0.10) refers to a 10-day event window since the beginning of the lockdown period, whereas MCAR(0.28) refers to the entire lockdown period. ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

and statistically significant MCARs for the entire outbreak period.

Table 6 shows the MCARs for each industry group in the lockdown period. While Greek share prices recovered to a large extent during the lockdown period, the basic raw materials, food and beverage, industrial goods and retail sectors were significantly affected by the lockdown, as they underperformed compared with

Table 7 Mean cumulative abnormal returns for the lockdown lift period by industry

(%)

Industry	MCAR (0.10)	t-stat	MCAR (0.19)	t-stat
Basic raw materials	2.28	0.78	-3.07	-0.82
Construction	-0.77	-0.53	-2.44	-1.35
Food and beverage	0.60	0.22	-2.77	-1.16
Healthcare	0.09	0.02	-3.56	-0.59
Industrial goods	**-3.70****	-2.22	**-5.22****	-2.51
Personal goods	-1.90	-0.68	**-9.59****	-2.90
Real estate	0.29	0.14	**-5.69****	-3.00
Retail	-0.87	-0.17	-4.06	-0.68
Technology	**-5.23****	-1.95	**-10.58****	-2.62
Telecommunications	-4.35	-1.14	**-12.90****	-2.53
Travel and leisure	3.64	0.98	-2.78	-0.59
Utilities	3.75	1.41	**11.12****	3.24

Notes: This table shows the mean cumulative abnormal returns (MCARs) for the twelve industries during the lockdown lift period (4 May-31 May 2020). MCAR(0.10) refers to a 10-day event window since the beginning of the lockdown lift period, whereas MCAR(0.19) refers to the entire lockdown lift period. ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

the market index. More specifically, the MCARs for the basic raw materials, food and beverage, industrial goods, retail and healthcare sectors are -10%, -9.7%, -8%, -6.2% and -4.1%, respectively, focusing on a 10-day event window. The impact of the lockdown on Greek stock returns weakens in a broader event window covering the entire lockdown period. The fourth column of Table 6 shows that only the food and beverage sector yields a negative and statically significant MCAR. In addition, construction and technology outperformed the market index.

Table 7 illustrates the MCARs of the Greek industries for the lockdown lift period. Using a 10-day event window, we observe that industry-level stock returns were not significantly affected in the lockdown lift period. In particular, the second column of Table 7 shows that only the MCARs in technology and industrial goods are negative and statistically significant, i.e. -5.2% and -3.7%, respectively. However, using a wider event window that includes the entire three-stage lockdown lift period, more industries underperformed relative to the Athex composite index. Telecommunications (-12.9%), technology (-10.6%), personal goods (-9.6%), real estate (-5.7%) and industrial goods (-5.2%) exhibit negative and statistically significant MCARs.

5 CONCLUDING REMARKS

In this study, we provide evidence on the response of stock returns at the industry level to the first wave of the COVID-19 pandemic in Greece. For our analysis, we identify five periods associated with COVID-19 developments from January to May 2020 as follows: (a) pre-incubation (1 January-30 January 2020); (b) incubation (31 January-25 February 2020); (c) outbreak (26 February-22 March 2020); (d) lockdown (23 March-3 May 2020); and (e) lockdown lift (4 May-31 May 2020).

We initially focus on the mean cumulative returns (MCRs) of each industry in our sam-

ple to evaluate the performance of industry-level stock returns for the five corresponding periods. We document that in the pre-incubation period, in which the COVID-19 pandemic received little attention in Greece, all industries, with the exception of telecommunications and utilities, had positive MCRs. Besides, technology, industrial goods, real estate and basic raw materials had positive and statistically significant MCRs throughout this period.

During the incubation period, in which the COVID-19 pandemic attracted the attention of the Greek public and the media, all industries performed poorly. In addition, we find that the MCRs of the basic raw materials, retail, construction, technology and real estate sectors are negative and statistically significant. In the outbreak period, industries witnessed the largest drop in their stock returns. The MCRs for all industries are negative and statistically significant, with the travel and leisure, construction, telecommunications, industrial goods, real estate, technology and utilities sectors sustaining the heaviest losses.

During the lockdown period a recovery in industry-level stock returns was observed. This may be due to the income support and debt relief measures announced by the Greek government and the response of the ECB to the COVID-19 pandemic via the pandemic emergency purchase programme (PEPP). Telecommunications, construction, technology, and travel and leisure exhibit the highest and statistically significant MCRs. The sharp decline in equity prices during the outbreak period, followed by an increase in equity prices during the lockdown period, is in line with the pattern of global and US equity prices for the same time horizon. This V-shaped trajectory in the Greek stock market is possibly attributed to changes in risk attitude and investor sentiment.[4] However, more research is needed to further investigate this puzzle in the stock market in the

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[4] Cox et al. (2020) find a similar pattern for the US stock market in the early weeks of the coronavirus pandemic. Using a dynamic asset pricing model, they argue that this was driven by shifts in risk aversion or sentiment.

early stages of the COVID-19 pandemic. With respect to the lockdown lift period, we document that most industries exhibited positive MCRs. However, only the construction and food and beverage sectors had a positive and statistically significant performance.

We also examine whether and how industry-level stock returns reacted in each of the five periods associated with the COVID-19 pandemic in Greece, turning our attention to the mean cumulative abnormal returns (MCARs). We report that most industries exhibited positive MCARs, with the technology, industrial goods, real estate and basic raw materials sectors outperforming significantly the market index in the pre-incubation period. During the incubation period, industry-level stock returns did not significantly react, with the exception of the utilities sector. The latter has a positive and statistically significant MCAR at 10%.

Despite the turmoil in the Greek stock market during the outbreak period, most industries experienced smaller losses compared with the market index, as most of the industries exhibit positive MCARs using a 10-day event window. Retail, food and beverage, personal goods and industrial goods yield positive and statistically significant MCARs. For the entire outbreak period, industrial goods, retail, telecommunications and utilities outperformed the market index.

While equity prices rebounded during the lockdown period, we provide evidence that the impact of the lockdown had been strong for the first ten days since its implementation. Using a 10-day event window, all industries

included in our study underperformed relative to the market index, with the basic raw materials, food and beverage, industrial goods, travel and leisure, and healthcare sectors exhibiting negative and significant MCARs. However, the effect of the lockdown weakens using the event window that covers the entire lockdown period. Food and beverage only exhibits negative and statistically significant MCARs. We also document that even when some of the lockdown measures were lifted, most industries underperformed. Except utilities, the telecommunications, technology, personal goods, real estate and industrial goods sectors have negative and significant MCARs during the lockdown lift period.

Overall, the study provides evidence on the heterogeneous impact of the first wave of the COVID-19 pandemic in Greece across industries, possibly due to sector-specific idiosyncratic features. This is more evident in the outbreak and lockdown periods, as reflected in the V-shaped trajectory of the market index over these two periods. While most sectors of the Greek economy performed badly in the outbreak period, as captured by the sharp decline of the market index, the event study analysis shows that the utilities, telecommunications, personal goods and retail sectors were significantly less exposed to the COVID-19 outbreak compared with the market index. Despite a partial recovery in equity prices during the lockdown period, we provide evidence that there was a short-term negative effect on the basic raw materials, food and beverage, industrial goods and retail sectors. However, the impact of the lockdown weakens when extending the event window.

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