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# The market reaction to COVID-19: European Evidence

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**ABSTRACT**: *The aim of this study is to examine the market reaction to COVID- 19 on European capital markets and its long-run performance. Using a dataset of 3,181 firms over the period 2019-2021 results show that the COVID-19 effect differs by region, country and sector. The average cumulative abnormal returns (CARs) for the European countries under investigation are -12.32%, with Austria (-19.24%), Germany (-16.31%) and Ireland (-16.63%) being the most affected countries from the pandemic over the 11-day window around the event. Sectors were affected differently, with Energy (-15.74%), as expected, being the most negatively affected in the short run. Regarding the long-term effects of the pandemic, evidence based on the 18-month buy and hold raw returns (BHR) shows increase of 41.6%, with the Utilities sector being the best performer in the Southeastern EU with BHR returns of 124.6%. Interestingly, our evidence suggests that larger, more profitable, more efficient firms with greater operating cash flow ability were those that yield the greatest long run market return performance after the pandemic.*

**KEYWORDS**: Covid-19 pandemic; returns performance; Europe; market reaction, event study

## INTRODUCTION

The COVID-19 pandemic, as a public health emergency, was not only causing human infections and deaths but it also had economic consequences. The pandemic hit Europe in January 2020 and the first

cases appeared in France, Italy and Spain. European Union Member States took measures to fight pandemic. As of March 17th 2020, EU Member states imposed travel restrictions between member states and third countries. Public events were cancelled, schools closed, as well as restaurants and hotels. Furthermore, in many countries non-essential production was stopped and coupled with lockdown measures stifle the economic activities in European countries. The above measures were in effect throughout the second half of March 2020 and April of the same year and were partially or completely lifted in the summer of 2020. When the pandemic emerged the International Monetary Fund predicted that global gross domestic product (GDP) would fall by 3% throughout the year, while the World Trade Organization (WTO) predicted that global trade could decline by as much as 32% in 2020[1]. The aforesaid measures had a heterogeneous impact across industries within European countries. According to Eurostat[2] reports transportation and storage ser vices were affected by the crisis in relatively strong way -20.2% in Q2 2020 based on turnover with the highest massive declines suffered by air transport services. Since the COVID-19 containment measures differed between countries as to timing and strict- ness, it was to be expected that the effects on services production would also vary. In particular, there was strong reduction in accommodation and services in Malta and Spain by -90% and -78%, respectively. According to Rinaldi, Cho, Lodhia, Michelon, and Tilt (2020) the COVID-19 crisis has increased the complexity surrounding organization and governance and has triggered new challenges in understanding the pandemic effects in economic, social, environmental, ethical and governance aspects via new research avenues. Researchers highlighted the enormous economic and social con- sequences of COVID-19 together with its impact on financial markets and institutions (Goodell, 2020). Other researchers examined the impact of the pandemic and showed that European countries and the US suffered at different magnitudes the economic losses (Chen et al., 2020). A stream of literature (Adams and Abhayawansa (2022); Bose, Shams, Ali, and Mihret (2022); Cho, Senn, and Sobkowiak (2022); Demers et al. (2021)) investigates the social and environmental implications caused by COVID-19 under the lenses of sustainability accounting research through reporting and performance management practices. Another bunch of studies (Yu, Chu, Ding, and Zhao (2021);De Vito and Gomez (2020); Huang and Ye (2021); Crovini, Schaper, and Simoni (2021)) analyzes the risk contagion and risk liquidity associated with COVID-19. Lastly, other researchers ((Xu, Chen, Zhang, and Zhao, 2021); Chatjuthamard, Jin- dahra, Sarajoti, and Treepongkaruna (2021); Dechow, Erhard, Sloan, and SOLIMAN (2021)) examined the connection of market sentiment and the effect on Covid on stock returns. Extant literature though has not examined the market reaction and the long run market effects of the pandemic. Thus, this study complements and extends the aforementioned literature. The aim of this study is to comprehensively evaluate the impact of COVID-19 on stock prices in European

[1]https://www.wto.org/english/news_e/pres20_e/pr855_e.htm

[2]https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Impact_of_ Covid-19_crisis_on_services#Development_of_services_turnover_in_the_last_quarter_of_2021

capital markets, namely the four largest EU economies, France, Germany, Italy and Spain as well as the impact on the stock markets in the following countries: Austria, Cyprus, Greece, Ireland, Luxembourg, Malta and Netherlands. Specifically, we will examine the market reaction to the announcement of the COVID-19 and the long run performance of this event. This market reaction and long-run performance will be conducted by country, sector and geographic region.

## LITERATURE REVIEW

COVID-19 has adversely affected economies across the globe in an unprecedented way. The year 2020 marked the history due to this outbreak of novel coronavirus disease COVID-19 which seriously affected people's production and life. Chen et al. (2020) using high-frequency indicators to analyze the economic impact of COVID-19 in Europe and the United States during the initial phase of COVID-19, find that countries in Europe and the US suffer at different magnitudes the economic losses. They show that this depends on whether they experience larger or lower outbreaks of COVID-19 and on how they adopt the non-pharmaceutical interventions. In essence, they find that the easing of mitigation policies improved mobility in both the US and European countries.

The World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) outbreak as a pandemic on 11th of March 2020 (Ohannessian, Duong, and Odone, 2020). By the end of March over 720,000 cases reported in more than 203 countries and more than 100 countries around the world had already instituted the partial or full lockdowns. Air and intercity travel was down by 70–90% as compared to figures from March 2019 in major world cities affecting billions of people (Dunford, Dale, Nassos, Lowther, and Arenas, 2020). Goodell (2020) highlights the enormous economic and social consequences of COVID-19 together with its impact on financial markets and institutions. Back to 2004, Haacker (2004) discussed the economic costs that brought about by HIV/AIDS including increased spending on prevention, care and treatment. COVID-19 is perhaps a unique outcome in terms of its global scope an unprecedented one since 1918, the outburst of last influenza pandemic. According to Baker, Bloom, Davis, Kost, M., and Viratyosin (2020) the first wave of the Spanish flu in Spring 1918 occurred during the last stages of World War I and the deadlier second wave overlaps with the end of World War I. This coexistence made it difficult for any type of research to estimate properly the effect of that pandemic.

The COVID-19 crisis has provided opportunities and challenges for accounting scholars to address the issues within the accounting lens in areas related to Environ- mental, Social and Governance (ESG), risk management and financial markets among others. A stream of literature (Adams and Abhayawansa (2022); Bose et al. (2022); Cho et al. (2022); Demers et al. (2021)) investigates the social and environmental im- plications caused by COVID-19 under the lens of sustainability accounting research

through reporting and performance management practices. Adams and Abhayawansa (2022) criticize the harmonization of sustainability reporting frameworks under the COVID-19 case by demonstrating that sustainability reporting practices differed significantly across countries, even in Europe. Bose et al. (2022) by capturing the re- lationship between the changes in firm's value using Tobin's q and the Covid impact using as a proxy deaths or infections scaled by the population find that firms with better sustainability performance experience less decline in value. Cho et al. (2022) point out the inadequacy of current accounting and accountability mechanisms on the environment by the impact of Covid-crisis. On examining the share price resilience through indicators such as Environmental Social and Governance Score (ESG) score, Demers et al. (2021) find that the ESG score has no significant power in Covid crisis period while investments in intangible assets support price resilience during the first quarter 2020. A bunch of studies (Yu, Chu, Ding, and Zhao (2021); De Vito and G´omez (2020); Huang and Ye (2021); Crovini, Schaper, and Simoni (2021)) analyze the risk contagion and risk liquidity associated with COVID-19. Yu et al. (2021) explore the risk contagion of global stock markets caused by COVID-19 and they find that Italy and the UK are the main contributors in transmitting risks. De Vito and Gomez (2020) by examining listed firms in 16 countries and by applying a scenario stress test analysis on liquidity ratios they find that in the adverse scenario the firm deplenishes its cash holdings within 2 years and that the bridge loan is more cost- effective solution compared to tax deferrals in preventing a cash crunch. Huang and Ye (2021) find that firms with careful consideration on the structure of debt level combined with a commitment on corporate social responsibility (CSR) activities help them survive from negative economic shocks. Crovini et al. (2021) highlight the paramount importance of identifying and assessing risks related to COVID-19 spread should be a common risk reporting practice to enhance dynamic accountability. Lastly, a stream of literature (Xu, Chen, Zhang, and Zhao (2021); Chatjuthamard, Jindahra, Sarajoti, and Treepongkaruna (2021); Dechow, Erhard, Sloan, and SOLIMAN (2021)) examines the connection of market sentiment and the effect on COVID-19 on stock returns. Xu et al. (2021) find that stock market response to specific information is decelerated by the public attention and accelerated by the infection scale and draw the general conclusion that COVID-19 outbreak distorts stock price incorporation of firm specific information and affects price discovery efficiency in a heterogeneous manner.

Chatjuthamard et al. (2021) find that an increase in the growth of confirmed cases increases the volatility of returns. In addition, Dechow et al. (2021) apply the concept of implied equity duration to pandemic shutdown for assessing sensitivity in equity prices by identifying that value firms are more susceptible to underperformance due to lower durations (near-term cash flows based value). Lastly, Rinaldi (2022), provides a review of the related literature and sketches also an agenda of main areas that future accounting research may explore[3].

[3]Rinaldi et al. (2020) provides a comprehensive review of the related literature

Based on the aforementioned discussion, we are motivated to explore the impact of the COVID-19 crisis and the market reaction across European countries since COVID- 19 is a unique crisis and results of this study are expected to inform investors, policy makers and the public at large that natural disasters can inflict economic damage that is present in every area, with different effects though, across the world.

**Research Design**

Research Model

We use event study methodology to examine the market reaction of COVID-19 to European stock markets (Peterson, 1989). We use the market model based event study since market models are the most commonly used and have a good predictive power (Brenner, 1979). Hence, we calculate the normal rate of return as follows:

$rit = \alpha i + \beta i RMt$ (1) The second step of the process is to calculate the abnormal returns as shown below: $ARit = Rit - (\alpha i + \beta i RMt)$ (2) Calculate the cumulative abnormal rate of return: $CARit = Rit - (\alpha i + \beta i RMt)$ (3) where $Rit$ is the return rate of stock $i$ on the trading day $t$ and $RMt$ is the market return at the same date $t$ and $\alpha i$, $\beta i$ are the regression coefficients. The $\alpha i$ is the excess return unrelated to the market index while $\beta i$ is the sensitivity that stock has to the market index returns. $ARit$ is the average abnormal return rate of stock obtained by subtracting from actual return the expected return calculated from the market model. $CARi(t1,t2)$ is the accumulated abnormal returns in the event window (t1,t2).

**Event Window and Sample Selection**

The COVID-19 has a profound adverse impact on the global economy and more specif- ically to the European economies. According to Baker et al. (2020) no previous in- fectious disease outbreak including the Spanish Flu has affected the stock market as forcefully as the COVID-19. The root of COVID-19 has its origin in the Chinese Hubeis province which causes by crowd panic. He, Sun, Zhang, and Li (2020) use the closure of Wuhan on January 23, 2020 as reported by the Official media as the event date of the COVID-19 outbreak. In the middle of March 2020 volatility levels in stock prices of US stock market surpasses those seen in October 1987 and December 2008. Given that COVID-19 in Europe started on February 23, 2020, following the announcement of a lockdown in northern Italy, examining countries across Europe we use the declaration of COVID-19 as pandemic from the World Health Organization (WHO) on 11th of March 2020. We select 255 trading days before the event as the forecast period in order to improve the forecast accuracy. We choose four different event windows based on the length centered on the event date.

Regarding the market reaction to the pandemic, our dataset consists of 3,181 listed firms from a number of European countries. The time interval is from March 3, 2019, to March 11, 2020. The companies' individual stock returns and comprehensive market returns were retrieved from Compustat security daily prices and Datastream, respectively.

**Long run performance of the COVID-19 event**

In this section we focus on the COVID-19 event to examine the long-run performance of sectors. We measure the long-run performance of the COVID event by using buy- and-hold raw returns (BHR) based on the following formula:

$$BHR = \prod_{i=1}^{n}(1 + r_{it}) - 1 \qquad (4)$$

where n = 6 months trading days, 12 months trading days and 18 months trading days. rit is the returns for firm i. Then we match the returns with annual fundamentals from Compustat to calculate financial ratios of the year prior to COVID-19 to be used as controls in the multivariate setting regression analysis [4].

**Multivariate Regression Analysis**

For the multivariate analysis we estimate the regression model of the following form:

$$BHR = a + \beta_{1t}ROA_{it} + \beta_{2t}Loss_{it} + \beta_{3t}CashFlows_{it} + \beta_{4t}Leverage_{it} + \beta_{5t}AssetsTurnvoer_{it} + \beta_{6t}BooktoMarket_{it} + \beta_{7t}Size + FE + \varepsilon \qquad (5)$$

where BHRit is the buy-and-hold raw returns where represents the three time- windows. In our model we use fixed effects for Country and Sectors.

The model controls for a number of variables, ratios from fundamentals that prior research indicates are associated with future return performance and which are publicly available before the start of the return cumulation period. Following prior research, we control for prior profitability, proxied by ROA. Muhammad and Scrimgeour (2014) examining Australian market finds a positive impact on regressing returns on ROA and other accounting measures obtained from firm financial reports. Saleh (2015) also shows that ROA and ROE exert positive influence on stock returns with reference to Oil and Gas sector of Pakistan. The aforesaid results are also confirmed by Naoum and Papanastasopoulos (2021) who use UK data and showed that the cash flow component of earnings has a positive effect on future profitability and stock performance. Li (2011) and Jiang, Soares, and Stark (2016) show that persistence loss in firms negatively drive returns. Hence, we control also for Loss and we expect it to have a negative impact on future performance. Furthermore, we control with Cash Flows raised from operations and we expect this variable to have a positive effect on future returns. We buttress this based on the argument of Naoum and Papanastasopoulos (2021) since Cash from operations has an embedded source the operating activities. Lee and Moon (2011) find that firms with zero levels of

[4]We used also Buy and Hold Abnormal Returns (BHAR) in the analysis

debts exhibit greater long-run performance based on buy-and-hold abnormal returns and Fama and French factor models than firms with leverage. Since leverage is considered an important factor we incorporate it to the model. Huo and Qiu (2020) examining Chinese stock market, they find that firms with lower Book-to-Market ratio tend to have worse performance after one month. Hence, we consider including this variable Book-to-Market as well. We use Asset Turnover measured as the ratio of sales to total assets, to capture asset efficiency. Lastly, we control for firm size (Size), which we measure as the natural logarithm of the firms's total assets as widely used in prior literature. According to Huo and Qiu (2020), firms with smaller size experience higher CARs in the post-event window.

**Empirical Analysis**

Market reaction to the COVID-19 event

**Country-level analysis**

In this study we examine the market reaction of the pandemic for the four larger EU economies, namely, Germany, France, Italy, Spain as well as the following EU coun- tries: Austria, Cyprus, Greece, Ireland, Italy, Luxembourg, Malta and Netherlands. For each country we use the corresponding major stock market index as described in Appendix B (2). Regression results presented in Table 3 provide evidence for the market reaction to the pandemic for four windows, ranging from the three-day window CAR (-1, +1) to the twenty-one day window CAR (-10, +10). Results related to the 3-day window CAR (-1, +1) show that on the declaration date of COVID-19 as pandemic by WHO the average market reaction is -3.85% and statistically significant at a = 0.01 in all markets except Malta. Greece and Cyprus demonstrate the lowest market reaction -0.83% and -1.79% with statistical significance at 5% and 1% level, respectively. On the other hand, Austria and Germany exhibit the highest market reaction -6.51% and -5.12%, respectively. Regarding the average market reaction to the 5-day and 11-day windows, results show that it has been -6.83% and -12.32%, respectively. Extending the window to 21 days, CAR (-10, +10), evidence shows that the average market reaction for all European countries is -11.00%. The Irish capital markets were affected most, with negative abnormal returns of -14.81%, whereas the Maltese capital market has been unaffected since the mean CAR (-10, +10) is statistically insignificant. Evidence presented in Figure 1 shows graphically the aforesaid results for an 11-day window for all firms for each country for the COVID-19 event. Evidence shows that the markets reacted negatively to the pandemic. In the subsequent analysis we explore the reasons behind these negative reactions by examining this market reaction by sector levels.

**Sector-level analysis**

In this section we proceed to investigate further whether the aforesaid country-level results are sector specific. Table 4 presents the market reaction of the pandemic across countries by sector. We observe

that the highest negative market reaction is with energy and Industrials, with the average market reaction being -15.74% and -14.38%, respectively. Energy sector is affected the most in Austria and Germany with CAR (- 5, +5) being -35.08% and -17.64%, respectively. As far as Industrials is concerned, Ireland is affected the most, with -21.74% followed by Austria with CAR (-5, +5) being -18.55%, respectively. Results presented in Figure 2 show the impact of the pandemic on various industries, by displaying the average daily stock price movement across the industries during the event window CAR(-5,+5). We break down the sectors' stock price performance on the day of the COVID-19 outbreak into: severely negatively affected, moderately affected and less severely affected. Overall, most sectors were affected negatively, with Energy, Industrials and Information Technology having the greatest impact. Industries with the lowest impact are Consumer Staples, Health Care, Financials and Utilities with CAR (-5, +5) being -0.76%, -1.00%, -1.01% and -1.04%, respectively.

**Geographical-level analysis**

In a subsequent analysis we group the countries based on cultural and state borders proposed by StAGN. According to this segmentation Central EU includes Germany and Austria, Southeastern EU includes Greece and Cyprus, Southern EU includes Italy, Spain and Malta and Western EU the rest counties, namely, France, Ireland, Luxembourg and Netherlands. Table 5 (5) shows the market reaction of the 11-day window CAR (-5, +5). As expected Central EU demonstrates the highest negative market reaction to Covid, with CAR (-5,+5) being -16.13%, and Southern EU ranked second with CAR (-5,+5) being -11.36% (both statistically significant at the 1% level). The least affected region is the Southeastern with CAR(-5,+5) being -7.19%.

Figure 3 presents cumulative abnormal returns over an eleven day window (CAR -5,+5) centered at 0, the date at which the COVID-19 is declared by WHO as pan- demic (11 March, 2020). This figure illustrates the average market reaction across the aforesaid four geographical regions. Comparative results show that the region af- fected the most (least) was Central (Southeastern) EU. Figure 4 presents cumulative abnormal returns over an eleven- day window (CAR -5, +5). The figure illustrates the highest and lowest market reactions for each of the four geographical regions. By focusing within each region, the Consumer staples has been the least impacted in 2 out of 4 regions, namely Central and Southeastern EU. Southeastern EU and Southern EU share a common worst sector which is the Information technology with an average negative market reaction of 14% while in the Central EU the Energy sector takes the lead by -21.19% followed by the Real estate with -14.91% for Western EU.

**Long-run market performance after the event of Covid: Analysis by country and sector**

**Descriptive Statistics and Univariate Analysis**

In this section we focus on the COVID-19 event to examine the long-run performance of each of the industrial sectors by country. We measure the long-run performance of the pandemic event by using buy-and-hold raw returns (BHR). Results presented in Table 6 show descriptive statistics for buy-and-hold returns for 3 periods and the relevant control variables. Mean BHRs are positive, ranging from 10.32% for the 6-month period after COVID-19 to 48.87% for the 18- month horizon. With respect to control variables, the mean return on assets (ROA) is -3.25% with the median ROA being 2.14%, depicting a distribution that is negatively skewed. ROA is a proxy for prior firm profitability which affects the firm's shareholder returns. Leverage, defined as the ratio of total debt to total assets, has a mean (median) value of 62.05% (59.94%), implying that on average more than half of the firms' assets are financed with debt. Cash flows, defined as operating cash flows to current liabilities, has a distribution which is positively skewed, with operating cash flows covering 87% of the firm's current liabilities, indicating the ability of the firm to cover its short-term obligations. We construct variable Loss as a continuous variable for losses by setting to zero all earnings to focus on those firms which are loss-makers. Thus, Loss has a mean of -16 million euro and median zero, indicating that more than half of the firms are profitable. In particular, 587 firms out of the 1,852 in our sample are loss-making firms. Book-to-Market is widely used as control variable in prior literature computed as the ratio of common shareholders' equity to market value of equity which is a proxy for risk factors or investor's sentiment. In general, high Book-to-Market stocks or value firms exhibit better stock's performance an ongoing appreciation of the stock value. In our sample Book-to-Market has a mean of 67% indicating that on average our dataset has growth stocks. Since the last quartile of Book-to-Market is 0.9714, it indicates that value stocks are about 25% of the sample (those that exceed 1). Asset Turnover, defined as sales divided by assets, has a mean of 79.57%, indicating that on average each euro invested by European firms generates about 0.80 cents in revenues. Higher Asset Turnover implies that firms are more efficient in utilizing their assets to generate sales and belong to 4th quartile (p75) where sales begin to exceed the assets. Lastly, we use as size proxy the firm's natural logarithm of assets. The fiscal year end of the firm prior to COVID-19 event is used to calculate all ratios. All variables are winsorized to 1 and 99 percentiles.

Table 7 presents Pearson correlations between the variables used in the subsequent empirical analysis. Profitability, as captured by ROA and Asset Turnover are posi- tively correlated with the long-run performance in all time frames of buy-and-hold raw returns (BHR) as expected at the 1% statistical significance level, except one at the 5% level. Cash flows ratio is positively correlated with the longer time windows of 12 and 18-month BHR. As expected, Leverage, a measure of firm risk and Loss are

negatively correlated with subsequent stock price performance, a preliminary evidence on the subsequent findings in our multivariate regression analysis.

Table 8 presents buy and hold raw return (BHR) performance results by region over three periods, 6-months, 12-months and 18-months. The best performing region is the Southeastern with 55.4% return over the 18-month return window which surpasses both Central EU (47.2%), Western EU (38.9%) and Southern EU (31.0%). Figure 5 (shows the buy and hold raw returns across the four regions. We observe that firms in the Southeastern EU (Greece and Cyprus) surpass Central EU and Western EU stock performance one year after the Covid. Best performing sector in the 18- month time span is Information Technology in Central EU and Southern EU with 68.7% and 65.1% respectively while Materials in Western EU (64.7%) and Utilities in Southeastern (125%) have the highest performance compared to all other sectors. All in all, best performing sector is Materials whereas worst performing is Real Estate. Figure 6 illustrates graphically the results in the corresponding graphs for each region.

The aforementioned results are consistent with those related to UK market found by Morning Star and Mckinsey[5] over the period 23 March 2020 to March 2021. Their results showed that the worst performing sector was the Real Estate with just under 30% gain on returns confirming our results across Europe and in particular for Ger- many and Austria (Central EU) with 12.3% (see table 6) and Italy, Spain and Malta (Southern EU) (-5.6%) over the one-year time window (BHR 12m) indicating that the impact in Europe is stronger based on magnitude. The rationale behind those results, according to Morning Star and McKinsey is that offices, shops, restaurants, hotels shut down over multiple lockdowns and many tenants had difficult time in paying their rents. This rational applies to our analysis as well for the rest EU countries that we examined. Based on our sample the worst performing firms are those belonging to the Real Estate sector over 18 month window[6]. More specifically, regarding results by region is concerned, in central EU the worst performer is YMOS AG corporation, with return performance of about -75% buy and hold raw (BHR) returns. This firm is a Germany-based holding company with subsidiaries primarily engaged in the real estate, finance and equity investment sectors. In Southern EU the worst performing is a real estate investment company, namely the IMVEST SPA founded in 2002 with buy-and-hold raw returns of about -75% for the 18-month period after the announcement of COVID-19. In western EU, the French corporation ADOMOS was found to be the worst performing firm with BHR being about -50%. On the other hand, according to Morningstar the best performing sector in the UK is healthcare with average returns being 220% amid the sharp increase in investor interest during pandemic. According to Mckinsey, the year 2020 was a year of strategy lockdown. Firms that they come out strong from this crisis are ready to act boldly

[5]See Morning Star and Mckinsey, https://www.morningstar.co.uk/uk/news/210686/best-and-worst-sectors-since-lockdown.aspx

[6]Consistent with previous analysis, results below are winsorized at 1% and 99%

to surge ahead and be winners for the forthcoming years. Specifically, on-line shopping, remote education and telemedicine have intensified their forces to exploit the situation under Covid. We also went a step further and identified the best performing firms by region and sector for the 18 months after Covid. The best performing firm within the information Technology sector is ClIQ Digital AG, a global streaming provider in the Computer services based in Germany, and inn Southern EU, Digital Value S.p.A an Italian firm which provides information technology services founded back in 2018 both of them enjoyed returns up to about 353%. The latter shred this position with SESA S.p.A another company in the information technology sector. In Western EU the French company Moulinvest SA, an organization that specializes in the wood industry and forestry operations was found to be the best performer with 353%. In Southeastern EU the Public Power Corp SA in Greece had the highest BHR returns of about 337%.

**Multivariate Regression Analysis on the determinants of the buy and hold raw returns**

Since evidence thus far showed that the pandemic had negative effects over the long run on the European capital markets, we went a step further to examine the determinants of the buy and hold returns (BHR). Table 9 presents results for three models, using three different return windows, 6-months, 12-months and 18 months after the announcement of the pandemic. Results in all three specifications show that the coefficients of ROA, efficiency (asset turnover) and size are highly statistically significant. Specifically, the coefficients of ROA are positive, indicating that more profitable firms are more likely to have greater buy and hold raw returns after the pandemic, implying that less profitable (or firms with losses) were more likely to have negative buy and hold raw returns. This is shown from the variable Loss, since its coefficient is negative and statistically significant in the 12-month and 18-month specifications. The loss variable is taking the value of 1 if net income is negative, and 0 otherwise. Specifically, as far as ROA is concerned, a 1% increase in ROA led to an increase in buy and hold raw returns by 0.1751%, 0.2970% and 0.5908%, over the 6-month, 12-month, 18-month period after the pandemic, respectively. Moreover, firms with greater efficient utilization of their resources, as measured with asset turnover, are more likely to have greater buy and hold raw returns after the pandemic. Also, since the coefficient of Size is positive, it is implied that larger firms are more likely to have greater performance or to be affected less by the pandemic. Regarding the coefficient of cash flows, since the coefficients of this variable are positive and statistically significant over the longer windows of 12 and 18 months, results imply that firms that generate greater operating cash flows to repay their current obligations, i.e., have greater cash flow ability, are expected to have greater performance after the pandemic or to put it differently, firms with less cash flow ability suffered most from the pandemic.

In summary, evidence shows that larger firms, with greater efficiency, higher profitability and cash flow ability are those that performed the best up to the 18-month period after the pandemic. On the other

hand, firms that were affected the most nega- tively were smaller firms with losses, with inefficient utilization of their resources, and were not able to generate enough operating cash flow to pay their current obligations.

**Additional Analysis**

We performed additional analysis by replacing buy-and-hold raw returns with buy- and-hold abnormal returns (BHAR). We calculate them as follows:

$$BHAR = \prod_{t=1}^{T}(1 + r_{it}) - \prod_{t=1}^{T}(1 + r_{Mt}) \quad (6)$$

Where $r_{it}$ is the return of firm i at t=6m, 12m and 18m and for $r_{Mt}$ the corresponding stock market analogous to the stock exchange of the country of the firm. Untabulated results were qualitatively similar to our results presented earlier in this section.

## CONCLUSIONS

A number of studies examined the effect of the COVID-19 on the capital markets but to the best of our knowledge no other empirical study examined the market reaction of the pandemic and its long run performance on European countries. The aim of this study is to examine the market reaction to COVID-19 on European capital markets as well as its long-run performance. Overall, our results show that the countries most affected from the pandemic were Ireland, Germany and Austria with -12.32% negative abnormal returns on average for all countries over an eleven-day window around the COVID-19 event. Evidence also shows that Energy, Industrials and Information Technology were affected most negatively from the pandemic over the short run, whereas Consumer Staples, Healthcare, Financials and Utilities were among those sectors that have been resilient to pandemic over the short run (11-day window around the announcement). As far as the long- term effects of the pandemic is concerned, based on the 18-month buy and hold raw returns (BHR), our results showed an overall increase in BHR returns of 48.87% with the best performing sector being the energy in the Southeastern EU. By examining the determinants of the long run performance of those EU firms, our evidence suggests that larger, more profitable, more efficient firms with greater operating cash flow ability were those that created the greatest long run market return performance after the pandemic.

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Table 1: Appendix A: List of all variables, their description and source

| Variabl | Descriptio | Data |
|---|---|---|
| Assets Turnover | Sales (sale) divided by Total assets (at) | Compustat Global Annual |
| Book-to-Market | Book value of equity given from ceq and market value obtained from priced closed at the fiscal year and common shares | Compustat Global Annual Fundamentals, Compustat Global Security |
| BHR–i | Buy and hold raw returns based on the formula | Compustat Global Security |
| Cash Flows | Cash flows from operations divided by Earnings before interest and depreciation and amortization | Compust Global Annual |
| Leverag e | Total liabilities (lt) divided by total assets (at) | Compust Global Annual |
| Loss | Equals to net income if Net income (nicon) is negative ; otherwise 0 | Compustat Global Annual |
| ROA | Net income (nicon) divided by total assets (at) | Compust Global Annual |
| Size | Natural logarithm of total assets (at) | Compust Global Annual |

The table above shows the list of all variables, their description and source.

Table 2: Appendix B: Stock Market Indices by Country

| Description | Code | Corresponding country |
|---|---|---|
| AUSTRIAN TRADED INDEX - PRICE INDEX | ATXINDX | Austria |
| AEX INDEX (AEX) - PRICE INDEX | AMSTEOE | Netherlands |
| CYPRUS MAIN MARKET - PRICE INDEX | CYPMAMK | Cyprus |
| DAX INDEX - AGGREGATE PRICE | BDDAX30 | Germany |
| FRANCE CAC 40 - PRICE INDEX | FRCAC40 | France |
| FTSE MIB INDEX - PRICE INDEX | FTSEMIB | Italy |
| IRELAND SE 20 LEVERAGED - PRICE INDEX | ISEQ20L | Ireland |
| LUXEMBOURG SE LUXX - PRICE INDEX | LXLUXXI | Luxembourg |
| MADRID SE GENERAL (IGBM) - PRICE INDEX | MADRIDI | Spain |
| MALTA SE MSE - PRICE INDEX | MALTAIX | Malta |
| ATHEX ALL SHARE - PRICE INDEX | ATHXASH | Greece |

In this table we present the major market indices for each country used to calculate the buy-and-hold abnormal returns.

Table 3: Cumulative Abnormal Returns for different windows

| European Countries | N | CAR(-1,+1) | p-value | CAR(-2,+2) | p-value | CAR(-5,+5) | p-value | CAR(-10,+10) | p-value |
|---|---|---|---|---|---|---|---|---|---|
| Austria | 100 | -0.0651*** | 0.0000 | -0.1102*** | 0.0000 | -0.1924*** | 0.0000 | -0.1418*** | 0.0000 |
| Cyprus | 67 | -0.0179*** | 0.0012 | -0.0321*** | 0.0003 | -0.0522*** | 0.0008 | -0.0630*** | 0.0006 |
| France | 862 | -0.0330*** | 0.0000 | -0.0678*** | 0.0000 | -0.1060*** | 0.0000 | -0.1004*** | 0.0000 |
| Germany | 890 | -0.0512*** | 0.0000 | -0.0841*** | 0.0000 | -0.1631*** | 0.0000 | -0.1368*** | 0.0000 |
| Greece | 186 | -0.0083** | 0.0364 | -0.0384*** | 0.0000 | -0.0814*** | 0.0000 | -0.0942*** | 0.0000 |
| Ireland | 99 | -0.0435*** | 0.0000 | -0.0807*** | 0.0000 | -0.1663*** | 0.0000 | -0.1481*** | 0.0000 |
| Italy | 391 | -0.0428*** | 0.0000 | -0.0633*** | 0.0000 | -0.1318*** | 0.0000 | -0.1069*** | 0.0000 |
| Luxemburg | 106 | -0.0222*** | 0.0000 | -0.0553*** | 0.0000 | -0.0989*** | 0.0000 | -0.0806*** | 0.0000 |
| Malta | 25 | -0.0037 | 0.6976 | -0.0116 | 0.3070 | -0.0261 | 0.1881 | -0.0322 | 0.2168 |
| Netherlands | 172 | -0.0432*** | 0.0000 | -0.0572*** | 0.0000 | -0.1023*** | 0.0000 | -0.1027*** | 0.0000 |
| Spain | 283 | -0.0289*** | 0.0000 | -0.0524*** | 0.0000 | -0.0735*** | 0.0000 | -0.0779*** | 0.0000 |
| **Total** | 3,181 | -0.0385*** | 0.0000 | -0.0683*** | 0.0000 | -0.1232*** | 0.0000 | -0.11000*** | 0.0000 |

The table shows the average market reaction (cumulative abnormal returns) by the 11 European Countries with different windows 3-day,
5-day, 11-day and 21-day centered on the declaration of Covid as pandemic by WHO. ***, **, * denote statistical significant at 1%, 5%
and 10% respectively.

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Table 4: Cumulative Abnormal Returns by country

| CAR (-5,+5) | Austria | Cyprus | France | Germany | Greece | Ireland | Italy | Luxemburg | Malta | Netherlands | Spain | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *N* | 8 | 16 | 106 | 107 | 31 | 7 | 62 | 8 | 2 | 17 | 16 | 380 |
| *Consumer Discretionary* | -0.2351*** | -0.0604* | -0.0948*** | -0.1711*** | -0.0710*** | -0.3277*** | -0.1293*** | -0.1834** | -0.0175 | -0.1383*** | -0.1208*** | -0.1303*** |
| *p-value* | 0.0016 | 0.0574 | 0.0000 | 0.0000 | 0.0000 | 0.0036 | 0.0000 | 0.0279 | 0.7239 | 0.0007 | 0.001 | 0.0000 |
| *N* | 6 | 8 | 43 | 35 | 22 | 5 | 17 | 5 | 2 | 11 | 11 | 165 |
| *Consumer Staples* | -0.0852 | -0.0659 | -0.0480*** | -0.1229*** | -0.0801** | -0.1752** | -0.0923*** | -0.1685** | -0.0049 | -0.1175* | -0.0045 | -0.0836*** |
| *p-value* | 0.1211 | 0.1478 | 0.0019 | 0.0000 | 0.0124 | 0.0234 | 0.0038 | 0.0348 | 0.9398 | 0.0528 | 0.8822 | 0.0000 |
| *N* | 4 | 2 | 14 | 9 | 4 | 2 | 7 | 4 | N/A | 4 | 3 | 54 |
| *Energy* | -0.3508*** | -0.1899 | -0.1444*** | -0.1764** | -0.1700* | -0.1637 | -0.0907* | -0.1470* | N/A | -0.0865 | -0.1859** | -0.1574*** |
| *p-value* | 0.0059 | 0.3379 | 0.0000 | 0.0200 | 0.0749 | 0.1591 | 0.0555 | 0.075 | N/A | 0.5653 | 0.0181 | 0.0000 |
| *N* | 18 | 15 | 56 | 121 | 16 | 5 | 58 | 7 | 6 | 22 | 26 | 350 |
| *Financials* | -0.1887*** | -0.0021 | -0.1301*** | -0.1361*** | -0.0598* | -0.1618*** | -0.1256*** | -0.0354 | 0.0788 | -0.0927*** | -0.0256 | -0.1106*** |
| *p-value* | 0.0000 | 0.8904 | 0.0000 | 0.0000 | 0.0603 | 0.0084 | 0.0000 | 0.6054 | 0.1068 | 0.0043 | 0.1597 | 0.0000 |
| *N* | 2 | N/A | 94 | 69 | 6 | 7 | 16 | 3 | N/A | 7 | 23 | 227 |
| *Health Care* | -0.0215 | N/A | -0.1052*** | -0.1484*** | -0.0755 | -0.1307** | -0.0825** | -0.0468 | N/A | 0.0295 | -0.0959*** | -0.1101*** |
| *p-value* | 0.8256 | N/A | 0.0000 | 0.0000 | 0.3768 | 0.0247 | 0.0121 | 0.5083 | N/A | 0.5734 | 0.0001 | 0.0000 |
| *N* | 7 | 3 | 137 | 126 | 20 | 4 | 37 | N/A | 2 | 26 | 13 | 375 |
| *Information Technology* | -0.2242*** | -0.0911 | -0.1076*** | -0.1802*** | -0.1234*** | -0.0651 | -0.1840*** | N/A | -0.093 | -0.0838*** | -0.1284*** | -0.1410*** |
| *p-value* | 0.0003 | 0.387 | 0.0000 | 0.0001 | 0.0006 | 0.1936 | 0.0000 | N/A | 0.3399 | 0.0029 | 0.0006 | 0.0000 |
| *N* | 7 | 6 | 42 | 39 | 22 | 5 | 18 | 7 | N/A | 10 | 13 | 169 |
| *Materials* | -0.2595*** | -0.1218 | -0.1073*** | -0.1646*** | -0.1108*** | -0.1408** | -0.1373*** | -0.1093*** | N/A | -0.02 | -0.0532 | -0.1228*** |
| *p-value* | 0.0012 | 0.2349 | 0.0000 | 0.0000 | 0.0053 | 0.0229 | 0.0000 | 0.0099 | N/A | 0.6706 | 0.2203 | 0.0000 |
| *N* | 8 | 6 | 59 | 74 | 10 | 3 | 12 | 7 | 7 | 6 | 55 | 247 |
| *Real Estate* | -0.3033*** | -0.0052 | -0.1477*** | -0.1429*** | -0.022 | -0.2631* | -0.1373** | -0.2338** | -0.0857*** | -0.2595*** | -0.0622*** | -0.1280*** |
| *p-value* | 0.0008 | 0.8577 | 0.0000 | 0.0000 | 0.584 | 0.0765 | 0.0107 | 0.0425 | 0.0018 | 0.003 | 0.0000 | 0.0000 |
| *N* | 2 | N/A | 62 | 53 | 8 | N/A | 51 | 7 | 2 | 8 | 16 | 211 |
| *Telecommunications* | -0.1838* | N/A | -0.0889*** | -0.1561*** | -0.0975 | N/A | -0.1340*** | -0.1252*** | -0.0669 | -0.1596*** | -0.1064*** | -0.1221*** |
| *p-value* | 0.0687 | N/A | 0.0000 | 0.0000 | 0.1699 | N/A | 0.0000 | 0.0051 | 0.6387 | 0.009 | 0.0045 | 0.0000 |
| *N* | 3 | N/A | 23 | 17 | 6 | N/A | 21 | 3 | N/A | 2 | 17 | 92 |
| *Utilities* | -0.1674 | N/A | -0.1302*** | -0.1031*** | 0.0074 | N/A | -0.1049*** | -0.0349 | N/A | -0.1276 | -0.1637*** | -0.1147*** |
| *p-value* | 0.191 | N/A | 0.0001 | 0.0008 | 0.7597 | N/A | 0.0002 | 0.5492 | N/A | 0.2593 | 0.0001 | 0.0000 |
| *N* | **22** | 3 | 135 | 161 | 36 | 10 | 76 | 3 | 2 | 33 | 38 | 519 |
| *Industrials* | -0.1855*** | -0.2032 | -0.1151*** | -0.1776*** | -0.0845*** | -0.2174*** | -0.1475*** | -0.1218 | -0.1133 | -0.1139*** | -0.1317*** | -0.1438*** |
| | 0.0000 | 0.1868 | 0.0000 | 0.0000 | 0.0003 | 0.0005 | 0.0000 | 0.2277 | 0.1094 | 0.0000 | 0.0000 | 0.0000 |
| ***N*** | **87** | **59** | **771** | **811** | **181** | **48** | **375** | **47** | **23** | **146** | **231** | **2,779** |

Table 5: Market reaction by geographical region

| Geographical_region | N (firms) | Sectors | CAR(-5,+5) Covid |
|---|---|---|---|
| **Central EU** | **1,044** | | **-0.1613*** ** |
| | | | 0.0000 |
| *Best Sector* | *51* | *Staples* | -0.1188*** |
| | | | *0.4332* |
| *Worst Sector* | *19* | *Energy* | -0.2119*** |
| | | | *0.0000* |
| **Southeastern EU** | **234** | | **-0.0719*** ** |
| | | | 0.0000 |
| *Best Sector* | *6* | *Utilities* | 0.0074 |
| | | | 0.7597 |
| *Worst Sector* | *22* | *Information Tech* | -0.1203*** |
| | | | *0.0005* |
| **Southern EU** | **604** | | **-0.1136*** ** |
| | | | 0.0000 |
| *Best Sector* | *28* | *Staples* | -0.0560** |
| | | | 0.0152 |
| *Worst Sector* | *50* | *Information Tech* | -0.1616*** |
| | | | 0.0000 |
| **Western EU** | **907** | | **-0.1078*** ** |
| | | | 0.0000 |
| *Best Sector* | 57 | *Staples* | -0.0740*** |
| | | | 0.0000 |
| *Worst Sector* | *70* | *Real Estate* | -0.1491*** |
| | | | 0.0000 |
| **Total** | **2,789** | | **-0.1261*** ** |
| | | | 0.0000 |
| *Best Sector* | 18 | *Staples* | -0.0836*** |
| | | | 0.0000 |
| *Worst Sector* | *93* | *Energy* | -0.1574*** |
| | | | 0.0000 |

This table shows the market reaction based on 11 day window CAR(-5,+5) by geographical region centered on the date of declaration of Covid as pandemic by WHO. Within each region the best and worst sector is demonstrated. ***, **, * denote statistical significant at 1%, 5% and 10% respectively.

Table 6: Descriptives

| | N | Mean | SD | p25 | Median | p75 |
|---|---|---|---|---|---|---|
| *BHR 6m* | 1832 | 0.1032 | 0.3092 | -0.0799 | 0.0447 | 0.2424 |
| *BHR 12m* | 1805 | 0.3422 | 0.5594 | 0.0000 | 0.2169 | 0.5497 |
| *BHR 18m* | 1783 | 0.4887 | 0.7954 | 0.0000 | 0.2793 | 0.7852 |
| *ROA* | 1819 | -0.0325 | 0.1979 | -0.0236 | 0.0214 | 0.0494 |
| *Leverage* | 1847 | 0.6205 | 0.3174 | 0.4468 | 0.5994 | 0.7472 |
| *Cash Flows* | 1740 | 0.8701 | 5.7066 | 0.4655 | 0.7970 | 1.0093 |
| *Loss* | 1852 | -16.2962 | 137.07 | -0.9525 | 0.0000 | 0.0000 |
| *Book-to-Market* | 1842 | 0.6755 | 1.2571 | 0.2566 | 0.5307 | 0.9714 |
| *Asset Turnover* | 1846 | 0.7957 | 0.5572 | 0.4209 | 0.7237 | 1.0699 |
| *Size* | 1847 | 5.4265 | 2.5574 | 3.5065 | 5.2204 | 7.1726 |

This table reports the number of observations, mean, standard deviation,25th percentile, 50th percentile (median), and 75th percentile for all variables associated with the sample of firms used in our multivariate setting. The dataset is a matched sample between Compustat Global Security Daily and Compustat Global Fundamentals Annual. We drop firms that have missing their sectors based on the 2 digit GICS industries that denote Sectors; variable named as gind. See Appendix A (1) for variable definitions with data sources.

Table 7: Correlation Analysis

| *Variables* | *BHR_6m* | *BHR_12m* | *BHR_18m* | *ROA* | *Leverage* | *Cash Flows* | *Loss* | *Book-to-Market* | *Asset Turnover* | *Size* |
|---|---|---|---|---|---|---|---|---|---|---|
| *BHR_6m* | 1.0000 | | | | | | | | | |
| *BHR_12m* | 0.772*** | 1.0000 | | | | | | | | |
| *BHR_18m* | 0.687*** | 0.867*** | 1.0000 | | | | | | | |
| *ROA* | 0.143*** | 0.122*** | 0.177*** | 1.0000 | | | | | | |
| *Leverage* | -0.095*** | -0.067*** | -0.069*** | -0.367*** | 1.0000 | | | | | |
| *Cash Flows* | 0.0200 | 0.048** | 0.065*** | -0.0030 | -0.042* | 1.0000 | | | | |
| *Loss* | -0.0100 | -0.052** | -0.0370 | 0.054** | -0.060** | 0.0050 | 1.0000 | | | |
| *Book-to-Market* | 0.0010 | 0.0360 | 0.0270 | 0.211*** | -0.500*** | 0.047** | 0.0100 | 1.0000 | | |
| *Assets Turnover* | 0.059** | 0.088*** | 0.128*** | 0.169*** | 0.110*** | -0.0030 | 0.0130 | -0.038* | 1.0000 | |
| *Size* | 0.096*** | 0.102*** | 0.096*** | 0.344*** | 0.0070 | 0.0070 | -0.164*** | 0.075*** | -0.0130 | 1.0000 |

This table presents Pearson correlation coefficients for the variables used in the main analysis. For definitions of variables see Appendix A1. ***, **, * denote statistical significant at 1%, 5% and 10% respectively.

Table 8: Best and Worst sectors in the long run (average Buy and hold raw returns)

| ***Geographical region*** | ***BHR_6m*** | | ***BHR_12m*** | | ***BHR_18m*** | |
|---|---|---|---|---|---|---|
| **Central EU** | **0.119** | | **0.351** | | **0.472** | |
| Best Industry | 0.196 | Information Tech | 0.504 | Materials | 0.687 | Information Tech |
| Worst Industry | 0.043 | Real Estate | 0.123 | Real Estate | 0.158 | Real Estate |
| **Southeastern EU** | **0.056** | | **0.291** | | **0.554** | |
| Best Industry | 0.358 | Utilities | 0.816 | Utilities | 1.246 | Utilities |
| Worst Industry | -0.113 | Energy | 0.037 | Health Care | 0.092 | Financials |
| **Southern EU** | **0.059** | | **0.195** | | **0.310** | |
| Best Industry | 0.248 | Utilities | 0.474 | Materials | 0.651 | Information Tech |
| Worst Industry | -0.107 | Energy | -0.054 | Real Estate | -0.007 | Real Estate |
| **Western EU** | **0.072** | | **0.308** | | **0.389** | |
| Best Industry | 0.158 | Information Tech | 0.487 | Materials | 0.647 | Materials |
| Worst Industry | -0.036 | Real Estate | 0.062 | Real Estate | 0.086 | Real Estate |
| **Total** | **0.085** | | **0.298** | | **0.416** | |
| Best Industry | 0.181 | Utilities | 0.480 | Materials | 0.692 | Materials |
| Worst Industry | -0.022 | Energy | 0.060 | Real Estate | 0.099 | Real Estate |

This table shows the long-run performance based on buy-and-hold raw returns for 6, 12 and 18 months across regions by identifying best and worst performing sectors.

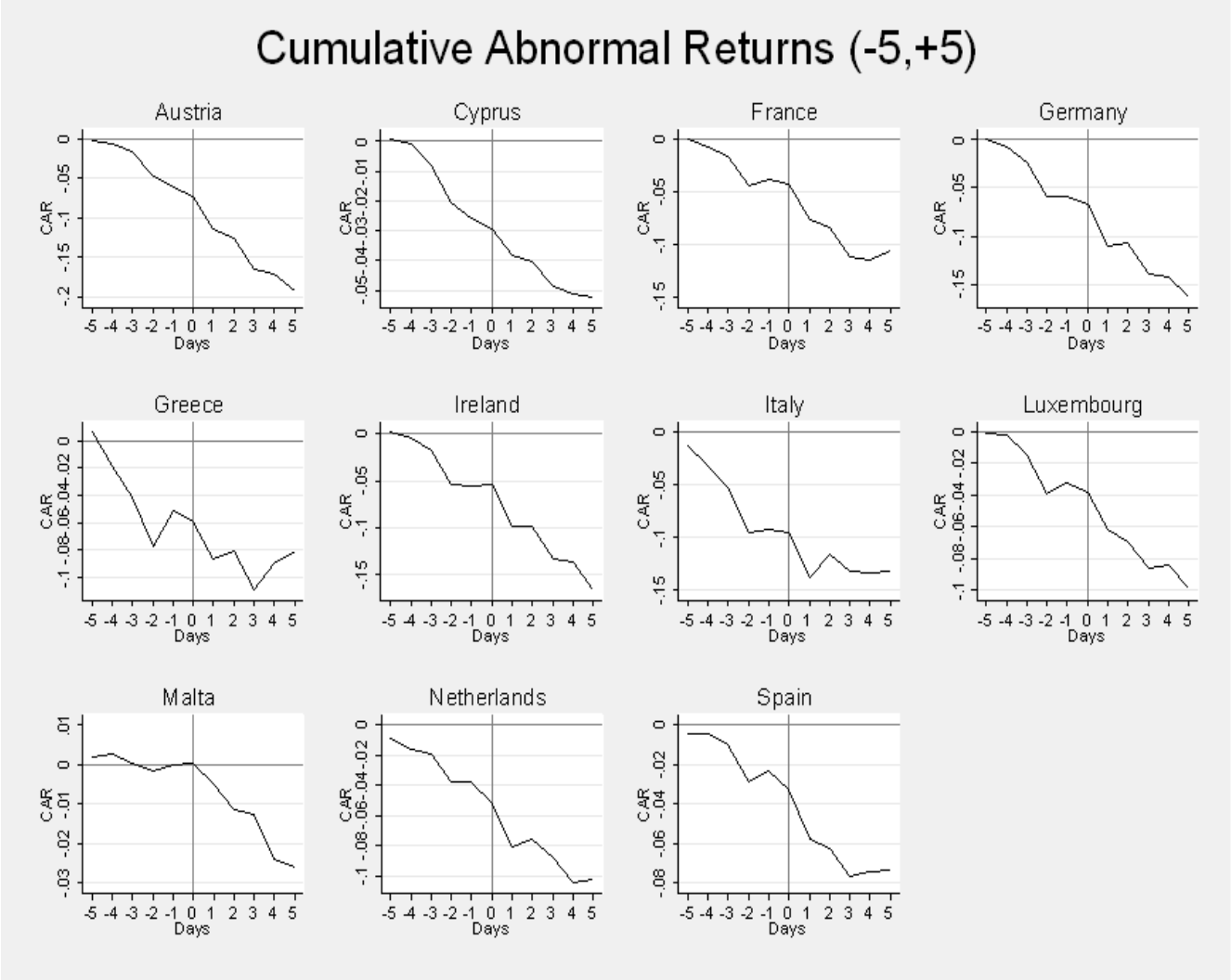
Table 9: Regression Analysis

| | *(1)*<br>*BHR_6m* | *(2)*<br>*BHR_12m* | *(3)*<br>*BHR_18m* |
|---|---|---|---|
| *ROA* | 0.1751*** | 0.2970*** | 0.5908*** |
| | (0.0003) | (0.0008) | (0.0000) |
| *Loss* | -0.0000 | -0.0002** | -0.0003** |
| | (0.5139) | (0.0378) | (0.0492) |
| *Cash Flows* | 0.0012 | 0.0046** | 0.0095*** |
| | (0.3311) | (0.0482) | (0.0036) |
| *Leverage* | -0.0921*** | -0.0709 | -0.1119 |
| | (0.0027) | (0.2124) | (0.1583) |
| *Assets Turnover* | 0.0298** | 0.0663** | 0.1533*** |
| | (0.0449) | (0.0162) | (0.0001) |
| *Book-to-Market* | -0.0124* | 0.0080 | 0.0004 |
| | (0.0827) | (0.5476) | (0.9841) |
| *Size* | 0.0123*** | 0.0160** | 0.0259*** |
| | (0.0004) | (0.0130) | (0.0040) |
| *_cons* | -0.0064 | 0.3123*** | 0.3397** |
| | (0.9094) | (0.0027) | (0.0190) |
| *Observations* | 1685 | 1663 | 1642 |
| *R-squared* | 0.0924 | 0.0816 | 0.1281 |
| *Country Fixed Effects* | Yes | Yes | Yes |
| *Industry Fixed Effects* | Yes | Yes | Yes |

This table presents regression results of buy and hold raw returns for 6 months, 12 months and 18 months on a set of firm characteristics based on comprehensive ratios. All variables are defined in Appendix A.

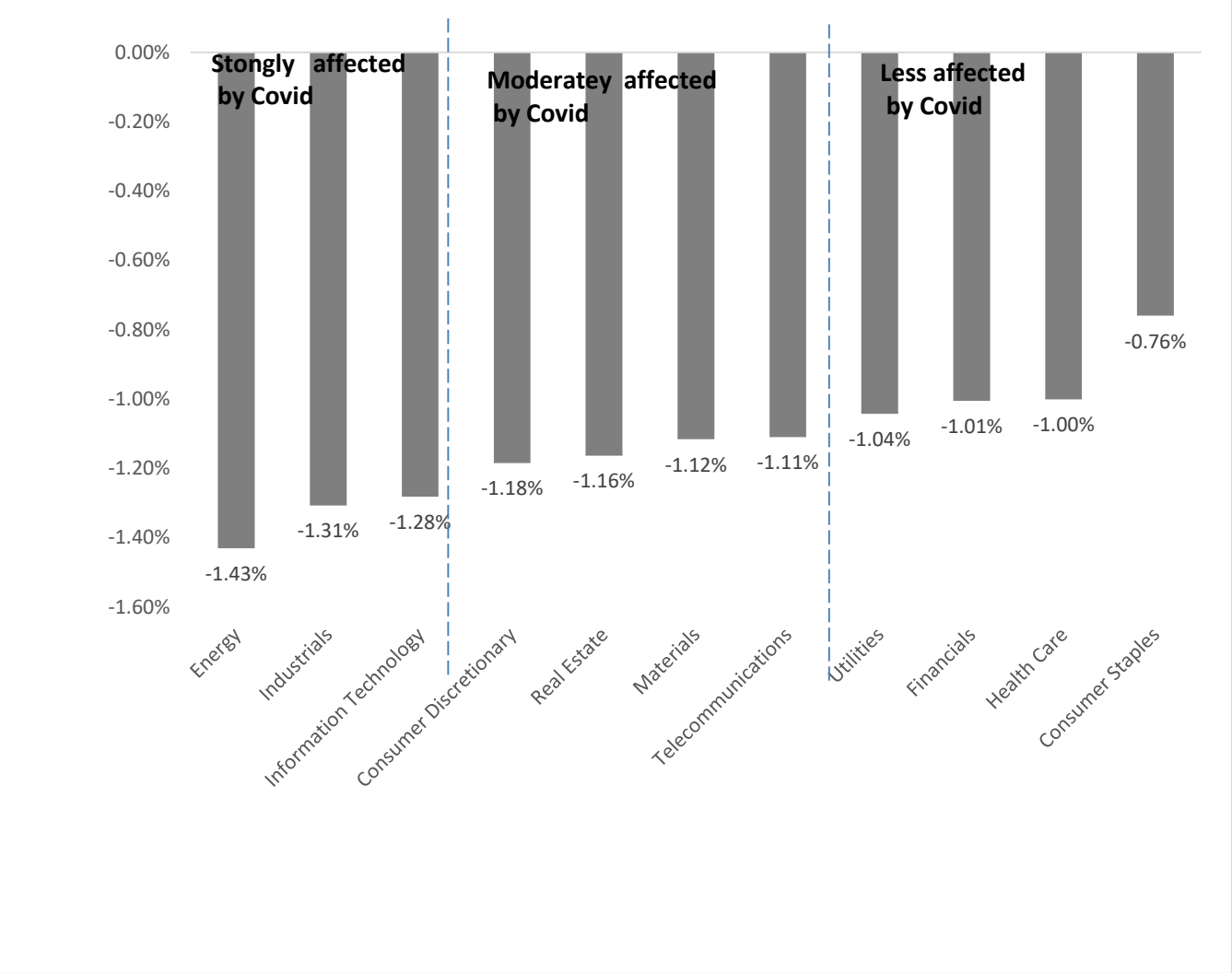
Fixed effects for Country and Sector were used. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. p-values are presented in parenthesis

Figure 1: Cumulative abnormal returns for each country



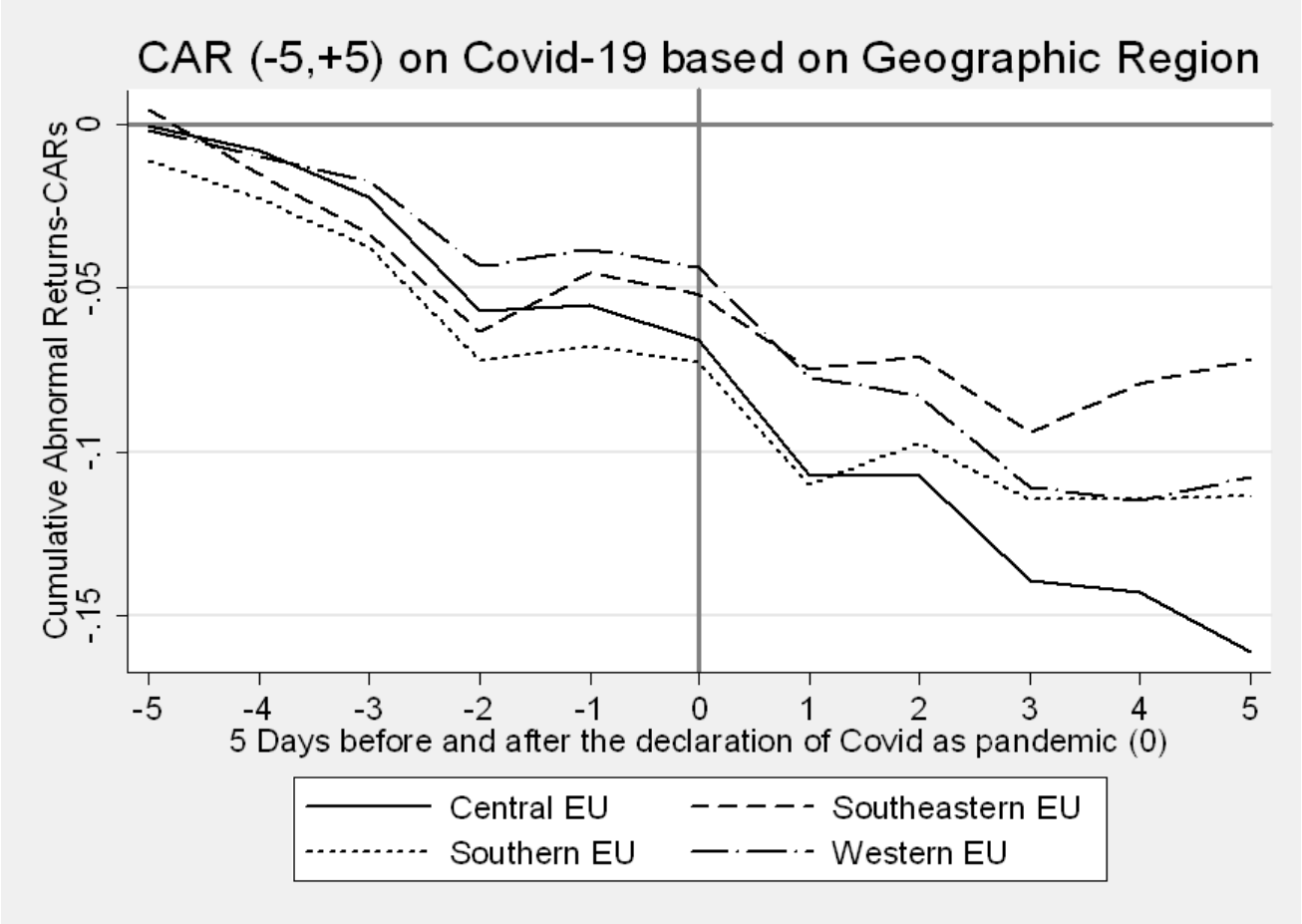

Cumulative abnormal returns (-5,+5) centered at 0 where for the Covid is the announcement of WHO for the declaration of COVID-19 as pandemic (11 March 2020). The figure illustrates the average market reaction for each of the eleven European countries under investigation.

Figure 2: Average Market reaction by Sector.



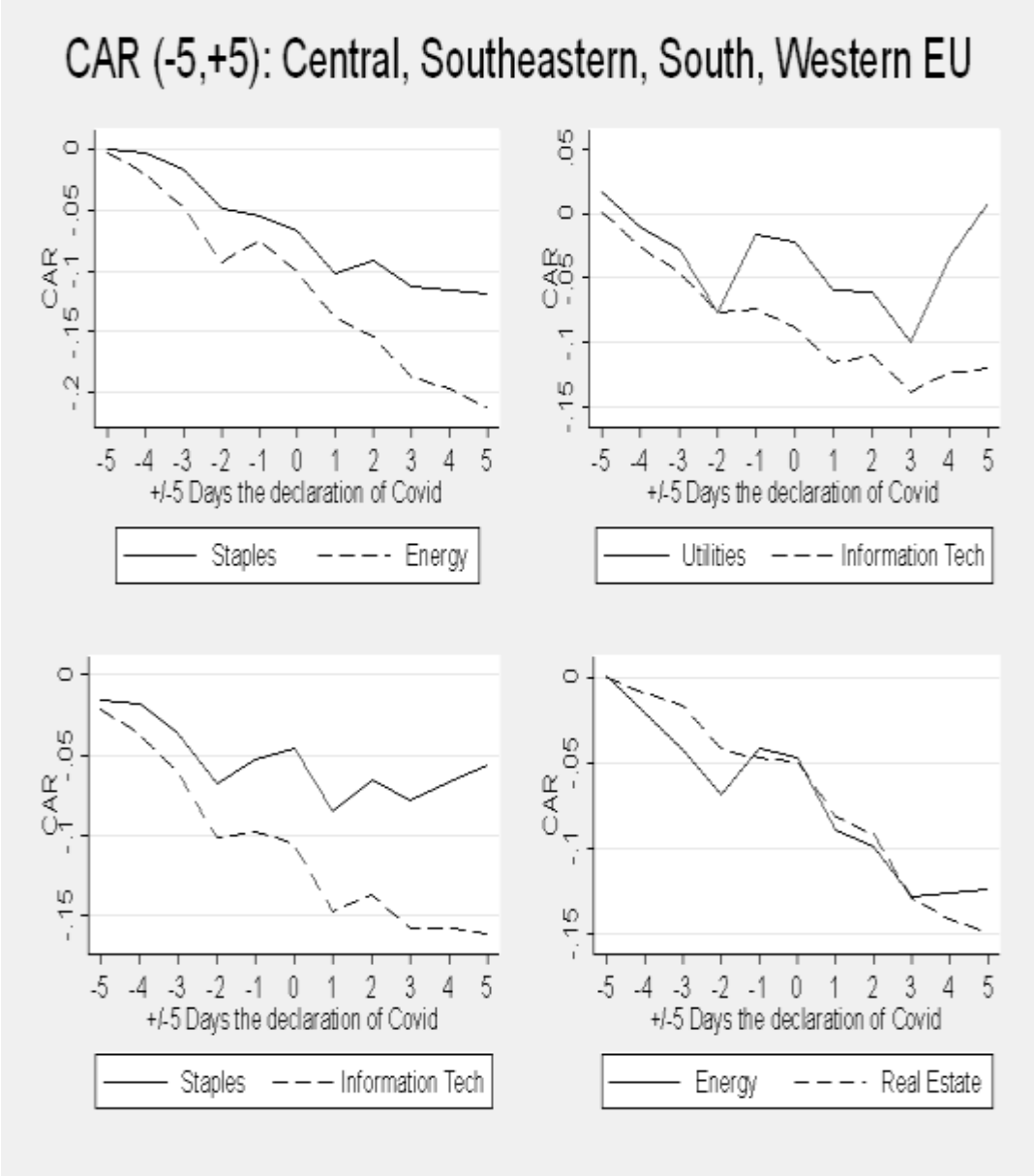

Average Market reaction on the 11-day window centered on the date of declaration of Covid (11 March 2020) across all 11 sectors of 11 European countries separated across the severity of the impact in 3 categories strongly, moderated and less affected.

Figure 3: Cumulative abnormal returns by region.




This figure presents cumulative abnormal returns over an eleven day window (CAR -5,+5) centered at 0 the date at which the COVID-19 is declared by WHO as pandemic (11 March, 2020). The figure illustrates the average market reactions across four geographical regions. Central EU include Germany and Austria, Southeastern EU includes Cyprus and Greece, Southern EU includes Italy, Malta and Spain, Western Europe includes France, Ireland, Luxembourg and Netherlands. This is based on the proposed split along cultural and state borders from German organization Der Ständige Ausschuss für geographische Namen (StAGN).

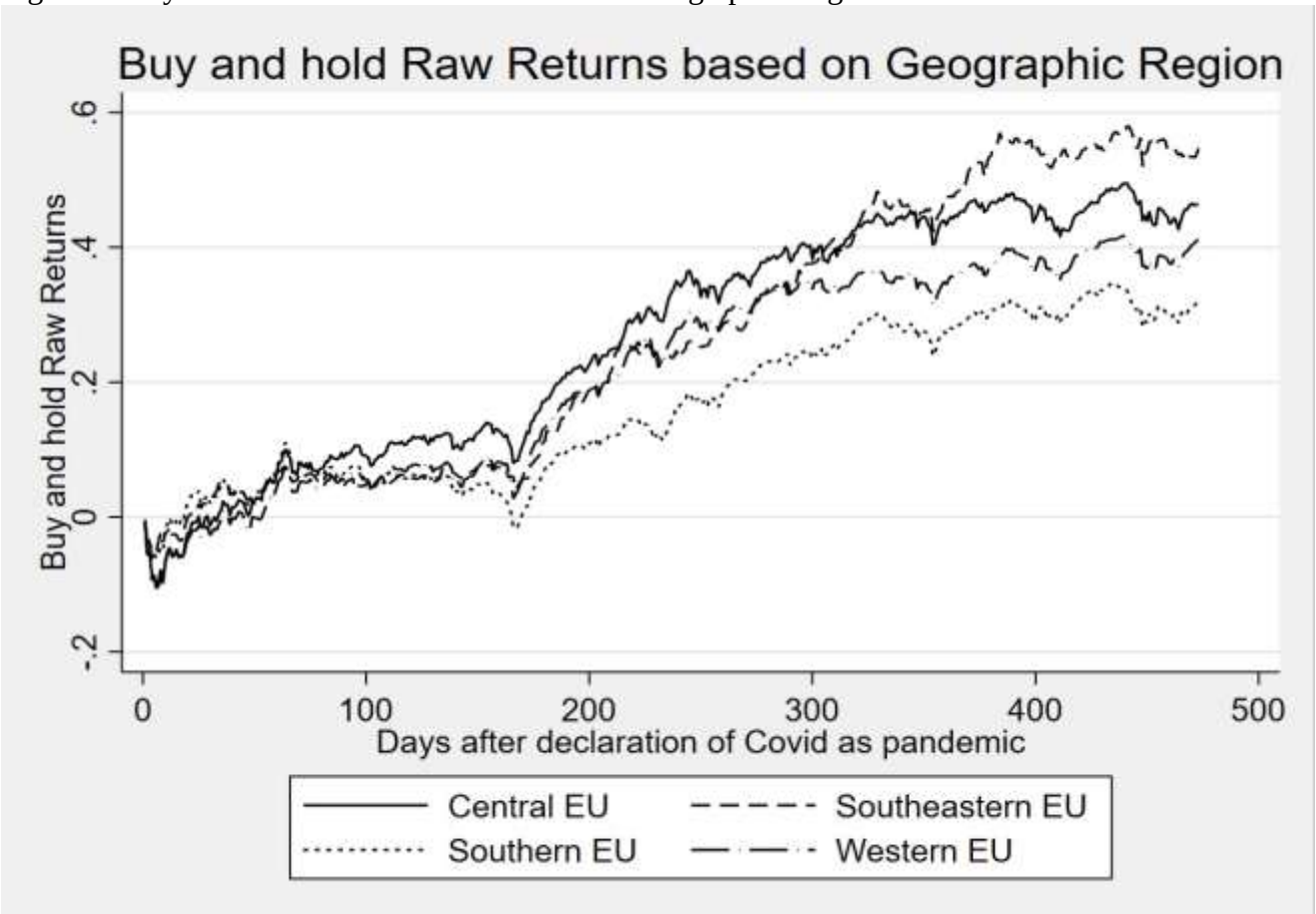
Figure 4: Cumulative abnormal returns by region and sectors




In this figure we present cumulative abnormal returns over an eleven day window (CAR -5, +5) centered at 0 the date at which the COVID-19 is declared by WHO as pandemic (11 Mar 2020). The figure

illustrates the highest average and lowest average market reactions sectors for each of the four geographical regions. Central EU (top left) includes Germany and Austria, Southeastern EU (top right) includes Cyprus and Greece, Southern EU (bottom left) includes Italy, Malta and Spain, Western Europe (bottom right) includes France, Ireland, Luxembourg and Netherlands. This is based on the proposed split along cultural and state borders from German organization Der Ständige Ausschuss für geographische Namen (StAGN).

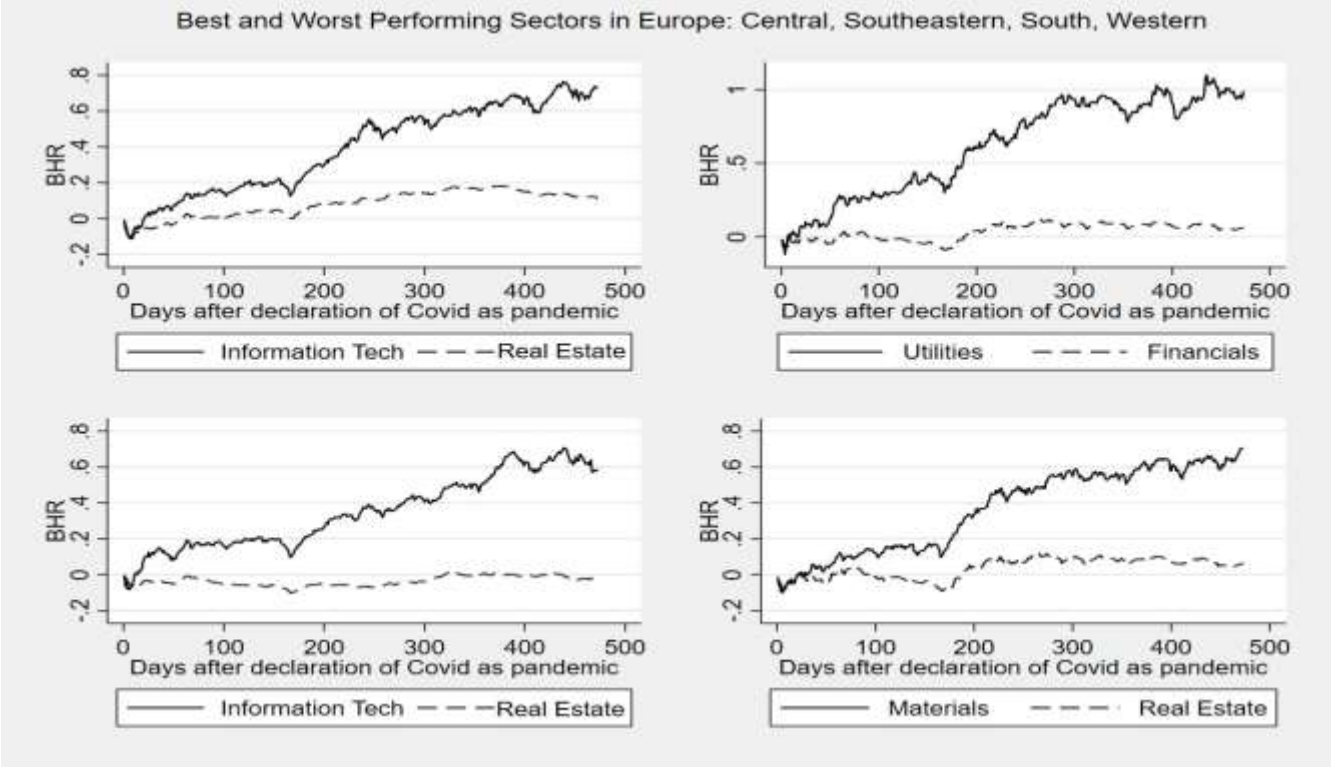
Figure 5: Buy and hold Raw Return based on the Geographic Region




This figure illustrates buy-and-hold raw returns for up to 18-month period, across the four geographical regions starting March 11th 2020, the date of the declaration of COVID19 by WHO as pandemic. Central EU includes Germany and Austria, Southeastern EU includes Cyprus and Greece, Southern EU includes Italy, Malta and Spain, Western Europe includes France, Ireland, Luxembourg and Netherlands. This is

based on the proposed split along cultural and state borders from German organization Der Ständige Ausschuss für geographische Namen (StAGN).

Figure 6: Best and Worst Performing Sectors in Europe: Central, Southeastern, South, Western




This figure illustrates buy-and-hold raw returns for a period of up to 18-months, for best and worst performing sectors across the four geographical regions, starting on March 11th 2020, the date that Covid declared by WHO as pandemic. Central EU includes Germany and Austria, Southeastern EU includes Cyprus and Greece, Southern EU includes Italy, Malta and Spain, Western Europe includes France, Ireland, Luxembourg and Netherlands. This is based on the proposed split along cultural and state borders from German organization Der Ständige Ausschuss für geographische Namen (StAGN). The order is top left Central Europe, top right Southeastern Europe, bottom left Southern Europe and the bottom right Western Europe.