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Market risk exposure determinants during the COVID-19 outbreak: between competitiveness and inequality

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Abstract

Purpose – The objective of this research is to identify the economic, demographic, sanitary and even cultural factors which explain the variability in the cross-section of returns in different markets globally during the first weeks after the outbreak of COVID-19.

Design/methodology/approach – Building on the event study methodology and using seemingly unrelated equations, the authors created several indicators on the impact of the pandemic in 75 different markets. Then, and using cross-sectional regressions robust to heteroscedasticity and using an algorithm to select independent variables from more than 30 factors, the authors determine which factors were behind the different stock market reactions to the pandemic.

Findings – Higher currency depreciation, inflation, interest rate or government deficit led to higher returns, while higher life expectancy, ageing population, GDP per capita or health spending led to the opposite effect. However, the positive effect of competitiveness and the negative effect of income inequality stand out for their statistical and economic significance.

Originality/value – This research provides a global view of investors' reaction to an extreme and unique event. Using a sample of 75 capital markets and testing the relevance of more than 30 variables from all categories, it is, to the authors' knowledge, the largest and most ambitious study of its kind.

Keywords Inequality, Stock markets, Financial markets, Competitiveness, Abnormal returns, Pandemic

Paper type Research paper

1. Introduction

The economic scenario left by the COVID-19 pandemic is devastating. The impact of the virus itself and the measures applied to curb it have led to trade restrictions, saturation of social services, unemployment, shortages of certain products and many other economic and social problems.

This situation also has an impact on equity markets. It affects the short-term viability of almost any company, but above all, it impacts investors' expectations as uncertainty spreads through various channels: duration of restrictions, virus mortality, estimated time for immunisation, probability of a new pandemic, etc.

Since the first wave of the pandemic, an emerging body of research has analysed its effect on assets, and the results are similar to other political and unexpected events: negative impact on share prices, positive impact on volatility and an increase in various forms of financial contagion (Baker *et al.*, 2020; Heyden and Heyden, 2021; Pandey and Kumari, 2021; Zhang *et al.*, 2020; Zaremba *et al.*, 2020 or Zimon *et al.*, 2022). However, with notable exceptions (Ashraf, 2021; Fernandez-Perez *et al.*, 2021 or Seven and Yilmaz, 2021), the considerable differences in market losses remain largely unexplored.

From 31st December until 1st June, the Austrian market fell by 36% while the German market fell by 13%, the main Colombian index was down 40% while the Mexican index was down 17%, and Indian stocks fell by 18% while in neighbouring Sri Lanka they fell by 41%. It is these huge disparities that have led to this research because although the pandemic has

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affected markets globally, it is also true that by exploring these differences, we can contribute to a more detailed understanding of the financial effects of such an event.

Therefore, the main research question is to evaluate whether the variability in returns in markets is due to national level factors. More specifically, we investigate whether health, economic, demographic and even cultural factors are behind investors' different reactions. Furthermore, we assess whether the influence of significant factors on performance is persistent over the course of the first weeks of the pandemic.

Our experiment begins with daily changes in the major stock market indices of 75 countries of all income levels and regions. The indicators we use to estimate the impact of the pandemic on each market are abnormal returns, obtained using an extended market model and under a multivariate equation system called seemingly unrelated regressions (Karafiath, 1988; Zellner, 1962). Thanks to this method we obtain our indicators in a single step and consider cross-correlation, one of the biggest problems when examining time-clustered events. With these returns, we construct five different indicators which we use as dependent variables in the cross-sectional equations. For these equations, we use 33 explanatory variables selected individually for each equation by backward method, including control variables, such as GDP or aggregate consumption, and pandemic-related variables, such as ageing population or the number of tourists received. In addition, we test recent evidence (Ashraf, 2021; Fernandez-Perez *et al.*, 2021; Hu and Zhang, 2021) on the relationship between national culture and the impact of COVID-19 on markets.

In particular, we show that a large part of the market reaction is rationally explained and that there are changes in some of the explanatory variables according to the period examined. Thus, some of the factors that affected investors' decisions are not immutable throughout the pandemic.

We find evidence of the impact of certain economic and demographic variables, some of which are unexpected, such as the negative influence of a country's wealth, as well as significant regional differences. However, the most important findings refer to the impact of the level of competitiveness and the equality of income distribution. These two variables withstand robustness tests, show remarkable persistence across all regressions and are of enormous economic size. Moreover, we show that the cultural effect reported by other research is diluted in the presence of competitiveness. These results provide novel evidence on how extreme events affect equity markets, and can contribute to improving market stability, especially in the most affected countries.

Next, we review the related literature, then explain the origin of the data, the methods used and the different robustness tests. We continue with a section on the results and the corresponding discussion, and end with a summary of the findings.

2. Literature review and research objectives

Our study makes use of two methods that are widely used in financial literature. The first is related to event studies, as we estimate abnormal returns as an indicator of the pandemic's impact. The second is to find the driving forces behind the exposure, typically with cross-sectional, panel or mixed methods.

This literature is now developing in all fields and, in our view, is closely related to research about rare events or disasters and their effect on markets. Barro (2006) found that major disasters were partly responsible for the stock market premium during the twentieth century. Apart from this, the literature studying the impact of more specific episodes is prolific (Natural disasters (Bourdeau-Brien and Kryzanowski, 2017); Aviation catastrophes (Kaplanski and Levy, 2010) or even an earthquake (Valizadeh *et al.*, 2017)). It is quite evident that such events cause high social, political, and economic risk which is logically transferred to financial markets. Given the nature of these disasters, they usually cause abrupt falls in share prices, and spikes in volatility.

Our research is built on the premise that the emergence of the new coronavirus caused a significant negative reaction in stock markets. First, the market was hit by uncertainty, then by government and self-preventive measures and, finally, by the very incidence and mortality of the virus.

Baker *et al.* (2020) show that COVID-19 has caused an unheard level of uncertainty, and they assert that this is directly related to government and individual measures. Many researchers have reported significant and negative abnormal returns caused by the pandemic, using various models, methods, and samples (Angosto-Fernández and Ferrández-Serrano, 2022b; Ashraf, 2020b; Heyden and Heyden, 2021; Liu *et al.*, 2020; Ramelli and Wagner, 2020; Xiong *et al.*, 2020), along with a global increase in volatility and contagion (Aloui *et al.*, 2022; Baker *et al.*, 2020; Rakshit and Neog, 2022; Zaremba *et al.*, 2020; Zhang *et al.*, 2020). Market sensitivity to the increase in cases has also been studied, and daily growth is negatively related to stock returns of a large number of the world's markets (Ashraf, 2020a; Seven and Yilmaz, 2021; Pandey and Kumari, 2021), with some exceptions, as shown by Kumeka *et al.* (2022) for the case of Sub-Saharan African markets. There is a study that even relates market illiquidity and COVID-19 cases and deaths thanks to the wavelet coherency approach (Tiwari *et al.*, 2022).

In our opinion, the negative impact of the new coronavirus on markets is sufficiently demonstrated. Even in countries that were previously hit by disrupting events, such Iraq (Salehi *et al.*, 2022; Shafeeq Nimr Al-Maliki *et al.*, 2023). Thus, through this research we try to address the differences among a cross-section of global markets using rational explanations.

In this sense, there is a growing finance literature that looks for specific determinants of risk exposure during extreme events. Articles about the *Trump* victory (Wagner *et al.*, 2018), *Brexit* (Hill *et al.*, 2019; Oehler *et al.*, 2017), the conflict between China and Taiwan (He *et al.*, 2017) or the failed attempt of independence in Catalonia (Angosto-Fernández and Ferrández-Serrano, 2022a). These articles found significant factors that partly explain the variability of returns during these episodes, but as they are country or region specific, the evidence corresponds to firm-level characteristics.

The lack of one-time events at a higher-level limits insights into specific country determinants. However, publications on macro variables affecting the cross-section of returns, have been developing for several decades (Ferson and Harvey, 1991; Lettau and Ludvigson, 2002; Vassalou, 2003; Verma and Bansal, 2021), and there is also evidence on the current pandemic and the different reactions in markets around the world.

At firm-level and limited to the Chinese market, Xiong *et al.* (2020) show factors that negatively affect returns, such as belonging to the most vulnerable sectors, the number of fixed assets, and having more institutional investors; and other factors that positively affect returns, such as market size, profits, growth opportunities, and combined leverage. A more detailed sector-by-sector analysis can be found in He *et al.* (2020), whose research suggests that the rapid recovery of Chinese firms is partly due to the size of the economy, infrastructure, the industrial chain, and public stimulus. Shin and Park (2022) even found evidence that women-led businesses were more resilient to the pandemic in South Korea. In other sector-by-sector study but in India, Verma *et al.* (2021) found that the lockdown imposed by authorities was beneficial for the performance of most of the industries.

In the same vein, but using data from the US and the EU, Ramelli and Wagner (2020) and Heyden and Heyden (2021) present significant results regarding the level of internationalisation, financial constraints, or ownership structure. Not to mention the work of Abbas and Nainggolan (2022), who analyse firm-level factors, such as liquidity or solvency, that may have mitigated the effects of workplace closures in ASEAN countries.

At country level, there are at least, two studies that found that national culture plays an important role, explaining returns spread at national level. Specifically, these cultural variables are the level of uncertainty avoidance (negative effect) and individualism (positive effect) (Ashraf, 2021; Fernandez-Perez *et al.*, 2021). The negative influence of uncertainty avoidance is also detected at firm-level by Hu and Zhang (2021).

There is another paper (Chia and Zhong, 2020) that also relates national culture to equity markets, but through volume, where more confident, individualistic, and less risk averse nations imply more trading volume during the pandemic. Income level, civil rights protection, the quality of institutions and better market conditions are positively related to volume as well. Fernandez-Perez *et al.* (2021) also presented weak evidence in control variables, such as the negative effect of GDP per capita, the surprising positive effect of population density, and the negative effect of market volatility on returns. In addition, they report the negative effect of stringent policies and the level of corruption, and the positive effect of the level of democracy.

A global study of 77 countries also found significant differences in terms of a country's income level (Liu *et al.*, 2020). According to the authors, in high-income countries, there was an overreaction and then a faster rebound effect than in low-income countries. In addition, they find that the tighter the restrictions the better the market performance. Finally, a negative influence on returns from the services and natural resources industry was reported by Seven and Yilmaz (2021) over a sample of 78 markets, which is one of the biggest samples.

Given the current focus on the pandemic, new evidence may appear almost every day, but at present it remains very limited in this regard. Therefore, our research attempts to go further by collecting those variables that have recently been shown to be related to market returns during the pandemic, adding those that have historically been shown to be rewarded in the markets, and adding others that, in our view, may have much to say at a time of health, political, and economic crisis.

Thus, our research complements other similar research in the study of the variables involved in the impact of COVID-19 on equity markets, but above all it introduces some very important variables that are often neglected, such as income inequality.

Therefore, the objectives of this research are as follows:

(1) Estimate the cross-sectional variability of abnormal returns during the first wave of the pandemic.

(2) Determine as many factors as possible at the national level that are potentially responsible for this volatility.

(3) Estimate how much of the cross-sectional variability can be rationally explained by these factors.

3. Data and methods

This is an experimental study that aims to look for the determinants that will help us explain the variability of stock market returns during the COVID-19 outbreak. Therefore, as an indicator of the pandemic's impact, we use a country's abnormal returns, commonly used in event studies.

To do so, we collected the daily quotations from the stock market indices in local currencies [1] – one per country – provided that there were data from at least 100 sessions before 31 December 2019, the day when the first case was detected. Then, we used them to compound logarithmic returns:

$$r_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right) \tag{1}$$

where r_{it} is the return to index i on day t and P_{it} or P_{it-1} are the points of the index i on day t or *t-1*.

The data was obtained from Investing and by asking each stock exchange individually when the data was not on the website. This procedure gave us a sample of more than 90 countries, but after applying the requirement that no more than 25% of their returns should be 0, the sample was reduced to 80 countries. In addition, we checked that the countries had sufficient economic and social indicators to be able to conduct the subsequent analysis. This last requirement left us with a final sample of 75 countries. The list of countries and their respective stock indices, as well as details of raw returns, can be found in Appendix 1. The period used to estimate these indicators runs from 2 August 2019 to 1 June 2020 covering the entire period already known as the first wave. This makes a total of 211 daily returns per market. To obtain abnormal returns, we use an extended market model; we add an autocorrelation term and a lag term of the market to the traditional market model. The returns used as market *proxy* are those of the MSCI World.

We applied this model due to theoretical and statistical reasons. First, it is known that when a market is not fully efficient, the past terms of asset returns can influence present returns. We also realised that in many markets, especially in developing countries, the autocorrelation or the lagged market term was sometimes more important than the market term itself. Finally, this model was more descriptive than the market model in most markets, these results are available on request.

Abnormal returns are obtained in a single step using *dummy* variables and jointly estimated through a multivariate equation system called seemingly unrelated regressions (Karafiath, 1988; Zellner, 1962). This represents an easy way to obtain abnormal returns and it considers contemporaneous dependence on disturbances by taking into consideration one of the main problems of clustered events: cross-sectional correlation [2].

Thus, *dummy* variables are used to estimate these abnormal returns, and each *dummy* coefficient corresponds to one week and its value represents the daily average abnormal return of that week. For each national market:

$$r_{it} = \alpha_{i0} + \alpha_{i1} * r_{it-1} + \beta_{i1} * r_{WORLDt} + \beta_{i2} * r_{WORLDt-1} + \sum_{j=0}^{Y_i} \delta_{ij} * D_j + \varepsilon_{it} \tag{2}$$

r_{it} is the logarithmic return of the index (country) i on day t; α_{i0} is the constant of the model for the index i; r_{it-1}, r_{WORLDt} and $r_{WORLDt-1}$ are the autocorrelation of r_{it}, the logarithmic return of the world market index on day t and its lag, respectively. α_{i1}, β_{i1} and β_{i2} are their associated coefficients. δ_{ij} is the average daily abnormal return for index i in week j, D_j is a binary variable that takes the value of one on any of the days of week j of the event, and ε_{it} is the disturbance term. The weeks of the event are defined as Y_i since they take different values depending on the country. Ranging from 10 to 22. This is because we define the event (pandemic) as beginning when the first case is detected and made public by the authorities in each country.

Once the coefficients are obtained, we rely on two different approaches to the problem: the first one organises the returns from the first case, so that we can compare abnormal returns from the first weeks of any country's pandemic, even if they occurred non-contemporaneously; the second, places time zero at the official WHO pandemic declaration, in this case analysing a simultaneous event in all markets. The first approach responds to the most extensive analysis possible of the development of the pandemic in each country, and the second specifically responds to exploring the weeks that most affected the markets, which is where we have found the most minima.

Out of all possible indicators we select five: three of them start from the first week of cases, and two of them around the week when the pandemic was declared. These indicators are: FWAR (0), FWCAR (0,1), FWCAR (0,9), OPAR (0) and OPAR (−1,2). FW refers to first week and OP to official pandemic, AR and CAR are abnormal returns and cumulative abnormal returns, and the number of weeks included is given in brackets:

$$CAR_i(t_1, t_2) = \sum_{j=t_1}^{N=t_2} \delta_{ij} \tag{3}$$

where $CAR_i(t_1, t_2)$ are the Cumulative Abnormal Returns to market index i, from t_1, the beginning of the observation period to t_2, the end of the respective period.

The reason the longest period is 10 weeks is because it is the last CAR for which the sample is 75, as there are countries that had been detecting cases for 10 weeks at most by 1 June. The OPAR (−1,2) corresponds to the analysis of the weeks surrounding the pandemic declaration, as this is where the highest number of minima is concentrated. The main statistics of abnormal returns are shown in Table 1.

As previously explained, these abnormal returns are used as an indicator of the impact of COVID-19 at country level and as a dependent variable in a set of cross-sectional regressions, estimated by OLS using heteroscedasticity standard errors.

To the best of our knowledge, we have collected the largest sample of economic, social, and health variables to explain the behaviour of world markets during the pandemic. This does not imply that there may be omitted variables, but our intention was to try to ensure that no variables of potential impact were left out. The sample consists of 33 variables: Global Competition Index (GCI), Human Development Index (HDI), Social Progress Index (SPI), Individualism (IND), Masculinity (MAS), Uncertainty Avoidance (UA), Capitalisation (CGDP), Country Risk Premium (CRP), GDP per capita (lnGDP), GDP Growth (GRW), Public Debt (DEB), Deficit (DEF), Country Liquidity (lnL), Interest (I), Inflation (CPI), Dollar Appreciation (DA), Aggregate Consumption (COGDP), Current Account (CA), Net Exports (XN), Internationalisation (lnIN), Population (lnP), Ageing Population (65), Average Age (lnAA), Life Expectancy (LE), Health Expenditure (HE), Physician Density (PD), Beds Available (BA), Coalition Government (COG), Services Sector (SS), Tourists (lnT), Tourists over Population (TP) and Gini coefficient (GIN). All these variables are summarised and contextualised in Appendix 2.

To carry out this cross-sectional analysis, we follow an algorithm system: specifically, the backward method [3]. Using this method, we allow each dependent variable to be regressed against its optimal explanatory variables; therefore, we start regressing each one against all the regressors and start removing the least significant variables until the Akaike criterion, the Hannan-Quinn criterion, and the adjusted R2 reach optimal values. This method is risky because it is based on statistics and not on a fundamental economic model, but it allows us to introduce changes in the variables that each model incorporates, and this can be more realistic because an investor may consider certain information on the day of the first contagion and different information two weeks later. Thus, each regression follows this general equation:

$$CAR_i(t_1, t_2) = \alpha_0 + \sum_{j=1}^{N=X} \gamma_j * Variable_{ij} + \mu_i \tag{4}$$

Table 1. Abnormal returns main statistics

	N	Mean	SD	Min	Q1	Median	Q3	Max	Kurtosis	Asymmetry
FWAR (0)	75	−0.434	0.998	−3.546	−0.967	−0.386	0.159	1.767	1.151	−0.624
FWCAR (0,1)	75	−3.871	7.377	−25.283	−7.017	−3.164	0.237	9.537	1.003	−0.787
FWCAR (0,9)	75	−9.713	12.784	−45.211	−18.500	−9.307	−1.036	20.209	0.473	−0.416
OPAR (0)	67	−0.600	1.139	−3.038	−1.222	−0.533	0.033	2.943	1.177	0.545
OPCAR (−1,2)	75	−8.341	8.539	−36.522	−13.822	−7.498	−2.863	12.522	1.065	−0.499

Note(s): Statistics are multiplied by 100, except n, kurtosis, and asymmetry. N is sample size. SD is standard deviation. Q1 and Q3 mean quartile 1 and 3, respectively. Kurtosis is excess of kurtosis. FW and OP mean First Week and Official Pandemic, respectively, and AR and CAR mean Abnormal Return and Cumulative Abnormal Returns, respectively. The numbers in brackets indicate the number of weeks included in the indicator. Samples below 75 are because some countries had not yet recorded their first case of coronavirus when it was officially announced as a pandemic, and therefore we consider them outside the event

Source(s): Table by authors

where γ_j is the load of each factor j in the cumulative abnormal returns during the selected period. $Variable_{ij}$ can be any of the 33 variables chosen. μ_i is the error term. X is a different number for each regression, depending on the number of optimal j factors chosen according to the methodology explained above.

We are aware that many of these variables have a similar objective and may therefore have a near perfect correlation or collinearity. This has been considered and they are not simultaneously included in the initial regressions. The correlations of all these variables are displayed in Appendix 3. In Appendix 4, we show statistical information about the explanatory variables. They have been obtained from The World Bank and Investing.

In summary, for each impact indicator (abnormal returns), we select different regressors. In doing so, no single equation confirms or disproves the result of another, as we allow for different explanations for each indicator. For this reason, we implement two robustness tests for all regressions. First, we apply random resampling with replacement to all regressions, simulating population rather than sample behaviour. The procedure is applied 50 times per regression. Using the full sample, we will have 50 equations per dependent variable with 75 different data, which could be from 75 the same to 75 different, as in the original sample. Second, we add regional fixed factors. We created eight binary variables dividing the world into regions to control for fixed effects: Africa (A)- 9 markets, Asia (AS)- 17, North America (NA)- 3, South America, and the Caribbean (SA&C)- 8, Europe (E)- 19, Eastern Europe (EE)- 7, Middle East and Northern Africa (MENA)- 10 and Oceania (O)- 2. In this way, we check whether the fundamental factors are compatible with regional and cultural effects.

4. Results and discussion

Table 2 shows the regression results using the entire sample. The exception of OPAR (0) is due to the fact that some countries had not yet reported their first case when WHO made the declaration. Coefficients are shown for variables that are included in at least one regression.

First, the signs of DEF and lnGDP are striking. The former is relevant in the first weeks of the pandemic and the latter in the longest period and in the week of the WHO declaration. The economic and statistical significance is large, and we believe it has to do with the fact that richer countries, in terms of GDP and surpluses, have more stable markets, and an event like this can make them more volatile, while markets in developing countries are characterised by greater turbulence, and in that sense the pandemic does not represent the same problem.

These results fit with those obtained by Fernandez-Perez *et al.* (2021) with respect to the wealth with a sample similar to ours, however they contrast with the research of He *et al.* (2020) who indicate that national product positively influenced returns, although they refer only to China.

The interest rate (I) is significant and positive in FWCAR (0,1). This makes sense since countries with higher rates could intervene to stimulate the economy through monetary policy. Nevertheless, the sign changes in OPAR (0), which complicates this explanation, although it should be borne in mind that stimulus measures were being announced in Europe and the United States at the same time, which could make variable I less interesting for investors. In the same vein, inflation positively affects returns in FWCAR (0,9) and OPAR (0), as is expected by definition, but it also changes its sign in FWCAR (0,1), which could be driven by pandemic sentiment. In this sense, the high positive correlation (0.88) between both variables is noteworthy.

Surprisingly, the sign of DA is positive and relevant in the two shortest periods, which means that markets with weaker currencies (depreciated against dollar) reacted better to the first wave of the pandemic. This could be interpreted as a better valuation of export capacity rather than import capacity, or the influx of foreign investors in search of cheaper investments. Internationalisation has a positive impact on markets in FWAR (0) and FWCAR

Table 2. Cross-country results. Full sample

	FWAR(0)	FWCAR(0,1)	FWCAR(0,9)	OPAR(0)	OPCAR(−1,2)
N	75	75	75	67	75
Constant	−7.385*** (2.083)	25.971 (58.933)	−6.485 (13.745)	5.982** (2.935)	169.3** (71.876)
GCI	1.383*** (0.268)	10.409*** (1.834)	19.151*** (3.333)	1.372*** (0.477)	8.66*** (2.559)
lnGDP			−7.483*** (2.297)	−0.874*** (0.298)	
GRW	−0.076 (0.064)				
DEF	−0.084** (0.037)	−0.667*** (0.234)			
lnL			−1.201 (0.780)		
I	−0.024 (0.018)	0.397*** (0.131)		−0.120** (0.051)	
CPI		−0.236* (0.12)	0.810*** (0.084)	0.125** (0.047)	−0.252 (0.206)
DA	0.039** (0.018)			0.039* (0.02)	0.331 (0.227)
CA			0.359 (0.336)		
lnIN	0.707* (0.395)	8.512*** (2.757)			
lnP				−0.164 (0.124)	
UR	−0.015** (0.008)				
65	−0.042** (0.019)			−0.069** (0.028)	
lnLE		−24.916* (14.62)			−50.106** (19.079)
HE	−0.104** (0.046)	−1.062*** (0.283)	−0.997* (0.532)	−0.087* (0.045)	
COG				0.357 (0.293)	
Adj R2	0.329	0.326	0.266	0.260	0.166

Note(s): N is sample size. Variables description is available in Appendix 3. Standard deviation between brackets. ***, ** and * mean significance at 1%, 5% and 10%, respectively. Adj R2 means Adjusted R-squared. Each column shows the coefficients of the optimal regressors chosen for each CAR. Samples below 75 are because some countries had not yet recorded their first case of coronavirus when it was officially announced as a pandemic, and therefore we consider them outside the event
Source(s): Table by authors

(0,1), therefore countries that are more connected to the rest of the world have a better performance. Interestingly, the evidence found at the aggregate level is also found at the firm level, as attested by the research of Ramelli and Wagner (2020) and Heyden and Heyden (2021).

The variables that are more related to the pandemic characteristics also explain part of the downturn. Population over 65 and life expectancy are debated as health indicators, but the two are consistent and do not overlap. Thus, countries with a higher proportion of older people or longer life expectancy were more vulnerable. UR is only relevant in the week of the first case, but with the expected sign. This directly contrasts with a previous study (Fernandez-Perez *et al.*, 2021) that surprisingly found a positive relationship between population density and returns, this difference may be due to the method used to measure the variable. HE is significant and persistent in almost all equations, but with a negative sign, which may also be related to the country's level of development. In any case, it seems that higher investment in health did not lead to better returns.

However, the main result is for the Global Competition Index. First, it is significant during all periods examined, and the effect is so profound that the market does not absorb it quickly. It has the expected sign and is responsible for 2/3 of the explanatory power of all regressions. Economic size is also important. For example, in the longest window, the GCI of a Q1 country is responsible for a 19.92% drop compared to a country in Q3, ceteris paribus.

The following simulation gives an understanding of the overall effect of the variables. If a country were to have low competitiveness (Q1), high surplus (Q3), high currency appreciation (Q1), a low degree of internationalisation (Q1), high urban population (Q3), ageing population (Q3) and health expenditure (Q3), it would obtain a premium of −3.61% compared to a country with the opposite characteristics for the FWAR (0). This is an important figure considering that the average daily abnormal return during that first week was −0.43%.

Table 3 shows the equivalent results for the reduced sample. As can be seen in appendix 4 there are missing variables for some countries, so this table reports the coefficients of the regressions using the sample of 56 countries, corresponding to the variable with the least data (GIN). It also contributes to the robustness of the experiment.

Wealth measured by GDP only remains significant in FWCAR (0,9). The sign is now clear for I (positive) and for CPI (negative), although they are significant in fewer regressions. The level of urbanisation and internationalisation are not consistent, as the signs change with respect to the full sample. The rest of the significant variables remain in the reduced sample with some minor differences. DA is significant in four of the five periods. 65 wins out as an indicator over lnLE, and the GCI and HE are no longer significant in some periods but remain robust in the rest.

Among the new variables, market size appears relevant and positive in OPCAR (−1,2), which can be explained by more liquid and less manageable markets, and services' share in GDP is negative for OPAR (0), which was also expected given the special affectation of this sector. Both the positive role of market size (Xiong *et al.*, 2020) and the negative role of the service sector (Seven and Yilmaz, 2021) are in line with international evidence.

However, the role of the Gini coefficient stands out above all, since it is negative and significant in all regressions, especially in the longer periods. This may indicate a long-tail effect of inequality in the market, and it is also economically relevant.

For comparison purposes, a country in Q3 would obtain returns of −9.27% compared to a Q1 country for the longer period. Moreover, it does not lead to a detrimental effect of the GCI on returns, so an uncompetitive country with a rather unequal income distribution would obtain −30.96% for the same period. Thus, the combination of the two would explain much of the fall suffered by international markets.

Inequality could affect economic recovery in a number of ways. We believe that among the most important of these is the citizens' capacity to undertake collective measures to contain

Table 3. Cross-country results. Reduced sample

	FWAR(0)	FWCAR(0,1)	FWCAR(0,9)	OPAR(0)	OPCAR(−1,2)
N	56	56	56	48	56
Constant	−11.669** (4.666)	−94.053*** (18.161)	423.615** (204.386)	3.637** (1.691)	−13.815 (15.362)
GCI	1.840*** (0.415)	9.999*** (1.780)	20.856*** (3.836)		4.314 (3.453)
CGDP					0.066* (0.036)
lnGDP	−0.861 (0.535)		−12.390*** (3.737)		
DEB		−0.049 (0.030)	0.070 (0.050)		
DEF	−0.105* (0.055)	−0.739** (0.325)			
lnL			1.560 (0.984)		
I		0.454** (0.215)		−0.036 (0.023)	
CPI		−0.606*** (0.184)			−0.647*** (0.234)
DA	0.032*** (0.010)	0.335** (0.145)	0.761*** (0.171)	0.046 (0.027)	0.654** (0.261)
COGDP		0.123 (0.101)			0.294** (0.138)
lnIN	2.461* (1.455)	15.369*** (4.564)	−19.934* (11.658)		
lnP	−0.185 (0.165)				
UR			0.172 (0.137)	0.038*** (0.011)	0.170 (0.118)
65	−0.124* (0.064)	−0.455* (0.269)		−0.113** (0.049)	−0.609 (0.418)
lnAA	2.277 (1.580)				
lnLE			−73.561 (48.703)		
HE	−0.152*** (0.055)	−1.328*** (0.426)			
COG					−3.900 (2.490)
SS				−0.045* (0.025)	−0.289 (0.234)
GIN	−3.854* (2.107)	−36.446** (17.393)	−96.354*** (27.418)	−6.431* (3.440)	−56.966** (24.048)
Adj R2	0.400	0.418	0.414	0.288	0.329

Note(s): See Table 2. Samples below 56 are due to the fact that some countries had not yet recorded their first coronavirus case when it was officially announced as a pandemic, and therefore we consider them outside the event
Source(s): Table by authors

the virus. In a highly unequal society, measures cannot be homogeneous for all, as some will be able to afford them, and others will not.

Also notable is the general increase in the regressions' ability to explain cross-sectional variability, reaching figures of over 40%. This may be due to a reduction effect, as the smaller sample may have less variability, as well as an increase effect, as new variables found to be partially significant are included. Overall, the goodness of fit and information criteria indicate that the descriptors used best describe the returns ordered by the time the virus entered each country, rather than by calendar date. Thus, it appears that during the first weeks of confirmed cases, investors react in a similar (or less variable) way, as for example, in China and South Africa, despite occurring at very different times.

4.1 Robustness tests

Despite discovering novel and intriguing findings on multiple variables, our study's sample size remains limited relative to the number of variables integrated into the cross-sectional regressions. Hence, our primary focus for assessing robustness pertains to sampling bias. To ensure the reliability of variable-specific outcomes across markets, we conducted systematic resampling with replacement on all aforementioned regressions.

Table 4 present variables ordered identically to the previous section, with the percentage denoting the frequency of sustained significance for each variable. That is to say, if it indicates a rate of 90%, it means that the variable remained significant and sign consistent in 45 regressions out of 50. In this way, we evaluate whether the results are resistant to sampling changes. While it is true that our sample includes more than 95% of the world's market capitalisation, including more countries would therefore probably not alter the results. It is also true that these results may be produced by only a few markets.

The results for the rate of dollar appreciation, the level of internationalisation (as also suggested by the reduced sample), urbanisation (idem), and ageing population do not reach the minimum threshold that might be desired. At a level below 75–80%, it could be that in a similar experiment the results would be different if 10–15 countries more or less were used, so it is likely that the significance of these variables is related to some specific country/countries.

Government deficit, interest rate, inflation, life expectancy, and health care spending present limited evidence, being robust in at least one of the periods. It is important that CPI shows robustness when it has a positive effect on returns in FWCAR (0,9). The same applies for the interest rate, which is robust to FWCAR (0,1). Competitiveness and wealth per capita are the strongest variables. It appears that the relative competitiveness position has a positive effect on coping with COVID-19, while closely related output per capita has a pernicious effect.

Panel B shows the same procedure as the Panel A but using the reduced sample. In general, the results are even more conservative. The evidence on DEF, I, CPI, lnLE and HE is diluted, while it increases for DA, UR (with opposite sign) and 65. This indicates a sample dependence in the significance of these variables. On the other hand, GCI and lnGDP maintain a robust effect, despite changes in the regressions in which they are representative. The new variables are not robust, with the exception of the Gini coefficient, which is significant in 48 out of 50 regressions for the FWCAR (0,9) period.

We also test whether the results are robust to the introduction of regional fixed factors, and we also show that our competitiveness variable is robust to the introduction of similar variables and even cultural variables.

Regarding the incorporation of geographical variables, we can highlight that the impact of ageing population variables becomes non-significant and changes direction, suggesting a greater influence of regional factors, while most of the variables consistently exhibit significance. Europe emerges as the most affected region, reflecting the high priority given to

	FWAR(0)	FWCAR(0,1)	FWCAR(0,9)	OPAR(0)	OPCAR(−1,2)
Panel A: full sample					
GCI	100%	100%	100%	84%	98%
lnGDP			92%	86%	
DEF	66%	90%			
I		80%		60%	
CPI		32%	82%	60%	
DA	52%			46%	
lnIN	42%	66%			
UR	74%				
65	62%			66%	
lnLE		58%			86%
HE	46%	96%	64%	52%	
Panel B: reduced sample					
GCI	100%	100%	100%		
CGDP					46%
lnGDP			88%		
DEF	48%	62%			
I		38%			
CPI		66%			70%
DA	70%	64%	84%		82%
COGDP					54%
lnIN	46%	78%	50%		
UR				100%	
65	46%	64%		88%	
HE	72%	60%			
SS				60%	
GIN	40%	56%	96%	54%	78%

Note(s): Variables' description is available in Appendix 3. Each equation (column) contains the same regressors as in Table 2 for the Panel A, and as in Table 3 for the Panel B. Each percentage represents the times the variable is significant at standard levels over 50 regressions
Source(s): Table by authors

Table 4.
Resampling results

pandemic containment efforts by governments. However, the inclusion of regional factors does not enhance the explanatory power of the model, as indicated by the information criteria.

Replacing the GCI with alternative variables such as the Human Development Index (HDI) and Social Progress Index (SPI) does not yield consistent or significant results. Thus, the GCI remains a more robust indicator for understanding the observed relationship with abnormal returns.

Additionally, national culture has been found to play a significant role in the pandemic's impact on various markets (Ashraf, 2021; Fernandez-Perez *et al.*, 2021). Uncertainty avoidance and individualism have been identified as influential cultural factors. However, when incorporating these variables alongside the Global Competitiveness Index (GCI) in cross-sectional regressions, the GCI continues to demonstrate greater robustness. The cultural variables have minimal contribution and even worsen the model's specification, except for uncertainty avoidance, which negatively affects returns in the weeks following the initial cases. In other specification, excluding the GCI, uncertainty avoidance still shows a negative impact but does not significantly improve the model's fit. In conclusion, the concept of competitiveness effectively captures the information provided by cultural variables. All these results are available on demand.

4.2 Results discussion

The aim of this research was to find out to what extent global returns could be explained by cultural, economic, demographic and health differences in different markets during the first wave of the pandemic. To some extent we have shown that an important part of this abnormal behaviour can be rationally explained. This varies from a moderate 16.60% to figures of over 40% in several regressions which is a relatively high coefficient of determination for a cross-sectional study. Therefore, we can say that investors took different national factors into account when protecting their investments against the effects of the pandemic.

Some of the above results may be obvious, such as investors paying attention to interest rates or the price of local currency. In a state of high uncertainty, these are financial variables that can give an idea of how well that market will be able to withstand a crisis. Likewise, it is logical to think that the countries most affected are those with the oldest populations, or those with the largest share of production devoted to services.

In our view, this is why two results stand out. The first is the importance of competitiveness at a national level. Firstly, it prevails over other indicators, indicating that for investors there are important nuances, and secondly, because of the economic significance of this variable. It seems that the GCI is able to synthesise a lot of information that investors take into account, explaining falls in returns of around 20% for the longest periods, when the average is close to -10%. Perhaps it would be interesting to incorporate it in future research on stock markets given the importance of this indicator in times of uncertainty. The second is the result of the Gini coefficient. What is surprising is not so much its economic relevance (which it also has), but because it points to inequality as a determining factor in capital markets. This finding is somewhat controversial because any measure aimed at improving the functioning of markets is usually related to competitiveness (labour market deregulation, tax cuts, removing barriers to entry, etc.), and it cannot therefore be contemplated that income equality makes a market stronger in times of crisis.

5. Concluding remarks

In this article, we have presented new evidence on one of the topics we need to analyse the most: the new coronavirus and its effect on the economy. In particular, we investigate which variables have influenced the impact of the pandemic and preventive measures on global stock markets. Our impact indicators consist of five different measures of abnormal returns, and we have more than 30 descriptive variables for a total of 75 markets.

The most relevant contribution of this research concerns the role of competitiveness and income inequality, the former having a positive impact and the latter having a negative impact. These two variables pass the robustness tests and are responsible for most of the regressions' ability to describe the sample.

Despite these interesting results, which hopefully contribute to this emerging debate, the adjusted coefficient of determination reaches figures somewhat above 40% in the best regressions. This means that there is still room to discover new explanatory variables and to improve on the evidence presented here. It would also be interesting to extend the research to find out to what extent a greater impact on capital markets after COVID-19 translated into a greater impact on variables of the productive economy, such as GDP or output.

Additionally, extending this research to track the role of inequality and competitiveness in subsequent COVID-19 waves and the resulting economic crisis would be valuable.

Likewise, in light of the extensive research conducted on COVID-19, conducting a comprehensive meta-analysis would be highly beneficial. Such a study would allow for a systematic comparison of findings, including looking at the differences between developed and developing countries and enabling a deeper understanding of the pandemic's impact on financial markets.

Finally, the research implications are huge since these combined results lead directly to the view that regulators should incentivise competitiveness, but with measures that do not harm economic equality. This is a challenge for the future.

Notes

1. We do not believe that there is a need for further adjustments in this regard given the short study period. In addition, countries with hyperinflation were eliminated from the sample and in the cross-sectional study we control for inflation and exchange rates.
2. See Zellner (1962) for the complete development of the SUR method, see Karafiath (1988) for the introduction of *dummies* in a multivariate system of equations, and finally, see Binder (1985) for a comprehensive explanation of the SUR method within an event study framework.
3. See Hocking (1976) for a review of variable selection procedures.

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Appendix 1

Table A1. Average and accumulated raw returns of the sample indices

Country	Index	Special week	First case date	Accumulated since 31st December	Average daily return since 31st December	Accumulated since first case	Average daily return since first case	Region
Argentina	S&P Merval	No	03/03/2020	−7.085	−0.0668	6.844	0.1104	SA&C
Australia	S&P ASX 200	No	25/01/2020	−10.5114	−0.0992	−14.623	−0.1662	O
Austria	ATX	No	26/02/2020	−35.6028	−0.3359	−28.562	−0.4328	E
Bangladesh	DESEX	Yes	09/03/2020	−10.7476	−0.1014	−6.951	−0.1198	AS
Belgium	BEL20	No	04/02/2020	−19.3868	−0.1829	−18.4266	−0.2247	E
Brazil	Ibovespa	No	26/02/2020	−27.358	−0.2581	−26.3786	−0.3997	SA&C
Bulgaria	SOFIX	No	08/03/2020	−20.884	−0.197	−13.9217	−0.24	EE
Cambodia	CSX	No	28/01/2020	5.5072	0.052	6.6239	0.0761	AS
Canada	S&P TSX	No	26/01/2020	−9.7988	−0.0924	−12.4917	−0.142	NA
Chile	S&P IPSA	No	04/03/2020	−24.629	−0.2323	−16.131	−0.2644	SA&C
China	SZSE Component	No	31/12/2019	9.1806	0.0866	9.1806	0.0866	AS
Colombia	COLCAP	No	07/03/2020	−40.3364	−0.3805	−30.2446	−0.5215	SA&C
Côte d'Ivore	BRVM Composite	No	12/03/2020	−15.3238	−0.1446	−7.6679	−0.1394	A
Cyprus	CYMAIN	No	10/03/2020	−41.1177	−0.3879	−21.7709	−0.3819	E
Czech Republic	PX	No	02/03/2020	−20.6349	−0.1947	−7.3773	−0.1171	EE

(continued)

Table A1.

Country	Index	Special week	First case date	Accumulated since 31st December	Average daily return since 31st December	Accumulated since first case	Average daily return since first case	Region
Denmark	OMX-C20	No	27/02/2020	9.2665	0.0874	4.8471	0.0746	E
Egypt	EGX 30	Yes	02/03/2020	−30.9497	−0.292	−17.822	−0.2829	M
Finland	OMX-H25	No	30/01/2020	−5.4207	−0.0511	−7.6095	−0.0895	E
France	CAC 40	No	25/01/2020	−22.796	−0.2151	−23.4963	−0.267	E
Germany	DAX	No	28/01/2020	−13.4052	−0.1265	−13.0707	−0.1502	E
Ghana	GSE Composite	No	13/03/2020	−14.261	−0.1345	−13.0362	−0.2414	A
Greece	ATG	No	27/02/2020	−33.2232	−0.3134	−20.895	−0.3215	E
Hong Kong	HSI	No	23/01/2020	−17.8151	−0.1681	−17.8915	−0.1988	AS
Hungary	SE	No	05/03/2020	−25.038	−0.2362	−18.8737	−0.3146	EE
Iceland	ICEX Main	No	29/02/2020	−3.6588	−0.0345	5.1202	0.0813	E
India	BSE Sensex	No	30/01/2020	−18.2949	−0.1726	−17.2998	−0.2035	AS
Indonesia	IDX Composite	No	02/03/2020	−27.6139	−0.2605	−13.1774	−0.2092	AS
Ireland	ISEQ Overall	No	01/03/2020	−18.1012	−0.1708	−6.5153	−0.1034	E
Israel	TA125	Yes	24/02/2020	−15.1277	−0.1427	−15.857	−0.2332	M
Italy	FTSE MIB	No	31/01/2020	−23.822	−0.2247	−24.984	−0.2974	E

(*continued*)

Country	Index	Special week	First case date	Accumulated since 31st December	Average daily return since 31st December	Accumulated since first case	Average daily return since first case	Region
Jamaica	JSE All Index	No	12/03/2020	−29.1257	−0.2748	−10.1079	−0.1838	SA&C
Japan	Nikkei 225	No	15/01/2020	−2.5162	−0.0237	−4.0621	−0.0423	AS
Jordan	SE All Share	Yes	03/03/2020	−14.867	−0.1403	−11.68	−0.1884	M
Kazakhstan	KASE	No	15/03/2020	−3.8191	−0.036	9.2898	0.1753	AS
Kenya	NASI	No	14/03/2020	−18.7256	−0.1767	2.563	0.0484	A
Malaysia	KLCI	No	25/01/2020	−7.0805	−0.0668	−4.392	−0.0499	AS
Malta	MSE	No	07/03/2020	−17.3032	−0.1632	−14.1092	−0.2433	E
Mauritius	Semdex	No	20/03/2020	−30.5445	−0.2882	1.9864	0.0405	A
Mexico	IPC	No	29/02/2020	−16.7301	−0.1578	−11.2377	−0.1784	NA
Morocco	MASI	No	03/03/2020	−21.4104	−0.202	−21.3721	−0.3447	M
Myanmar	Myanpix	No	24/03/2020	0.0545	0.0005	0.4657	0.0099	AS
Namibia	FTSE NSX Overall	No	15/03/2020	−27.7432	−0.2617	2.1981	0.0415	A
Netherlands	AEX	No	28/02/2020	−11.5882	−0.1093	−3.7184	−0.0581	E
New Zealand	NZSX 50	No	28/02/2020	−4.6577	−0.0439	−4.1803	−0.0653	O
Nigeria	NSE All Share	No	28/02/2020	−4.9617	−0.0468	−5.7064	−0.0892	A

(*continued*)

Table A1.

Table A1.

Country	Index	Special week	First case date	Accumulated since 31st December	Average daily return since 31st December	Accumulated since first case	Average daily return since first case	Region
Norway	OBX	No	27/02/2020	−16.2236	−0.1531	−10.824	−0.1665	E
Oman	MSM 30	Yes	25/02/2020	−11.6506	−0.1099	−16.194	−0.2417	M
Pakistan	Karachi All Share	No	27/02/2020	−15.859	−0.1496	−6.2798	−0.0966	AS
Peru	S&P Lima	No	07/03/2020	−30.1284	−0.2842	−18.2753	−0.3151	SA&C
Philippines	PSEi	No	30/01/2020	−29.4035	−0.2774	−24.7822	−0.2916	AS
Poland	WIG20	No	04/03/2020	−21.5356	−0.2032	−8.6248	−0.1414	EE
Portugal	PSI-20	No	03/03/2020	−16.8206	−0.1587	−8.4504	−0.1363	E
Qatar	QE General	Yes	01/03/2020	−14.7193	−0.1389	−5.084	−0.0794	M
Romania	BET	No	27/02/2020	−15.7892	−0.149	−13.0203	−0.2003	EE
Russia	RTS	No	01/02/2020	−18.956	−0.1788	−16.8783	−0.2034	EE
Saudi Arabia	TASI	Yes	03/03/2020	−26.7662	−0.2525	−14.422	−0.2326	M
Serbia	Belex 15	No	07/03/2020	−17.1791	−0.1621	−15.9967	−0.2758	EE
Singapore	FTSE Singapur	No	24/01/2020	−21.8902	−0.2065	−22.8759	−0.257	AS
South Africa	SWIX	No	06/03/2020	−16.2334	−0.1531	−7.6838	−0.1302	A
South Korea	KOSPI	No	20/01/2020	−5.6521	−0.0533	−8.0307	−0.0864	AS

(continued)

Country	Index	Special week	First case date	Accumulated since 31st December	Average daily return since 31st December	Accumulated since first case	Average daily return since first case	Region
Spain	IBEX 35	No	01/02/2020	−28.6026	−0.2698	−26.024	−0.3135	E
Sri Lanka	S&P Sri Lanka 20	No	28/01/2020	−41.0538	−0.3873	−37.0945	−0.4264	AS
Sweden	OMXS30	No	01/02/2020	−7.1625	−0.0676	−7.8044	−0.094	E
Switzerland	SMI	No	26/02/2020	−7.686	−0.0725	−6.3736	−0.0966	E
Tanzania	DSE ASI	No	17/03/2020	−12.961	−0.1223	−9.344	−0.1797	A
Thailand	SETI	No	13/01/2020	−17.6959	−0.1669	−17.7459	−0.1811	AS
Trinidad and Tobago	TTSE Composite	No	13/03/2020	−13.8106	−0.1303	−14.3146	−0.2651	SA&C
Tunisia	TUNINDEX	No	03/03/2020	−8.9901	−0.0848	−10.0041	−0.1614	M
Turkey	BIST 100	No	12/03/2020	−7.2494	−0.0684	5.551	0.1009	M
Uganda	Uganda All Share	No	22/03/2020	−28.2914	−0.2669	−7.5805	−0.1579	A
United Kingdom	FTSE 100	No	31/01/2020	−18.3636	−0.1732	−15.6232	−0.186	E
United Arab Emirates	ADX General	Yes	27/01/2020	−19.9507	−0.1882	−22.632	−0.2572	M
Uruguay	BVM	No	15/03/2020	−2.2646	−0.0214	0.3362	0.0063	SA&C
United States	S&P 500	No	21/01/2020	−1.4147	−0.0133	−4.7223	−0.0513	NA
Vietnam	VN	No	24/01/2020	−10.0905	−0.0952	−12.7925	−0.1437	AS

Note(s): Returns are multiplied by 100. Special week means that trading days go from Sunday to Thursday. The names of the indices appear as in Investing
Source(s): Table by authors

Table A1.

Appendix 2

Global Competition Index (GCI). This index was developed by the World Economic Forum and ranks from 1 to 7, with 7 being the ideal state. It includes more than 100 indicators. We believe that a country that is better prepared to compete in the global market will be less affected by the pandemic, as it will be better able to cope with the new economic environment. This index includes some of the variables we also use, hence we test for collinearity, which is not relevant in any case
We think that 'competitiveness' as a concept could be hidden by other variables that are strongly related but have important nuances. For this reason, we also include the *Human Development Index (HDI)* (from 0 to 1) and the *Social Progress Index (SPI)* (from 0 to 100)
In the same vein, we also include the following cultural variables: *individualism (IND)*, *masculinity (MAS)* and *uncertainty avoidance (UA)* developed by Geert Hofstede (Hofstede *et al.*, 2010). Recent articles (Ashraf, 2021; Fernandez-Perez *et al.*, 2021), found that more individualistic and less risk-averse countries reacted better during the pandemic. We added masculinity, as we think that it could also be related to the traditional view of competitiveness
Capitalisation over GDP (CGDP) is used as a measure of market size. The initial supposition is that a relatively small market is more sensitive so the epidemic effect could be worsened by panic behaviour. At firm level, it appears that lower volume levels are associated with higher performance (Datar *et al.*, 1998), and it is possible that this relationship prevails at the aggregate level
Country risk premium (CRP) is defined as the yield difference in a given country's 10-year bond and the German bond. Although the time series relationship regarding bonds and stock returns has become controversial (Baele *et al.*, 2010 or Connolly *et al.*, 2005), the cross-section of market returns could indicate which are the least suitable countries to invest in during great uncertainty
Production related variables: *the natural logarithm of the GDP per capita in PPP dollars (lnGDP)* and the *GDP growth rate (GRW)*. News about GDP growth appears to be priced according to Vassalou (2003). The related GNP was found to explain a significant proportion of expected returns (Elton *et al.*, 1995) and these variables are often used as control variables since business cycles are directly related to economic cycles (Birz and Lott, 2011; Lai, 2017). Additionally, Verma and Bansal (2021) found that GDP has a positive effect on capital markets. However, they might be related to the event since a stronger country in economic terms could be more capable of enduring the subsequent crisis. On the other hand, there is a relationship between production and development, and a more developed country could be more worried about the pandemic than a country with more urgent development issues; a view that is supported by a recent empirical study (Horvath, 2020)
Public debt (DEB) and *deficit (DEF)* as a percentage of GDP. There is evidence of its influence on the predictability of stock returns (Narayan *et al.*, 2014), and these variables are used as a *proxy* of the government's ability to promote economic stimulus measures and aid for those in need. Therefore, a higher debt or lower deficit might negatively affect investors' confidence in recovery
Natural logarithm of country liquidity (lnL), which is measured as a country's reserves in foreign currencies (excluding gold). Following market constraints, a rise in international prices is expected, and therefore, a country with higher reserves could be ready to deal with this. Some evidence supports this view (Narayan *et al.*, 2014)
Interest rate (I) and *consumer price index (CPI)*. These monetary variables are related to stock returns (Ferson and Harvey, 1991; Flannery and Protopapadakis, 2002; Lai, 2017 or Verma and Bansal, 2021). Additionally, COVID-19 has come at an unusual time, with many countries maintaining rates close to or even at 0%, which, given the low responsiveness, could negatively affect returns, and high inflation rates could be detrimental in the face of tightening international markets, as for example has been shown in Maurya *et al.* (2023) during the Russia–Ukraine conflict
Dollar appreciation (DA), which is measured as the natural logarithm of the ratio of the current year's exchange rate (national currency per dollar) to that of the previous year on 31 December. Pham and Phuoc (2020) developed a model including the USD/EUR exchange rate improving CAPM's performance for the US market. This relationship is extensible to other markets (Bilson *et al.*, 2001), and during the pandemic, currencies that have been depreciating more could hurt domestic markets due to the global downturn
Aggregate consumption over GDP (COGDP). This measure captures national dependence on consumption. Aggregate consumption was suggested to even replace the market portfolio (Breeden, 1979), and recent studies support the use of this variable as control (Lettau and Ludvigson, 2002; Narayan *et al.*, 2014)

(*continued*)

Table A2.
List of cross-sectional variables

Current account balance (CA) and *net exports (XN) as a percentage of GDP*. Both are used to determine the dependency relationship with the rest of the world, with the understanding that greater dependence on the outside world would be detrimental if countries were to take restrictive measures. Additionally, Narayan *et al.* (2014) showed that current account has a certain ability to predict country returns
Level of internationalisation (lnIN). This is a self-constructed variable that is the natural logarithm of the number of international organisations to which the country belongs. On the one hand, it can be detrimental if we understand the variable as a proxy for the level of direct connection with other countries, as it could be understood as a greater willingness for the virus to enter the country through different channels. On the other hand, belonging to a larger number of organisations may also mean a greater capacity to respond to the virus, for example, through common economic stimulus plans
The natural logarithm of total population (lnP) and the percentage of population living in urban areas (UR). Both variables could be positively related to the speed of the spread of the virus in a country, and the relative speed could be negatively related to financial markets
Healthcare related variables: *percentage of population over 65 years old (65)*, *the natural logarithm of the country average age (lnAA)*, *the natural logarithm of life expectancy (lnLE)*, *health expenditure as a percentage of GDP (HE)*, *physician density per 1,000 inhabitants (PD)* and *the number of beds available per 1,000 inhabitants (BA)*. These variables may be related to mortality and recovery rates, which in turn may have a direct impact on economic recovery
The type of government. We construct a binary variable that is one if the current government is a *coalition government (COG)*. Recent literature suggested that coalition governments are less able to make decisions as they are unable to act discretionally and instead act consensually (Vuchelen, 2003). This need for consensus could have a positive impact on the incidence of the virus and therefore a negative impact on investors
Services and tourism variables. We used the value of the *services sector over GDP (SS)*, *the natural logarithm of the number of tourists (lnT)*, and *the number of tourists over total population (TP)*. A country's dependence on services, and specially on tourism, could be critical for the entire economy since these sectors have been drastically reduced due to virus containment measures
The level of inequality measured through the *Gini coefficient (GIN)*. We are particularly interested in this variable, as we believe that inequality can be a key factor. A more unequal society may be less prepared to face common challenges, and in an extreme case, a society where only part of the population can afford to comply with anti-pandemic measures will have more difficulties recovering

Source(s): Table by authors based on existing literature, Available here: https://www.hofstede-insights.com/country-comparison/(Last accessed: 03/16/2021)

Table A2.

Appendix 3

Table A3.
Correlations of cross-sectional variables

	CGDP	GCI	IND	MAS	UA	CRP	lnL	I	CGDP	DA	CA	CPI	lnGDP	HDI	SPI	lnP	65
X̂N	0.285	0.546	0.174	0.016	−0.019	−0.525	0.191	−0.210	−0.884	−0.040	0.501	−0.199	0.660	0.533	0.348	−0.147	0.211
DEB	0.051	−0.031	0.136	0.296	0.159	−0.148	−0.104	0.059	0.251	0.092	−0.053	0.039	0.056	0.125	0.260	0.122	0.338
DEF	0.171	0.513	0.210	−0.162	−0.103	−0.669	−0.052	−0.373	−0.383	−0.103	0.354	−0.288	0.541	0.505	0.491	−0.387	0.393
GIN	−0.154	−0.422	−0.505	0.148	0.013	0.525	0.195	0.269	0.420	0.068	−0.256	0.164	−0.550	−0.561	−0.503	0.333	−0.587
TP	−0.058	0.229	0.187	−0.110	−0.065	−0.368	−0.392	−0.227	−0.185	0.029	0.327	−0.151	0.461	0.430	0.406	−0.616	0.311
lnT	0.027	0.204	0.092	0.210	0.110	−0.109	0.442	0.009	−0.188	−0.020	0.214	0.015	0.106	0.162	0.095	0.656	0.266
SS	0.128	0.290	0.535	−0.085	0.078	−0.521	−0.249	−0.087	0.201	0.165	0.206	0.001	0.419	0.576	0.721	−0.286	0.684
GRW	−0.207	−0.118	−0.173	0.070	−0.103	0.035	0.065	−0.273	−0.141	−0.207	−0.184	−0.251	−0.281	−0.255	−0.239	0.252	0.046
lnIN	0.098	0.127	0.389	−0.037	0.293	−0.106	0.106	0.040	−0.057	0.106	0.014	0.071	0.125	0.220	0.464	0.411	0.383
COG	0.164	0.230	0.212	−0.052	−0.068	−0.122	0.101	0.043	0.111	0.124	0.052	0.104	0.084	0.151	0.253	0.018	0.254
BA	0.003	0.278	0.186	0.200	0.378	−0.413	0.147	−0.074	−0.150	0.096	0.224	0.013	0.393	0.471	0.477	−0.002	0.684
PD	0.081	0.512	0.577	−0.094	0.161	−0.655	−0.114	−0.113	−0.206	0.188	0.373	−0.013	0.736	0.752	0.754	−0.402	0.687
HE	0.162	0.288	0.581	−0.081	0.184	−0.509	−0.158	0.046	0.167	0.240	0.096	0.028	0.335	0.494	0.713	−0.089	0.611
lnLE	0.143	0.664	0.416	−0.075	0.062	−0.729	0.057	−0.193	−0.354	0.112	0.465	−0.136	0.802	0.878	0.830	−0.263	0.670
UR	0.307	0.574	0.349	−0.043	0.153	−0.557	0.160	−0.073	−0.288	0.143	0.443	−0.013	0.701	0.699	0.610	−0.255	0.347
lnAA	0.087	0.522	0.406	−0.018	0.227	−0.776	0.075	−0.268	−0.347	0.104	0.384	−0.184	0.703	0.776	0.768	−0.154	0.882
65	0.065	0.458	0.550	−0.001	0.196	−0.735	−0.027	−0.232	−0.079	0.107	0.276	−0.103	0.561	0.702	0.808	−0.135	1.000
lnP	−0.020	−0.152	−0.216	0.216	0.076	0.365	0.617	0.250	0.000	−0.007	−0.084	0.194	−0.420	−0.331	−0.379	1.000	
SPI	0.240	0.644	0.650	−0.129	0.041	0.815	−0.135	−0.211	−0.203	0.143	0.329	−0.133	0.801	0.909	1.000		
HDI	0.234	0.717	0.540	−0.106	0.082	−0.783	0.039	−0.179	−0.443	0.113	0.483	−0.140	0.932	1.000			
lnGDP	0.318	0.775	0.500	−0.038	0.024	−0.733	0.053	−0.258	−0.555	0.040	0.515	−0.195	1.000				
CPI	−0.224	−0.324	−0.059	0.006	0.134	0.762	−0.003	0.393	0.175	0.746	−0.119	1.000					
CA	0.420	0.547	0.030	−0.163	−0.154	−0.366	0.346	−0.118	−0.476	−0.035	1.000						
DA	−0.198	−0.158	0.051	−0.023	0.137	−0.162	−0.130	0.696	0.028	1.000							
CGDP	−0.256	−0.500	−0.034	−0.020	0.107	0.410	−0.312	0.161	1.000								
I	−0.244	−0.406	−0.199	−0.051	0.153	0.916	-0.018	1.000									
lnL	0.352	0.334	−0.128	0.235	−0.099	0.031	1.000										
CRP	−0.227	−0.674	−0.474	−0.037	−0.022	1.000											
UA	−0.449	−0.331	−0.152	0.085	1.000												
MAS	0.046	−0.017	0.065	1.000													
IND	0.293	0.531	1.000														
GCI	0.581	1.000															
CGDP	1.000																

(continued)

lnAA	UR	lnLE	HE	PD	BA	COG	lnIN	GRW	SS	lnT	TP	GIN	DEF	DEB	XN
0.445	0.390	0.409	−0.014	0.339	0.174	−0.071	0.033	0.074	−0.010	0.202	0.351	−0.383	0.475	−0.177	1.000
0.187	0.087	0.304	0.364	0.091	0.219	0.017	0.343	−0.153	0.301	0.225	−0.008	−0.020	−0.164	1.000	
0.533	0.304	0.411	0.071	0.455	0.287	0.034	−0.063	0.091	0.235	0.015	0.371	−0.523	1.000		
−0.563	−0.127	−0.584	−0.149	−0.454	-0.435	0.034	−0.189	−0.244	−0.260	0.004	−0.463	1.000			
0.363	0.303	0.442	0.052	0.379	0.093	−0.005	−0.309	0.048	0.461	−0.041	1.000				
0.300	0.083	0.164	0.131	0.038	0.227	−0.073	0.371	0.171	0.116	1.000					
0.548	0.438	0.543	0.538	0.520	0.327	0.240	0.105	−0.167	1.000						
0.046	−0.534	−0.143	−0.286	−0.328	-0.009	−0.129	−0.040	1.000							
0.293	0.075	0.200	0.591	0.322	0.231	0.115	1.000								
0.197	0.135	0.130	0.207	0.233	0.133	1.000									
0.637	0.200	0.375	0.312	0.440	1.000										
0.669	0.551	0.617	0.583	1.000											
0.429	0.368	0.419	1.000												
0.724	0.642	1.000													
0.399	1.000														
1.000															

Note(s): Darker means a more intense relationship. both positive and negative
Source(s): Table by authors

Appendix 4

Variables	N	Mean	SD	Min	Median	Max
GCI	75	4.626	0.638	3.300	4.540	5.860
HDI	75	0.801	0.124	0.516	0.824	0.954
SPI	74	76.628	12.343	49.250	76.645	92.730
IND	68	43.441	22.910	13.000	36.500	91.000
MAS	68	49.265	17.780	5.000	50.000	95.000
UA	68	64.824	23.084	8.000	66.500	100.000
CGDP	74	61.089	54.077	0.360	41.035	302.090
CRP	61	4.277	4.080	0.000	2.644	16.337
lnGDP	75	10.072	0.910	7.881	10.275	11.527
GRW	75	2.288	2.060	−3.500	2.100	6.800
DEB	75	59.984	36.584	0.500	53.370	234.990
DEF	75	−1.792	3.298	−9.410	−1.960	6.400
lnL	75	10.267	2.047	1.396	10.520	14.949
I	75	4.599	7.731	−0.750	2.250	55.000
CPI	75	3.463	6.590	−2.100	2.100	53.500
DA	75	1.334	6.906	−11.529	1.006	46.383
COGDP	75	75.535	11.210	41.134	76.408	99.080
CA	75	−0.076	5.273	−15.800	−0.900	17.000
XN	75	0.673	9.024	−23.800	0.900	30.200
lnIN	75	4.135	0.238	2.833	4.127	4.543
lnP	75	16.936	1.641	12.768	17.053	21.055
UR	75	69.228	21.117	18.700	74.800	100.000
65	75	12.377	6.852	1.190	11.960	29.180
lnAA	75	3.521	0.261	2.754	3.592	3.884
lnLE	75	4.336	0.079	4.101	4.340	4.454
HE	75	6.921	2.945	0.000	7.000	17.100
PD	74	2.406	1.431	0.040	2.390	5.400
BA	72	3.493	2.534	0.500	2.800	13.400
COG	75	0.427	0.498	0.000	0.000	1.000
SS	75	66.274	11.635	38.700	66.800	93.400
lnT	68	16.104	1.144	12.835	16.171	18.308
TP	68	0.975	1.262	0.013	0.551	6.683
GIN	56	0.363	0.070	0.249	0.358	0.591

Note(s): N is sample size. SD is standard deviation. For an explanation of each variable, see Appendix 2. CGDP, CRP, GRW, DEB, DEF, I, CPI, DA, COGDP, CA, XN, UR, 65, HE and SS are multiplied by 100. Statistics on region are not showed since they are not relevant. Samples below 75 are due to the absence of such values
Source(s): Table by authors

Table A4. Explanatory variables main statistics

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