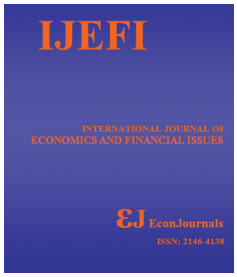

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Reactive or Immune: Stock Market Behaviour during Subsequent Waves of the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic, since its onset, has erupted in waves over the past 2 years. Previous studies investigated the initial impact of the outbreak on stock market returns. This study extends the investigation of the impact on stock market returns during subsequent waves of the pandemic. A panel data regression of stock market returns to Covid variables during the three waves indicated that the initial fear of the disease did not persist through the later waves and the fear factor of the disease spread, deaths and lockdowns faded with every subsequent wave. Investors reacted differently to certain COVID variables. The daily count of total cases and daily deaths were the variables of interest for the first wave, whereas, for subsequent waves, the growth in daily new cases was the most prominent. The country-wise analysis over periods of waves of the pandemic revealed that investor behaviours varied among countries with no identifiable pattern indicating the significance of societal behaviours affecting investor decisions, especially during the crises.

Keywords: Pandemic, COVID-19, Stock Market Returns, Waves of the Pandemic, Stock Market Volatility
JEL Classifications: G00, G10, G14, G40

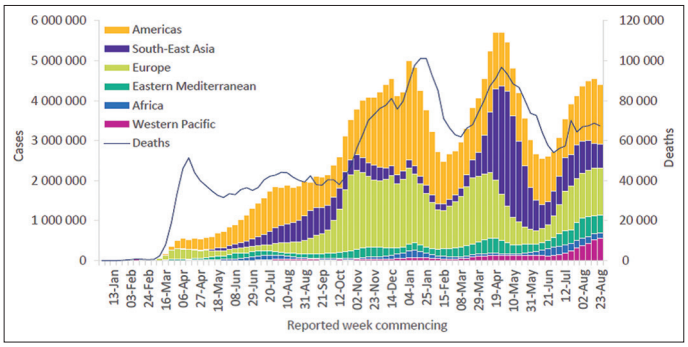
1. INTRODUCTION

1.1. Research Background

"Pandemic is not a word to use lightly or carelessly. It is a word that, if misused, can cause unreasonable fear." these were the words used by World Health Organization (WHO) Director-General Dr. Tedros Adhanom Ghebreyesus when he announced COVID-19 as a global pandemic on March 11, 2020 (Whiting and Myers, 2020). Pandemics are not new and have occurred in the past for various diseases and viruses (Ventriglio et al., 2020). However, the havoc caused by COVID-19 has been unprecedented, for more than 2 years from the outbreak, consisting of subsequent waves and the emergence of new variants. Lockdowns led to economic recession and job losses, impacting livelihoods, education and entertainment worldwide. Populations have faced fear, anxiety and panic during the initial upsurge in cases since January 2020 (Ventriglio et al., 2020). A collaborative study by the University of Georgia and South Dakota State University revealed that people were moving away from taking financial risks during the pandemic, with the majority being young investors below 25 years (Mizzou Magazine, 2021). Financial markets showed significant volatility as the S&P 500 triggered a level 1 market-wide circuit breaker[1] three times in March 2020. The circuit breaker was triggered only once in 1997 before this. As of 6 September 2021, globally, COVD-19 confirmed cases were 220,563,227 with 4,565,483 deaths and 5,352,927,296 vaccine doses administered (WHO, 2021). Figure 1 below gives a graphical view of the global trends in the COVID-19 cases from its onset till August 29, 2021.

1 The current guidelines mandate a 15-minute pause in trading on all U.S. stock exchanges if the S&P 500 index falls more than 7% before 3:25 p.m. New York time. The breakers are set up to calm markets by halting trading as it grows more and more volatile. The first two levels of breaks are set to halt trading for 15 minutes, while a level 3 will suspend trading for the rest of the day. (Reuters.com)

Figure 1: COVID-19 cases reported weekly by WHO region, and global deaths, as of 29 August 2021. Source: World Health Organization, COVID-19 Weekly Epidemiological Update, Edition 55, published 31 August 2021



1.2. Problem Statement and Research Objective

The Global Risks Report 2021 (WEF, 2021) identified infectious diseases as the "top global risk by impact," and according to the Global Financial Stability Report 2021, the two emerging themes mentioned in their report are the rising financial vulnerabilities and misaligned equity markets (IMF, 2021). Pak et al. (2020) illustrated that as the number of covid cases increased, the stock market indices value dropped with a correlation ranging from negative 0.7 to a negative 0.5, indicating a strong negative correlation. Goodell (2020) highlighted that the pandemic could have a very broad impact on the financial sector, including the stock markets, due to the influence of investor sentiment on decision-making. Extant research reveals the effects of the outbreak of the COVID-19 pandemic on stock markets (Ashraf 2020; Baret et al., 2020, Baker et al., 2020; Al-Awadhi et al., 2020; Bora and Basistha, 2021; Baker et al., 2020).

The behavioural finance perspective highlights that a change in social mood may have an adverse effect on stock market performance and further, during times of uncertainty, the prerational herding impulse persists, as hypothesized by Prechter and Parker (2007). The objectives of the study are to empirically evaluate the Covid-19 impact on the stock markets of the top three countries with the highest number of confirmed cases, namely, the USA, India and Brazil during the first three waves of the pandemic. The study examines stock market returns in countries with the highest confirmed COVID-19 cases until September 2021, per the WHO. It extends the investigation to assess the similarities and/or differences in investor behaviours between the initial and subsequent waves.

1.3. Significance of Study

Global stock markets lost $6 trillion at the onset of the pandemic[2], according to S&P Dow Jones Indices (Fitzgerald, 2020). Albulescu (2021) examined the impact of official announcements of new COVID-19 cases and the fatality ratio on the volatility of the S&P 500 in the US financial market and concluded that the pandemic enhanced market volatility. He further suggested that the prolonged nature of the COVID-19 pandemic is an essential source of financial volatility and thus presents a challenge for risk management. This study explores how investors reacted to the subsequent waves reflected through stock prices and their returns. It provides a valuable opportunity to gain insights into drivers of firm value over extended periods of an exogenous factor affecting stock markets. It is one of the few models incorporating the effects of multiple waves of the COVID-19 pandemic on financial markets. The rest of this paper is structured as follows: Section 2 details the literature review, Section 3 describes the sample selection and methodology, Section 4, the analysis and the findings, Section 5 conclusions and directions for future research.

2. LITERATURE REVIEW

2.1. Impact of Disease Spreads on Financial Markets

Historians like Hays (2005) have given an account of the various epidemics and pandemics that occurred worldwide since 430 B.C. and their impacts on human life, including travel (Au et al. 2005), global cooperation and capitalism. There has been a lot of research done on the economic impacts of the COVID-19 pandemic due to the lockdowns and travel restrictions, where intercity travel dropped by 70% to 90% in March 2020 compared to a year before (Dunford et al., 2020) and cultural and social events came to a standstill. Ma et al. (2020) concluded that the GDP decreased by 3% in countries affected by the disease and would take at least 5 years to recover to previous levels. Cooper et al. (2006) investigated that uncertainty over the future course of the epidemic leads to reduced investments. WHO's Global Preparedness Monitoring Board (GPMB)3 (2020), stated the impact of pandemics goes far beyond their immediate health effects and COVID-19 would be remembered for its devastating social and economic impact, throwing millions into poverty. The stock markets are usually the first to react whenever any crisis hits the economy. Ichev and Marinč (2018) found that the effect of the Ebola outbreak in 2014–2016 on financial markets was more substantial for companies closer to the place of the virus outbreak. Nippani and Washer (2004) revealed that SARS virus only affected China and Vietnam among the Asian stock markets. Although Ebola and SARS were not as severe as the current COVID-19 outbreak, they negatively impacted stock markets in the short term. The uniqueness of the COVID-19 pandemic is the speed of its spread and its highly infectious nature. During the initial outbreak, the US stock prices fell by 35% (Alfaro et al., 2020), the UK stock markets by 27.9%, the emerging stock markets of Brazil dropped by 40.5% and Russia by 24.2% (Salisu et al., 2020).

2 During the six days of the last week of February 2020

3 The GPMB is an independent monitoring and accountability body to ensure preparedness for global health crises, co-convened by WHO and the World Bank. The Board provides an independent and comprehensive appraisal for leaders, key policy-makers and the world on system-wide progress towards increased preparedness and response capacity for disease outbreaks and other emergencies with health consequences. The Board monitors and reports on the state of global preparedness across all sectors and stakeholders, including the UN system, government, nongovernmental organizations, and the private sector.

Alexakis et al. (2021) used the spatial econometric technique to determine lockdowns' direct and indirect effect on market returns. During the initial period, 45 major stock market indices, including the USA, European and Asian markets, revealed a negative relationship between stock market returns. Ashraf (2020) examined the stock market response to the COVID-19 confirmed cases and daily deaths in 64 countries using a panel data analysis technique and found that stock market returns declined as a country's cases increased. Baret et al. (2020), in their report on behalf of Deloitte Centre for Financial Services, observed that between 21 February 2020 and 9 March 2020, bond yields, oil, and equity prices fell sharply, and trillions of dollars, across almost all asset classes, suffered price drops. In the USA, 10-year Treasury bond yields had a record fall and were below 0.5%, the VIX[4] based on S&P 500 index rose to 54.46 as of 9 March 2020, from levels around 20 just before the pandemic, which is often known as the "fear index." Baker et al. (2020) used textual analysis and report data from media sources which evidenced that government restrictions on economic activity and voluntary social distancing had powerful effects in a service-oriented economy. The USA stock market reacted much more forcefully to COVID-19 than in previous pandemics in 1918-19, 1957-58 and 1968. A significant negative impact on Chinese stock prices across all companies has been reported by Al-Awadhi et al. (2020) using panel data analysis around the first quarter of 2020, comparing it with daily growth in total confirmed cases and deaths due to the virus. Zhang et al. (2020) found that by March 2020, the stock market in Japan had lost more than 20% from its highest position in December 2019. Ashraf (2021) investigated the cultural aspects with the extent to which markets reacted to the COVID-19 outbreak and suggested that investors in countries with a higher level of cultural uncertainty avoidance were more likely to panic, causing greater market volatility than others.

Few studies have attempted to assess the impact of the COVID-19 pandemic over a longer period extending to its subsequent waves, which have been fragmented. Tomal (2021) focused on the impact on real estate stocks, revealing a significant negative impact only during the first wave. In comparison, Martins and Cro (2022) examined the fast food and food delivery industry in the US and found a positive impact on stock returns during the waves. O'Donnell et al. (2021) considered the different phases during the pre-vaccination period in two countries of Italy and Spain, whereas Abouelfarag and Qutb (2022) experimented only the Egyptian stock market returns and volatility. Yousfi et al. (2021) did a comparative study between US and China during the first and second waves and evidenced a contagion from China to US markets and asymmetric effects on their correlation.

2.2. Subsequent Waves of the Pandemic

China was the first economy to be hit by the pandemic. On 31 December 2019, it announced a cluster of pneumonia cases in Wuhan and by 23 January 2020 the city of Wuhan was under a strict lockdown shocking the whole world. In the first quarter of 2020, its gross domestic product (GDP) went negative 6.8% (National Bureau of Statistics of China, 2020) and financial markets became more volatile (Apergis and Apergis, 2020; Zhang et al., 2020; Ji et al., 2020). Although this initial wave was well controlled, a second wave emerged in June-July 2020 (Coccia, 2021 and Xu & Cao, 2021). The first virus case in the United States (US) was reported by the Centres for Disease Control and Prevention (CDC) on 21 January 2020 and a public health emergency was announced on January 31, 2020. By mid-April 2020, all states and territories in the country were in an emergency due to rising cases which only started to subside by May 2020. Trends in the number of COVID-19 cases and deaths reported by the CDC are shown in Figure 2 below. The second wave began in July 2020 and lasted through mid-August 2020, and the third wave from the 1st week of November 2020 until the 1st week of January 2021. India reported its first case on January 30, 2020 with strict lockdowns announced by almost all states in March 2020. Cases were on the rise till September 2020 and started subsiding only in late October 2020. The second wave rose in March 2021, with total cases reaching 24,684,077, the second-highest in the world for confirmed cases (JHU, 2021). Figure 3 shows the confirmed new cases during the period of the two waves in India. Brazil reported its first case on February 25, 2020 and by June 2020 the country had crossed the million mark in terms of total cases. The country's government downplayed the impact of the virus and criticized lockdown measures where cases continued to rise until the end of August 2020. This was the first wave. The second wave began at the beginning of November 2020 until the end of January 2021 and the third wave picked up in March 2021 till the beginning of May 2021 (JHU, 2021). Figure 4 shows the confirmed new cases during this period in Brazil. Johns Hopkins University (JHU) experts explain that herd immunity could work when 70% of the population becomes immune to the virus (D'Souza and Dowdy, 2021). The WHO continuously monitored the emergence of new variants globally and identified variants of concern (VOC)[5] such as the Alpha, Beta, Gamma and the Delta, plus variants of interest (VOI)[6] like the Eta, Iota, Kappa, Lamda in Peru and Mu in Columbia. As of October 2021, Singapore experienced rising deaths, and China and Russia observed a rise in cases leading to lockdowns again (BBC News, 2021).

4 Chicago Board Options Exchange's Volatility Index (Cboe VIX) is a calculation designed to produce a measure of constant, 30-day expected volatility of the U.S. stock market, derived from real-time, mid-quote prices of S&P 500® Index (SPX℠) call and put options. On a global basis, it is one of the most recognized measures of volatility -- widely reported by financial media and closely followed by a variety of market participants as a daily market indicator.

5 The WHO described a variant of concern (VOC) to have one or more characteristics of increase in transmissibility or detrimental change in COVID-19 epidemiology; OR Increase in virulence or change in clinical disease presentation; OR Decrease in effectiveness of public health and social measures or available diagnostics, vaccines, therapeutics. (WHO 2021, Tracking SARS-CoV-2 variants, Available at: https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/)

6 A variant of interest (VIC) as defined by WHO is a SARS-CoV-2 variant with genetic changes that are predicted or known to affect virus characteristics such as transmissibility, disease severity, immune escape, diagnostic or therapeutic escape. Identified to cause significant community transmission or multiple COVID-19 clusters, in multiple countries with increasing relative prevalence alongside increasing number of cases over time, or other apparent epidemiological impacts to suggest an emerging risk to global public health. (WHO 2021, Tracking SARS-CoV-2 variants, Available at: https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/)

Figure 2: USA daily confirmed new cases (7-day moving average) per 100,000 population, John Hopkins University and medicine, coronavirus resource centre

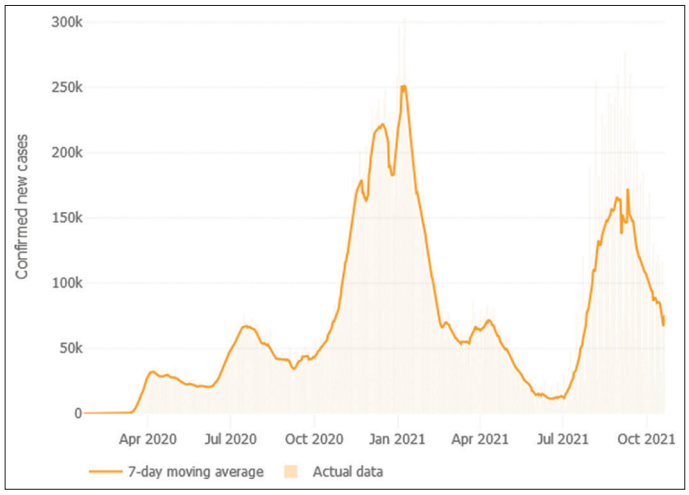


Figure 3: INDIA daily confirmed new cases (7-day moving average) John Hopkins University and medicine, coronavirus resource centre

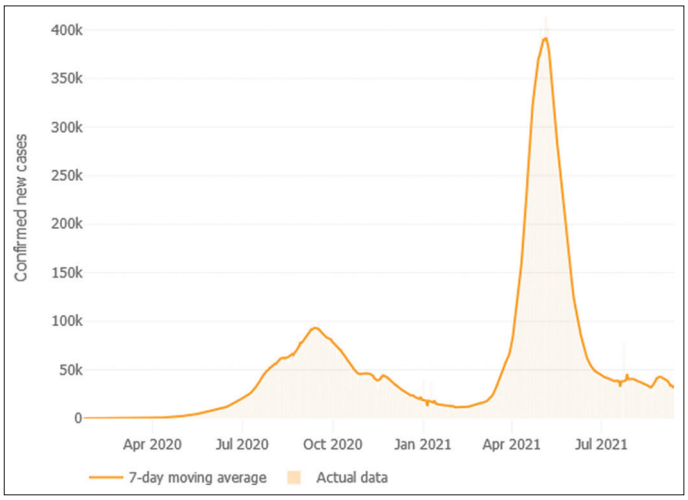
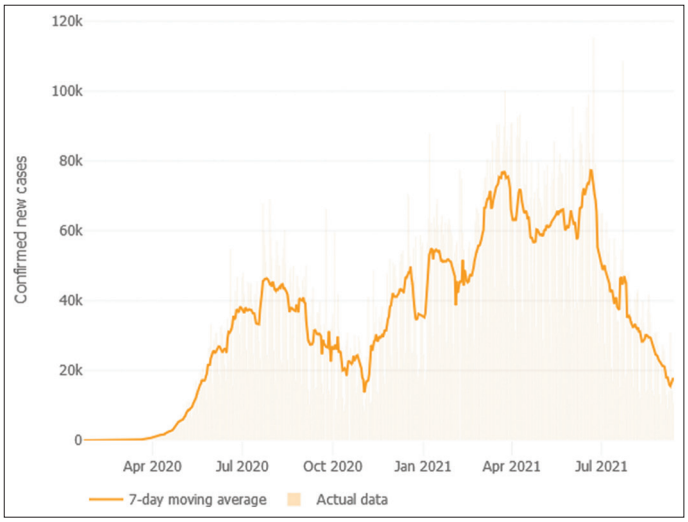


Figure 4: BRAZIL daily confirmed new cases (7-day moving average) john Hopkins University and medicine, coronavirus resource centre



2.3. Theoretical Background and Hypothesis

The theoretical basis for studying the pandemics - stocks connection lies in the argument that stock prices and returns respond to news and macroeconomic conditions that shape investors' decisions. (Bulmash & Trivoli, 1991, Clare & Thomas, 1994). The Efficient Market Hypothesis (EMH) theory by Fama (1970) states that stock prices fully reflect all available information and hence achieving consistent abnormal returns on stocks is not possible. The question then arises: Are markets efficient? Do they integrate the anticipations of the participants entirely? (Cowles, 1933). The challenge here is to understand whether stock markets fully reflect the dangers and fears associated with the health crisis, not only at the onset of the pandemic but also during the prolonged periods where we observe waves of the disease emerging. Previous studies have concluded that contagious, fatal pandemics affecting large populations cause economic activity slowdowns (Almond and Mazumder, 2005). Studies have shown that the world's largest stock market was inefficient in some periods and was slow to respond, which is not consistent with the EMH theory (Vasileiou, 2021). Topcu and Gulal (2020) have observed that the negative impact of the COVID-19 pandemic on emerging markets began to reverse as soon as April 2020, within the first quarter of the pandemic. It further highlights the need to investigate whether subsequent waves with greater contagion of the disease and higher deaths could result in investor reactions similar to the initial outbreak. Psychological studies have shown that people's decision-making does not follow the Bayes rule (Frisch, 1988) and when applied to financial markets De Bondt and Thaler (1985) found that stock prices overreact, evidencing substantial weak form market inefficiencies. Other studies have shown that investors are bearish when markets are down (Burns et al., 2011). Prechter and Parker (2007) indicate that social mood can be reflected in stock market indices due to investors' reaction after a particular event. Prechter et al. (2012) find a positive correlation between social mood and stock prices, whereas a negative social mood can lead to declining stock prices. Lo and MacKinlay (1990) found that "too many" consecutive transfers in the same direction permitted them to reject the hypothesis that stock prices could be described as true random walks. Other studies have shown that as the level of uncertainty is high during pandemics, the level of risk aversion among investors also increases (Ma et al., 2020). This study aims to answer the questions: Were the stock markets negatively impacted during the subsequent waves and further whether the impact on stock market returns was as severe in subsequent waves as compared to the initial outbreak of the COVID-19 pandemic. Further it aims to investigate if this impact during subsequent waves in similar across countries or are there any differences that require a behavioural explanation to the investor reactions during prolonged pandemic waves.

3. SAMPLE SELECTION AND METHODOLOGY

3.1. Sample Selection and Data

The WHO refers to a "wave" as a rising number of disease cases with a specific peak and then declines. It looks like a shape of a wave on a graph that increases, tops out and then decreases,

referring to in some cases as a surge or outbreak. These waves create an atmosphere of uncertainty with increased health risk and affect economic activity. As per WHO records[7], the three largest affected countries concerning the total confirmed cases at the time of this study (October 2021) are used for sample data. These countries are the first: United States of America (USA), second: India and third: Brazil. The periods of the waves have been selected based on the data of daily confirmed new cases (7-day moving average) per 100,000 population from the John Hopkins University and Medicine, Coronavirus Resource Centre, for the three countries described in the literature review and also supported by various studies. The first US case was detected on January 21, 2020 (History.com Editors, 2021) and the timelines of the rise in cases during the second and third waves have been detailed at Times.com by Wolfson and Wilson (2021). India started experiencing a surge in cases by March 2020 and (The Week, 2020) in June 2020 recoveries started exceeding new cases (Hindustan Times, 2020 and Ahmed et al., 2021). The second wave in India began in March 2021 and started falling after mid-May 2021 (Safi, 2021; Ahmed et al., 2021). In Brazil, the first case was detected on February 26, 2020 (Silva and Pena, 2021) and the first wave peaked in April 2020 with the second wave and remained low from May 2020 to November 2020, with the peak of its second wave in January 2021 (Sabino et al., 2021). The study uses the timelines of waves in the three countries as:

- USA
  - USA Initial Outbreak: February 01, 2020 - April 30, 2020
  - USA Second Wave: July 01, 2020 - August 31, 2020
  - USA Third Wave: November 01, 2020 - December 31, 2020
- India
  - India Initial Outbreak: March 01, 2020 - May 31, 2020
  - India Second Wave: March 01, 2021 - April 30, 2021
- Brazil
  - Brazil Initial Outbreak: March 01, 2020 - May 31, 2020
  - Brazil Second Wave: December 01, 2020 - January 31, 2021
  - Brazil Third Wave: March 01, 2021 - May 15, 2021.

The main stock market indices of the US, India and Brazil from Yahoo Finance to find the stock market returns (the dependent variable). US: the Standard and Poors 500 (S&P 500) Index includes 500 leading U.S. publicly traded companies, primarily emphasizing market capitalization. India: S&P BSE 200 index tracks the top 200 companies on the Bombay Stock Exchange (BSE)[8]. Brazil: Bovespa index (Ibovespa), the flagship index of the Brazilian stock exchange is B3[9] with 82 companies[10] weighted on the free float market value and constitute around 80% of the number of trades in the country (B3, 2021). The variable that is tested for the effect, the dependent variable, is the Stock Market Return (SMR) defined as the logarithmic percentage index daily return.

$$SMR_t = \left(\frac{\text{price}_t}{\text{price}_{t-1}}\right) \quad (1)$$

The confirmed cases and deaths data are taken from the COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at John Hopkins University (JHU). The independent variables are the Daily New Cases (DNC), Daily Deaths (DD) and Daily count of Total Cases Confirmed (DTC). The DNC, DD and DTC are taken for the respective periods during the initial and subsequent waves for the sample countries.

3.2. The Empirical Model

The study uses the quantitative analysis method and panel-data regression models to evaluate the relationship between the variables collected from secondary sources. A correlation and regression analysis of variables is performed country-wise. Panel-data regression model is used in prior studies by Al-Awadhi et al. (2020), Ashraf (2020), Bahrini and Filfilan (2020), which is more suitable than the classical event-study method. It reduces estimation bias and multicollinearity (Baltagi, 2008, Wooldridge, 2010, Hsiao, 2014) and identifies the time-varying relationship between dependent and independent variables (Hsiao, 2014). Table 1 below summarizes the variable names used in the model, their description and their source.

The regression model is used to test the relationship empirically, where subscripts of c and t represent country and day, α_c is a constant term, SMR is the dependent variable representing stock market returns in country c on day t. This is repeated for each of the three countries during their respective pandemic waves. DNC represents the independent variable of growth in daily new cases of COVID-19. DD represents the independent variable of growth in daily deaths due to COVID-19. DTC represents the growth in the daily count of total confirmed cases. ε_c,t is an error term.

$$SMR_{c,t} = \alpha_c + \beta_1 DNC_{c,t-1}, + \varepsilon_c \quad (2)$$

$$SMR_{c,t} = \alpha_c + \beta_2 DD_{c,t-1}, + \varepsilon_c \quad (3)$$

$$SMR_{c,t} = \alpha_c + \beta_3 DTC_{c,t-1}, + \varepsilon_c \quad (4)$$

The multiple regression model will be as below:

$$SMR_{c,t} = \alpha_c + \beta_1 DNC_{c,t-1}, + \beta_2 DD_{c,t-1}, + \beta_3 DTC_{c,t-1}, + \varepsilon_c \quad (5)$$

4. FINDING AND ANALYSIS

4.1. Panel Data Analysis

Given the descriptive statistics of the three waves in the appendix, Table 2, the major observation is that the mean SMR was negative

7 As on 19 October 2021, the total confirmed cases in the FIRST: USA with 44,408,612 cases, SECOND: India with 34,081,315 cases and THIRD: Brazil with 21,597,949 cases. And even these countries have the highest number of total deaths in the order of USA, Brazil and India. (WHO, 2021)

8 The BSE has been existence since 1875 and it is the oldest stock exchange in India with around 5,000 listed companies.

9 The B3 or Brasil, Bolsa, Balcão was formed in 2008 with the merger of the São Paulo Stock Exchange or Bolsa de Valores de São Paulo and the Brazilian Mercantile & Futures Exchange or Bolsa de Mercadorias e Futuros. There are around 350 companies listed on the exchange.

10 To know more about the constituents of the index visit: https://www.b3.com.br/en_us/market-data-and-indices/indices/broad-indices/indice-ibovespa-ibovespa-composition-index-portfolio.htm

only in the first wave and the second and third waves did not have a negative mean. Standard deviation of SMR was the highest during the first wave at 3.5% and almost the same for the subsequent two waves at 0.9%. The bivariate Pearson Correlation Coefficient is used and suited for the purpose and the histograms of the variables during their respective waves showed a normal distribution. Table 3 shows the correlation among the variables for the three waves. During the first wave, DTC and DD show a negative correlation with SMR, and DNC did not have a negative impact on the stock market. However, during the second wave, none of the COVID variables revealed any negative impact on stock returns. By the time of the third wave, only DNC was negatively correlated to the SMR.

A multiple regression analysis was performed with three independent variables of growth in DTC, DNC and DD to test the impact of the COVID-19 pandemic on stock market returns (SMR) during the initial and subsequent waves of the pandemic. The multicollinearity problem does not exist, as in all cases, the VIF is <10 and Tolerance is >0.1. It examines whether the independent variables (COVID-19 variables of growth in DTC, DNC and DD) have a causal impact on the dependent variable (SMR). It estimates the magnitude of the impact, if any. Table 4 below shows the regression analysis output for the three waves. We observe that the stock market returns were negatively impacted only during the first wave and variables of interest were the DTC (Daily Total Cases) and the DD (Daily Deaths), statistically significant below 5% significance level. The DNC (Daily New Cases) did not negatively impact stock market returns. Although for the second and third waves, DNC had a negative coefficient, both of these are not statistically significant. The literature review highlights that the COVID-19 outbreak affected the stock markets negatively, this study also establishes the same. The mean stock market returns during the first wave were negative 0.17%. The correlational analysis revealed that the SMR was negatively correlated to two COVID-19 variables out of the three. The regression analysis showed negative coefficients for the growth variables in DTC and DD. Hence, the empirical analysis confirms that the COVID-19 initial outbreak had a negative impact on SMR.

During the subsequent waves the statistical analysis does not reveal a negative impact on stock market returns through the COVID-19 variables, as the mean returns were positive. The correlational analysis revealed a weak negative correlation only in the third wave between DNC and SMR. Although negative, the regression analysis coefficients of DNC were not statistically significant. Hence it cannot be confirmed that the subsequent wave period of the COVID-19 pandemic had a negative impact on stock market returns, as no clear impact has been seen through the empirical analysis of the sample data.

4.2. Country-wise Analysis

The author was keen to investigate further if the results would differ from the panel data analysis, if the countries were analyzed separately. Did investors in different countries behave differently during the subsequent wave periods? Were they reactive or immune to the later waves, and which COVID variables were more prominent? A correlation and regression analysis for each country separately for each wave was performed to investigate differences in investor reactions in different countries. For the US markets, SMR had a negative mean only in the first wave, and the second and third waves did not have negative means. Although the covid cases rose during the third wave, the SMR was positive. The impact on stock market returns became insignificant by the time of the third wave. For the Indian stock markets, although there was not much difference in the pandemic spread during the two waves, the resulting impact on SMR during the second wave had mellowed down to an average of negative 0.02% from 1.6% in the initial wave. In Brazil, growth in DNC and DD slowed during the second wave and the growth in SMR showed a positive average of 0.08%. Negative SMR is not observed on average during the subsequent waves despite persistent high deaths compared to other countries. The country-wise descriptive statistics are shown in Tables 5-7 in the appendix.

A bivariate Pearson Correlation Coefficient was obtained for each country during the pandemic's waves. For US, during the first wave, growth in DNC, DD and DTC, all three variables show a negative correlation with SMR where DNC and DD are significant. By the time we reach the third wave, there is no negative correlation between any COVID variables and SMR. For India, the impact of the COVID-19 pandemic on the SMR was significant during the first wave, with all covid variables having a negative correlation at a significance level of 1%, with DD revealing the highest correlation among the others. During the second wave, the DNC had the highest impact on SMR, showing a correlation of –0.47. The SMR reveals a higher correlation with all covid variables during the second wave than the first. The Brazilian data related a different story than the US and India, where during the first wave, none of the covid variables had a negative impact on SMR. During the third wave, a negative correlation of DNC with SMR is seen, that is relatively weak. A summary of the correlation coefficients is shown in Table 8 below and detailed data in Tables 9-11 in the appendix. On comparison, the SMR was negatively correlated to all three independent variables during both waves in India. In the US, such similarity is only seen with the variable DNC and not the others, whereas in Brazil, no similar behaviour was observed between any of the independent variables.

Like the correlational analysis, regression analysis results also tell a different story for each country. Tables 13, 14, and 15 show the regression output for the COVID waves in the US, India and Brazil respectively. In the US during all three waves, the independent variable of growth in DTC had a negative coefficient; only for the first wave, the growth in DD revealed a negative coefficient. Hence, DTC and DD were variables of interest that impacted SMR where DD is also statistically significant. In India, during the first wave, the growth in DTC had a negative coefficient among other variables. During the second wave, the growth in DNC revealed a negative and statistically significant coefficient. In Brazil, the first wave showed negative coefficients for growth in DTC and DD, which were both statistically significant, but DNC was the variable of interest during the second and third waves. The cross-country examination reveals that growth in DTC and DD are the variables of interest during the first wave in all three countries. For the subsequent waves, there does not seem to be any similarity between countries. Growth in DNC is observed to be the more prominent variable of interest impacting the stock market returns.

4.3. Robustness Checks

The regression analysis ensured that the assumptions of normality in all variables during all the pandemic waves were fulfilled, and all variables are normally distributed by testing through histograms and frequency curves. The author also ensured the relationship between the dependent and independent variables was linear, referring to theory and previous studies in the literature review. Before running the regression tests, a stationarity test was conducted on dependent variables using SPSS add-in from R essentials. It used the Augmented Dicky-Fuller Test to check for unit root, where the null hypothesis was rejected as the P-values were all <0.05. The time series used in the study had stationarity, and a shift in time did not cause any change in the shape of the distribution. Finally, to confirm that the outcomes of the multiple regression were valid, separate regressions were run with each independent variable separately to test the impact on the dependent variable for each country and each period of the wave. The single-variate regression models revealed no substantial differences in the results compared to the multi-variate model.

5. INFERENCES OF ANALYSIS

The panel data analysis during the three waves of the pandemic indicates that the initial fear of the disease did not persist through the later waves and the fear factor of the disease spread, deaths and lockdowns could not continue to influence stock market return subsequently. The main finding was that SMR was negatively impacted only during the onset of the pandemic, indicating a shock to the financial market transmitted through the health crisis. The wave-wise negative impact on stock market returns faded with every subsequent wave and the initial outbreak caused the greatest fear and panic among investors. The correlation coefficients evidence this for each wave, where the initial wave experienced a negative correlation with more COVID-19 variables. For subsequent waves, SMR reacted negatively only to DNC, which was not statistically significant. Further investigation into country-wise analysis revealed that stock market reaction to the pandemic differed between countries with no identifiable pattern. For all sample countries, the first wave had a more substantial negative impact on SMR as compared to subsequent waves. For US, DTC and Brazil, DNC was the variable of interest, whereas for India all three COVID-19 variables were of interest. Table 12 shows the summary of the COVID-19 variables of interest in the three countries.

Figure 5: Correlation coefficients of SMR with COVID-19

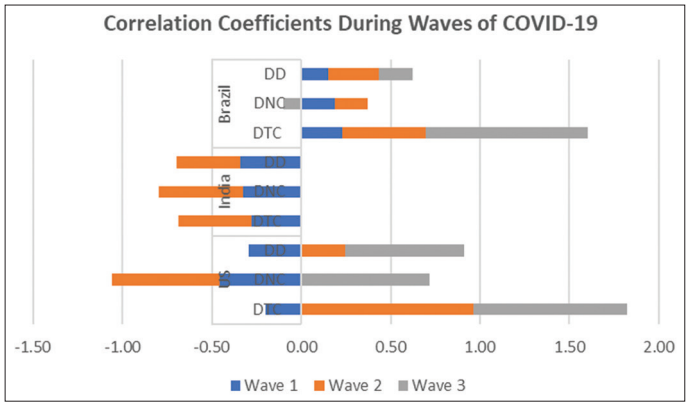


Figure 5 below is a graph of the correlation coefficients in the three countries during their respective waves. The investors' perceived risk lessens as the pandemic continues over prolonged periods. The "fear gauge" of the health crisis is overtaken by other concerns like lockdowns and restrictions in trade and travel that impact investors rather than the health crisis itself. It is inferred that investors in different countries behaved differently to the pandemic spread, whereas US and India investors became risk-averse and stock market returns turned negative, the Brazilian investors, however, did not behave similarly. Other factors like uncertainty in the efficacy of the vaccines and available treatments, policy decisions related to lockdowns and other restrictions, socio-cultural behavioural aspects of the population that bind the pandemic's beliefs could be reasons that could affect investor behaviours. The findings in the study suggest the need for alternative explanations and disagreements to generalizations of investor behaviours across the globe.

This study provided evidence that the results of the initial outbreak support the EMH theory due to the resulting increased volatility and negative returns in stock markets globally during the initial outbreak. It is also supported by various other studies such as Al-Awadhi et al. (2020), Ashraf (2020), Bahrini and Filfilan (2020), Fitzgerald (2020) and Albulescu (2021), among others. The author investigated whether stock markets fully reflect such pandemic-related dangers and fears during prolonged periods of waves. Here, the study observes some contradiction to theory on the overall stock market basis and does not refer to individual company expectations. Firstly, countries behaved differently, and we cannot generalize that the increase in covid cases led to a negative impact on stock markets, as this was not the case with Brazil as compared to the other two countries. Secondly, the negative impact on stock market returns was reversed by the time the pandemic reached its third wave. Pandemic waves cause disease to spread and bring about fear and uncertainty, the impact was not substantial after the initial outbreak, and fears were not translated to negative stock market returns. Psychological characteristics like risk-averseness or overreaction to crises led to a drastic fall in stock market returns in the initial outbreak. The socio-cultural behavioural aspects specific to particular societies (such as Brazil in this study) could have led to the results not conforming to the trends observed in US or India affecting decision-making in stock markets. Hence, this study highlighted that behavioural aspects of societies play a significant role in financial decisions.

6. CONCLUSIONS

Understanding the impact of a pandemic on financial markets is of concern for investors, financial market analysts, managers and policymakers alike. Financial markets are the backbones of an economy and any shock to them could rock economies, affecting the everyday lives of its people. This study complements the extant literature related to the impact of the COVID-19 pandemic on stock markets, where a substantial negative impact was observed in stock markets around the world, at the initial outbreak. It further examines whether similar implications persist when the pandemic ensues in the form of waves over more extended periods. This study

is vital to the main players of the stock markets as it increases their awareness of how investors perceive the pandemic's risk during subsequent waves compared to the initial outbreak and does not make assumptions based on the experience during the fresh outbreak of the pandemic. The fear of the disease and deaths subsides over longer periods. Furthermore, different countries respond differently to the emergence of the pandemic. This study filled the gap in the literature regarding the paucity of studies on the impact of the current COVID-19 pandemic over the longer term. The analysis suggests that stock markets respond quickly to the COVID-19 pandemic, which varies over time. It will be helpful for financial analysts to make predictions in case future waves arise and also help governments and policymakers to devise policies accordingly. It is found that some countries responded differently based on their socio-cultural beliefs which could relate to the pandemic itself and then to vaccine enforcement among populations. It has highlighted that generalizations could be drawn at the initial outset of the pandemic, however, for subsequent outbreaks that would not be appropriate. It opens a wide avenue of research to investigate the behavioral aspects of investors as factors that affect investor reactions over long-enduring pandemic periods. Including more countries in the sample list, could reveal other country-specific reasons. A lesson learnt from the COVID-19 pandemic is how sudden uncertainties affect investor behaviours and whether such prolonged conditions make investors immune to the risks of investing in stock markets.

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APPENDIX

Table 1: Variables description and data sources

Variable	Description	Source
SMR	Stock market return as the logarithmic percentage index daily change in the returns of each stock market index for US, India and Brazil separately	S&P 500 (US), S&P BSE 200 (India) and Bovespa Index (Brazil) from Yahoo Finance
DNC	Daily New Cases are the number of confirmed COVID-19 cases per day and the daily growth in new cases	JHU COVID-19 Data repository
DD	Daily Deaths are the number of confirmed COVID-19 deaths per day and the daily growth in new deaths	JHU COVID-19 Data repository
DTC	Daily count of Total Cases Confirmed is the cumulative number of confirmed cases since the beginning of the COVID-19 pandemic and the daily growth in the daily count of new cases	JHU COVID-19 Data repository

Table 2: Descriptive statistics summary of three waves panel data

	SMR	GROWTH_DTC	GROWTH_DNC	GROWTH_DD
Wave 1				
Mean	–0.00166	0.12848	0.10570	0.07009
Standard error	0.00208	0.01050	0.03612	0.02510
Median	0.00000	0.07153	0.00443	0.00000
Standard deviation	0.03456	0.17405	0.59891	0.41622
Sample variance	0.00119	0.03029	0.35869	0.17324
Range	0.29015	1.72277	6.18885	3.64632
Minimum	–0.15993	0.00000	–3.12273	–1.60944
Maximum	0.13022	1.72277	3.06611	2.03688
Count	275	275	275	275
Wave 2				
Mean	0.00096	0.00945	0.01497	0.01699
Standard Error	0.00066	0.00044	0.02059	0.02725
Median	0.00000	0.00780	0.02055	0.01766
Standard deviation	0.00892	0.00594	0.27930	0.36961
Sample variance	0.00008	0.00004	0.07801	0.13661
Range	0.06935	0.02046	1.91442	2.03934
Minimum	–0.04017	0.00100	–0.86444	–0.91501
Maximum	0.02919	0.02146	1.04998	1.12433
Count	184	184	184	184
Wave 3				
Mean	0.00174	0.00860	0.01330	0.02718
Standard error	0.00077	0.00037	0.03031	0.03545
Median	0.00000	0.00716	0.02648	–0.00764
Standard deviation	0.00896	0.00435	0.35475	0.41491
Sample variance	0.00008	0.00002	0.12585	0.17215
Range	0.06270	0.01519	2.05758	2.01445
Minimum	–0.04066	0.00166	–0.91264	–0.85743
Maximum	0.02205	0.01685	1.14494	1.15702
Count	137	137	137	137

Table 3: Correlation matrix for the three waves

		Wave 1		
	SMR	GROWTHDTC	GROWTHDNC	GROWTHDD
SMR	1.000000	–0.065675	0.093896	–0.094028
GROWTHDTC	–0.065675	1.000000	0.518824	0.124991
GROWTHDNC	0.093896	0.518824	1.000000	0.239606
GROWTHDD	–0.094028	0.124991	0.239606	1.000000
		Wave 2		
	SMR	GROWTHDTC	GROWTHDNC	GROWTHDD
SMR	1.000000	0.029978	0.013761	0.067316
GROWTHDTC	0.029978	1.000000	0.134750	0.744673
GROWTHDNC	0.013761	0.134750	1.000000	0.106087
GROWTHDD	0.067316	0.744673	0.106087	1.000000
		Wave 3		
	SMR	GROWTHDTC	GROWTHDNC	GROWTHDD
SMR	1.000000	0.011092	–0.015841	0.032001
GROWTHDTC	0.011092	1.000000	0.210622	0.172940
GROWTHDNC	–0.015841	0.210622	1.000000	0.823402
GROWTHDD	0.032001	0.172940	0.823402	1.000000

Table 4: Regression output for the three waves panel data

Wave 1				
Dependent variable: SMR				
Method: Least squares				
Included observations: 275				
Variable	**Coefficient**	**SE**	**t-statistic**	**Prob.**
C	0.001923	0.002626	0.732118	0.4647
GROWTHDTC	–0.032427	0.014107	–2.298671	0.0223
GROWTHDNC	0.012289	0.004187	2.935469	0.0036
GROWTHDD	–0.010388	0.005084	–2.043490	0.0420
R-squared	0.042141	Mean dependent var		–0.001673
Adjusted R-squared	0.031537	S.D. dependent var		0.034569
S.E. of Regression	0.034019	Akaike info criterion		–3.909349
Sum squared residual	0.313629	Schwarz criterion		–3.856741
Log likelihood	541.5355	Hannan-quinn criterion		–3.888236
F-statistic	3.974174	Durbin-watson stat		2.34404
Prob (F-statistic)	0.008528			
Wave 2				
Dependent variable: SMR				
Method: Least squares				
Included observations: 184				
Variable	**Coefficient**	**SE**	**t-statistic**	**Prob.**
C	0.000822	0.001244	0.661012	0.5094
GROWTHDTC	0.013917	0.112124	0.124121	0.9014
GROWTHDNC	–0.001477	0.003558	–0.415159	0.6785
GROWTHDD	0.002427	0.002679	0.905801	0.3663
R-squared	0.005528	Mean dependent var		0.000973
Adjusted R-squared	–0.011047	S.D. dependent var		0.008892
S.E. of Regression	0.008941	Akaike info criterion		–6.574742
Sum squared residual	0.014391	Schwarz criterion		–6.504852
Log likelihood	608.8762	Hannan-Quinn criterion		–6.546414
F-statistic	0.333520	Durbin-watson stat		2.210819
Prob (F-statistic)	0.801118			
Wave 3				
Dependent variable: SMR				
Method: Least squares				
Included observations: 135				
Variable	**Coefficient**	**SE**	**t-statistic**	**Prob.**
C	0.001321	0.001785	0.740318	0.4604
GROWTHDTC	0.041641	0.185925	0.223969	0.8231
GROWTHDNC	–0.003153	0.003942	–0.799800	0.4253
GROWTHDD	0.002860	0.003340	0.856472	0.3933
R-squared	0.006067	Mean dependent var		0.001719
Adjusted R-squared	–0.016695	S.D. dependent var		0.009048
S.E. of Regression	0.009123	Akaike info criterion		–6.526878
Sum squared residual	0.010903	Schwarz criterion		–6.440796
Log likelihood	444.5643	Hannan-Quinn criterion		–6.491897
F-statistic	0.266524	Durbin-Watson stat		2.050520
Prob (F-statistic)	0.849425			

Table 5: Descriptive statistics summary of subsequent waves in the US

Descriptive statistics US Wave 1						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	89	0.000	0.542	0.13274	0.145359	0.021
Growth in daily new cases	89	–1.177	2.079	0.11551	0.459016	0.211
Growth in daily death	89	–1.609	1.792	0.08643	0.449983	0.202
Stock market return	89	–0.128	0.090	–0.00147	0.032731	0.001
Valid N (listwise)	89					
Descriptive Statistics US Wave 2						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	60	0.006	0.21	0.01332	0.004797	0.000
Growth in daily new cases	60	–0.280	0.325	–0.00655	0.121579	0.015
Growth in daily death	60	–0.896	1.124	–0.00735	0.436088	0.190
Stock market return	60	–0.12	0.16	0.00186	0.005943	0.000
Valid N (listwise)	60					
Descriptive Statistics US Wave 3						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	60	0.006	0.017	0.01294	0.002301	0.000
Growth in daily new cases	60	–0.642	0.705	0.01500	0.208855	0.044
Growth in daily death	60	–0.685	1.053	0.03149	0.359712	0.129
Stock market return	60	–0.012	0.022	0.00211	0.006786	0.000
Valid N (listwise)	60					

Table 6: Descriptive statistics subsequent waves in India

Descriptive statistics India Wave 1						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	120	0.000	1.723	0.10132	0.182080	0.033
Growth in daily new cases	120	–3.123	3.066	0.07567	0.676233	0.457
Growth in daily death	120	–1.070	2.037	0.04506	0.396862	0.157
Stock market return	120	–0.138	0.078	–0.00164	0.025338	0.001
Valid N (listwise)	120					
Descriptive statistics India Wave 2						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	60	0.001	0.021	0.00907	0.007055	0.000
Growth in daily new cases	60	–0.191	0.302	0.05813	0.092779	0.009
Growth in daily death	60	–0.331	0.547	0.06094	0.158756	0.025
Stock market return	60	–0.040	0.020	–0.00022	0.009938	0.000
Valid N (listwise)	60					

Table 7: Descriptive statistics subsequent waves in Brazil

Descriptive statistics brazil wave 1						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	91	0.000	1.179	0.13691	0.187807	0.035
Growth in daily new cases	91	–2.197	1.956	0.10665	0.532135	0.283
Growth in daily death	91	–0.875	0.946	0.06784	0.348502	0.121
Stock market return	91	–0.160	0.130	–0.00203	0.042120	0.002
Valid n (listwise)	91					
Descriptive statistics brazil wave 2						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	61	0.002	0.011	0.00599	0.002299	0.000
Growth in daily new cases	61	–0.864	1.050	–0.00994	0.459662	0.211
Growth in daily death	61	–0.915	0.970	–0.00362	0.449259	0.202
Stock market return	61	–0.028	0.029	0.00079	0.010063	0.000
Valid n (listwise)	61					
Descriptive statistics brazil Wave 3						
	n	Minimum	Maximum	Mean	SD	Variance
Growth in daily total cases	75	0.002	0.008	0.00516	0.001778	0.000
Growth in daily new cases	75	–0.913	1.145	0.00838	0.438516	0.192
Growth in daily death	75	–0.857	1.157	0.01316	0.453821	0.206
Stock market return	75	–0.041	0.002	0.00130	0.010334	0.000
Valid n (listwise)	75					

Table 8: Summary of correlation coefficients

	Wave 1		Wave 2		Wave 3	
US	DTC	–0.198	DTC	0.963	DTC	0.861
	DNC	–0.454	DNC	–0.604	DNC	0.719
	DD	–0.296	DD	0.248	DD	0.664
India	DTC	–0.280	DTC	–0.405		
	DNC	–0.328	DNC	–0.469		
	DD	–0.342	DD	–0.357		
Brazil	DTC	0.228	DTC	0.47	DTC	0.902
	DNC	0.19	DNC	0.18	DNC	–0.10
	DD	0.15	DD	0.286	DD	0.185

Table 9: Correlation matrix for the three waves in the US

Correlation–US Wave 2	Daily total cases	Daily new cases	Daily deaths	S&P500
Daily total cases				
Pearson correlation	1	–0.565**	0.303*	0.963**
Sig. (2-tailed)		0.000	0.018	0.000
n	61	61	61	61
Daily new cases				
Pearson correlation	–0.565**	1	0.360**	–0.604**
Sig. (2-tailed)	0.000		0.004	0.000
n	61	61	61	61
Daily deaths				
Pearson correlation	0.303*	0.360**	1	0.248
Sig. (2-tailed)	0.018	0.004		0.053
n	61	61	61	61
S&P500				
Pearson correlation	0.963**	–0.604**	0.248	1
Sig. (2-tailed)	0.000	0.000	0.053	
n	61	61	61	61

**Correlation is significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

Correlation–US Wave 3	Daily total cases	Daily new cases	Daily deaths	S&P500
Daily total cases				
Pearson correlation	1	0.657**	0.701**	0.861**
Sig. (2-tailed)		0.000	0.000	0.000
n	61	61	61	61
Daily new cases				
Pearson correlation	0.657**	1	0.842**	0.719**
Sig. (2-tailed)	0.000		0.000	0.000
n	61	61	61	61
Daily deaths				
Pearson correlation	0.701**	0.842**	1	0.664**
Sig. (2-tailed)	0.000	0.000		0.000
n	61	61	61	61
S&P500				
Pearson correlation	0.861**	0.719**	0.664**	1
Sig. (2-tailed)	0.000	0.000	0.000	
n	61	61	61	61

**Correlation is significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

Table 10: Correlation matrix for the two waves in India

Correlation–India Wave 2	Daily total cases	Daily new cases	Daily deaths	S&P500
Daily total cases				
Pearson correlation	1	0.988**	0.993**	–0.405**
Sig. (2-tailed)		0.000	0.000	0.001
n	61	61	61	61
Daily new cases				
Pearson correlation	0.988**	1	0.974**	–0.469**
Sig. (2-tailed)	0.000		0.000	0.000
n	61	61	61	61
Daily deaths				
Pearson correlation	0.993**	0.974**	1	–0.357**
Sig. (2-tailed)	0.000	0.000		0.005
n	61	61	61	61
BSE200				
Pearson correlation	–0.405**	–0.469**	–0.357**	1
Sig. (2-tailed)	0.001	0.000	0.005	
n	61	61	61	61

**Correlation is significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

Table 11: Correlation matrix for the three waves in brazil

Correlation–Brazil Wave 2	Daily total cases	Daily new cases	Daily deaths	S&P500
Daily total cases				
Pearson correlation	1	0.205	0.447**	0.470**
Sig. (2-tailed)		0.110	0.000	0.000
n	62	62	62	62
Daily new cases				
Pearson Correlation	0.205	1	0.915**	0.180
Sig. (2-tailed)	0.110		0.000	0.162
n	62	62	62	62
Daily deaths				
Pearson Correlation	0.447**	0.915**	1	0.286*
Sig. (2-tailed)	0.000	0.000		0.024
n	62	62	62	62
Bovespa				
Pearson Correlation	0.470**	0.180	0.286*	1
Sig. (2-tailed)	0.000	0.162	0.024	
n	62	62	62	62

**Correlation is significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

Correlation–Brazil Wave 3	Daily total cases	Daily new cases	Daily deaths	S&P500
Daily total cases				
Pearson correlation	1	–0.129	0.165	0.902**
Sig. (2-tailed)		0.267	0.154	0.000
n	76	76	76	76
Daily new cases				
Pearson correlation	–0.129	1	0.779**	–0.100
Sig. (2-tailed)	0.267		0.000	0.391
n	76	76	76	76
Daily deaths				
Pearson correlation	0.165	0.779**	1	0.185
Sig. (2-tailed)	0.154	0.000		0.110
n	76	76	76	76
Bovespa				
Pearson correlation	0.902**	–0.100	0.185	1
Sig. (2-tailed)	0.000	0.391	0.110	
n	76	76	76	76

**Correlation is significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

Table 12: COVID-19 variables of interest in the three countries

	US	India	Brazil
Wave 1	DTC, DD*	DTC	DTC*, DD
Wave 2	DTC	DNC*	DNC
Wave 3	DTC*		DNC

*Statistically significant variables

Table 13: Regression output for the three waves in the US

US wave 1 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	0.002	0.005		0.331	0.742		
Growth in daily total cases	–0.023	0.031	–0.103	–0.749	0.456	0.595	1.680
Growth in daily new cases	0.011	0.010	0.158	1.134	0.260	0.579	1.727
Growth in daily deaths	–0.015	0.008	–0.210	–1.898	0.061	0.915	1.094

[a]Dependent Variable: Stock market return

US wave 2 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	0.004	0.002		1.573	0.121		
Growth in daily total cases	–0.140	0.170	–0.113	–0.825	0.413	0.916	1.091
Growth in daily new cases	0.008	0.010	0.172	0.847	0.400	0.421	2.378
Growth in daily deaths	0.000	0.003	0.008	0.042	0.967	0.446	2.242

[a]Dependent variable: Stock market return

US wave 3 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	0.011	0.006		1.868	0.067		
Growth in daily total cases	–0.673	0.444	–0.228	–1.518	0.135	0.757	1.321
Growth in daily new cases	0.004	0.006	0.126	0.688	0.494	0.508	1.967
Growth in daily deaths	–0.001	0.003	–0.047	–0.281	0.780	0.620	1.614

[a]Dependent variable: Stock market return

Table 14: Regression output for the two waves in India

India wave 1 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	–0.001	0.003		–0.503	0.616		
Growth in daily total cases	–0.010	0.014	–0.075	–0.737	0.462	0.794	1.259
Growth in daily new cases	0.010	0.004	0.259	2.520	0.013	0.774	1.292
Growth in daily deaths	0.000	0.006	0.003	0.034	0.973	0.968	1.033

[a]Dependent variable: Stock market return

India wave 2 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	0.000	0.002		0.196	0.845		
Growth in daily total cases	0.017	0.187	0.012	0.091	0.928	0.991	1.099
Growth in daily new cases	–0.016	0.015	–0.146	–1.046	0.300	0.897	1.115
Growth in daily deaths	0.001	0.009	0.022	0.161	0.873	0.896	1.117

[a]Dependent variable: Stock market return

Table 15: Regression output for the three waves in brazil

Brazil wave 1 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	0.006	0.006		1.074	0.286		
Growth in daily total cases	–0.062	0.029	–0.279	–2.140	0.035	0.630	1.588
Growth in daily new cases	0.019	0.011	0.244	1.779	0.079	0.568	1.761
Growth in daily deaths	–0.023	0.13	–0.191	–1.736	0.086	0.878	1.139

[a]Dependent variable: Stock market return

Brazil wave 2 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	–0.002	0.004		–0.560	0.578		
Growth in daily total cases	0.543	0.708	0.124	0.767	0.446	0.654	1.529
Growth in daily New cases	–0.007	0.008	–0.312	–0.863	0.392	0.131	7.631
Growth in daily deaths	0.007	0.007	0.335	1.011	0.316	0.156	6.409

[a]Dependent variable: Stock market return

Brazil wave 3 coefficients[a]							
Model	**Unstandardized B**	**Coefficients SE**	**Standardized coefficients beta**	**t**	**Sig.**	**Collinearity tolerance**	**Statistics VIF**
(Constant)	5.301E-5	0.004		0.012	0.990		
Growth in daily total cases	0.233	0.801	0.040	0.291	0.772	0.723	1.384
Growth in daily new cases	–0.009	0.007	–0.369	–1.217	0.228	0.149	6.718
Growth in daily deaths	0.009	0.007	0.389	1.360	0.178	0.168	5.967

[a]Dependent variable: Stock market return