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COVID-19, government interventions and emerging capital markets performance

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ABSTRACT

In this study, we explore the impact of government intervention to contain the spread of COVID-19 in emerging countries on the performance of their leading stock indices. We retrieved data on the performance of 25 international capital market indices included in the MSCI Emerging Markets Index and data about the closures, economic, and health measures imposed in each country examined. Overall, our findings show that government restrictions are associated with negative market returns, possibly due to the anticipated adverse effect to the economy. The adverse effect is more evident when closures are imposed. The market response to economic stimulus is mild but varies depending on the type of intervention imposed, much as with the health measures. Public campaigns may raise public awareness about COVID-19, but they can also increase the public's fear of the pandemic, reflected in the negative response in capital markets. The results are essential for understanding the trends and fluctuations in emerging markets during this current crisis and for preparing for crises in the future.

1. Introduction

There is substantial debate in recent literature about COVID-19′s effect on financial markets. Unlike other global crises, such as the dot.com bubble, the subprime crisis, and the European debt crisis that originated in the financial markets, the recent COVID-19-induced crisis is a true black swan event. First diagnosed in China, it has spread rapidly around the world, having unprecedented impacts on individuals, firms, sectors, and economies.

Governments have taken various steps to curb the spread of COVID-19 and its adverse effects on local economies. These measures include, *inter alia*, prohibitions on gatherings in public places, school and workplace closures, public health measures and economic measures to stabilize economies. One of the unique public datasets that have been compiled to track these measures is Oxford's COVID-19 Government Response Tracker (OxCGRT) developed by Hale et al. (2020). Tracking government intervention around the globe, it offers an opportunity to explore the impact of intervention on emerging capital markets.

Recently, both academics and practitioners have become interested in the behavior of emerging capital markets. Naturally, emerging countries differ from each other. However, their common features, such as greater systemic risk, poorer infrastructures, and less advanced healthcare systems create obstacles and real challenges to alleviating the negative effects of the COVID-19 pandemic.

We investigate the impact of government interventions on emerging capital markets for two reasons. First, despite the growing

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volume of literature about COVID-19 and financial and capital markets, previous studies have focused primarily on developed markets, with very few examining emerging markets. Second, we extend the empirical evidence about emerging markets by following the theoretical approach of Harjoto et al. (2020a, 2020b). Based on institutional theory (North, 1990, 1991, 2005), they argue that COVID-19′s impact in emerging markets may differ from that in developed markets. More specifically, institutional theory posits that an organization's structure and actions are affected by its social environment. Consequently, we can anticipate that the performance and resilience of the entire economy are also determined by the overall infrastructure, including formal and informal constraints, which are cornerstones in shaping economic growth. Given that emerging markets frequently suffer from institutional voids (Khanna and Palepu, 1997, 2011), as evidenced in the lack of financial facilities, and adequate regulations, we expect that any interventions, particularly those that further restrict the ability and ease of completing business transactions, will be associated with a negative response in emerging capital markets. This response might reflect investors' expectations about a poor future economic outlook, as well as increased uncertainty about future policy (Pastor and Veronesi., 2012).

Recently, OxCGRT has been the main data source for several studies examining government responses to crises. These studies have reviewed the impact of government responses on volatility and liquidity (Baig et al., 2020a; Zaremba et al., 2020, 2021a; Zaremba et al., 2021b; Bickley et al., 2021), herding behavior (Kizys et al., 2020) and returns (Ashraf, 2020a; Matthias et al., 2021). While these works focus on the aggregate impact of interventions using stringency indices, we delve deeper to isolate the components from each index and test the impact on returns of each component separately. Only such a detailed examination can reveal the singular information associated with each government measure, which may be absent in an aggregate form using an index. The unique conditions created by COVID-19 enable us to examine the response of emerging markets to "invasive" measures in three areas — public closures, health, and economics — that, combined, may have an impact on the performance of capital markets. The results of such an investigation may help policy makers evaluate the impact of each type of intervention.

We focus on the potential impact of the first set of interventions in the countries examined. Given that these interventions were the initial steps in managing the COVID-19 crisis, it is crucially important to understand their role and consequences, particularly as previous studies have documented the tendency of markets to overreact (Harjoto et al., 2020a, 2020b; Phan and Narayan, 2020). Thus, policy makers can use the information about the impact of these initial steps to fine-tune disaster management plans for deployment in the future.

Our study contributes to the literature in two fields. First, we add to the growing body of COVID-19 literature (e.g., Al-Awadhi et al., 2020; Albuquerque et al., 2020; Alfaro et al., 2020; Baker et al., 2020; Conlon and McGee, 2020; Conlon et al., 2020; Ding et al., 2020; Fernandes, 2020; Goodell, 2020a; Goodell and Huynh, 2020b; Goodell and Goutte, 2021a, b; Hassan et al., 2020; He et al., 2020; Ke, 2021; Kizys et al., 2020; Njindan Iyke, 2020; Onali, 2020; Ozili and Arun., 2020; Ozkan, 2021; Popkova et al., 2020; Ramelli and Wagner, 2020; Salisu et al., 2021; Shabir et al., 2021; Xiong et al., 2020; Zaremba et al., 2020) by exploring emerging capital markets during COVID-19. s, we contribute to the general literature dealing with government interventions and their effect on asset prices (e.g., Calderon and Schaeck, 2016; Fiordelisi and Ricci, 2016; Fuchs and Skrzypacz, 2015; Hryckiewicz, 2014; Jawadi et al., 2010; Kizys et al., 2016; Klomp, 2013; Pastor and Veronesi., 2012; Pennathur et al., 2014; Phan and Narayan, 2020; Philippon and Skreta, 2012), especially during crises. Using event study and multivariate regression methods, we link these two areas to our main research question: How does the stock market interpret the economic and non-economic measures that governments take as part of their attempt to contain the spread of the COVID-19 pandemic?

Previous papers on the impact of such interventions (e.g., Ashraf, 2020a; Baig et al., 2020a; Matthias et al., 2021; Zaremba et al., 2020, 2021a; Zaremba et al., 2021b) have generally taken an aggregate approach, such as examining the stringency of the interventions from Hale et al.'s (2020) Oxford database. While these indices are informative, they are constructed from a combination of different types of interventions. For example, the stringency index is a mix of several types of closure interventions (such as school closings, transportation shutdowns and stay-at-home requirements). These different interventions belong in the same grouping, but as each is defined differently, they may vary in their impact, as, indeed, our results show. It is possible that the effect of shutting down transportation is dissimilar to that of stay-at-home requirements. In fact, it is more interesting to explore which of the interventions has the strongest negative effect on emerging markets, which by nature have institutional voids. Our study has the advantage of assessing the effect of each intervention separately.

In addition, even ignoring the varying effects of specific measures taken, the widely used stringency index is constructed from two different types of interventions that could have confounding and perhaps even offsetting effects. For example, the index contains all types of closures and additional health measures. This mix may obscure the actual effect of health regulations or closures alone. Therefore, using the index might result in an *aggregation bias*.[1]

Our paper, in contrast, is unique in distinguishing each intervention, enabling us to assess its specific impact. Consequently, we hope that our paper provides a more complete mapping of the impact of government interventions that investors as well as state leaders and policy makers can use to obtain more accurate feedback about the effects of individual interventions planned.

Moreover, our event study methodology also allows us to distinguish between two different and important sets of empirical tests: pure and joint interventions. In the pure set of tests, we focus on cases in which countries imposed a single type of intervention, while in the joint set of tests, we examine the cases in which several types of interventions were made on the same day. This is the first time that

[1] The same applies to other indices, such as the Government Response Index, which is a mix of all types of closures, all types of economic measures, and all health measures combined. Similarly, the Containment and Health Index consists of all types of closures and all health measures combined. In fact, only the Economic Index is a pure economic intervention measure, but again, the impact of each economic step might be different.

a differentiation and comparison of this kind has been conducted, and it may provide insights into the possible forces and interactions between different types of interventions.

The findings can be summarized as follows. First, in general, government interventions are associated with a negative response in emerging markets, possibly due to a realization of the expected adverse effect on the future state of the local economy. Second, this negative effect is more pronounced when governments impose closures. Third, although we might expect a positive response to economic aid measures, the market response to such economic measures is mild, and varies according to the type of economic support. Finally, the response of the capital markets to health measures is generally positive but also varies depending on the type of intervention. While public campaigns seek to raise awareness about COVID-19, such efforts, by convincing the public of the severity of the disease, may increase their fears about the pandemic. Our multivariate regression results also support these findings. The negative response associated with closures is robust using different types of regression specifications. In addition, it does not weaken when adding control variables, such as economic strength, measured by GDP per capita, the severity of the pandemic, captured by the increase in the number of infected cases, or when controlling for the geographical location of the emerging markets.

The remainder of this study is organized as follows. Section 2 presents a literature review. Section 3 describes the data, our research methodology, and the measurement of the variables. Section 4 presents the main findings and discusses additional analyses and robustness tests, while the last section presents our conclusions.

2. Literature review and theoretical foundations

There is a growing stream of studies addressing the impact of the ongoing COVID-19 crisis on key aspects of developed and emerging financial markets, including their returns, liquidity, and volatility. He et al. (2020) used an event study approach to investigate the impact of COVID-19 on different Chinese industries. They reported a negative impact on industries such as transportation, mining, electricity, and heating, and a positive effect on manufacturing, information technology, education, and healthcare, which ultimately gave some balance to the economy. Ding et al. (2020) used an event study design and documented a negative response in the Chinese stock market to the lockdown of Hubei province. Goodell and Huynh (2020b) also conducted an event study, according to Kenneth French's definition, of 49 U.S. industry portfolios. They reported that when the first domestic case was confirmed in California (February 26, 2020), the 15 out of 49 industries experienced negative returns. Clark et al. (2021) also used an event study to focus entirely on hospitality firms during the COVID-19 period (February 21, 2020 to March 31, 2020). Using a dataset of 154 hospitality companies from 23 countries, they documented negative abnormal returns of restaurants, casinos, and hotels. Restricting their sample to U.S. and Japanese firms yielded negative cumulative abnormal returns of −29.67 % and −10.68 %, respectively.

The findings of Topcu and Gulal (2020), focusing on emerging stock markets demonstrated that the official response time and the size of governments' stimulus packages were meaningful in offsetting the negative impact of the COVID-19 pandemic. Using the government stringency indices from the Oxford database, Ashraf (2020a) explored their impact on the performance of 77 emerging and developed countries. He reported that health and economic support packages resulted largely in positive market returns, but that closures had a direct negative effect on stock market returns due to their adverse effect on economic activity. In line with Ashraf (2020a); Zaremba et al. (2021b) used the general OxCGRT stringency indices to examine the impact of government interventions on the volatility of sovereign bonds. They showed that government interventions substantially reduced local sovereign bond volatility. This effect was driven mainly by economic support policies; the containment and closure regulations and health system interventions played no major role.

We extend these examinations by trying to determine the effect of each individual type of intervention: closures, economic, and health measures. While other studies do exist in this area, they are generally focused on a single event or very few interventions, or they use a broad or aggregate definition of government interventions, such as the Oxford stringency indices (e.g., Ashraf, 2020a; Baig et al., 2020a; Matthias et al., 2021; Zaremba et al., 2020, 2021a; Zaremba et al., 2021b). The use of such indices might obscure the actual impact of each intervention, leading to an aggregate bias.

In this respect, recently, Harjoto et al. (2020a, 2020b) employed the event study approach to examine the WHO's declaration of COVID-19 as a pandemic and the U.S. Federal Reserve's announcement of a stimulus to assist firms. Their work suggests several interesting asymmetries that underscore how the responses of emerging markets may differ considerably from those of developed ones. First, the impact of the WHO's declaration was negative for emerging capital markets and positive for developed ones. Second, emerging markets responded negatively to both economic stimulus announcements, whereas developed countries responded positively. Lastly, they report that in the United States, the stimulus announcement was followed by a negative response for small cap firms and a positive response for large cap firms. They concluded that COVID-19 has had a much more severe impact on emerging markets than on developed ones. Harjoto et al. (2020a, 2020b) explain these findings using institutional theory (North, 1990, 1991) and institutional voids research (Khanna and Palepu, 1997, 2011), which posit that the damage caused by a disaster is a function of the economic and social conditions that shape a country's resilience to market crises. Consequently, they maintain factors such as underdeveloped monetary and fiscal policies and infrastructure, greater information asymmetry, and less developed healthcare systems in emerging economies exacerbated the severity of the adverse effects of COVID-19. In a subsequent study, Harjoto et al. (2020a, 2020b) confirmed the differences between emerging and developed markets in their response to COVID-19 infections and mortality rates and explain this difference using institutional theory. In fact, these two recent studies are closely related to our work, both in their focus on emerging markets, and, more importantly, with respect to the potential forces underlying the adverse shockwaves in emerging economies.

A careful mapping of the literature suggests several theoretical explanations for the impact of government interventions, such as school and working place closures, on the financial capital markets as a whole, and particularly for emerging economies. According to

the supply of stock market returns hypothesis, market performance is a function of the economic growth in each country (Diermier et al., 1984; Harjoto et al., 2020a, 2020b; Ibbotson and Chen, 2003). Any type of intervention is expected to increase economic uncertainty and interrupt economic activity. Hence, these interventions may have an adverse effect on the real economy, reflected in a negative response from equity markets.

Eichenbaum et al. (2020) argue that the appearance of such measures might harm elements of the business cycle, such as supply chains, production, and consumption. The closing of workplaces or schools disrupts the ability to conduct business transactions. These disruptions are particularly damaging in emerging markets lacking advanced infrastructures and suffering from institutional voids (Khanna and Palepu, 1997, 2011; North, 1990, 1991, 2005).

Measures such as closing schools and workplaces, quarantine and stay-at-home requirements, result in employees missing work. Therefore, these measures might signal not only declines in real economic activity, but also a drop in future household cash flows and future economic growth. Given the inadequate infrastructures in emerging equity markets that impair their ability to sustain themselves, investors may demand an increased premium for buying the risky assets of these countries (Chen et al., 2011; Epstein et al., 2009)

In addition, emerging countries are characterized by increased information asymmetry (Khanna et al., 2005), which government interventions may exacerbate. In this context, Pastor and Veronesi. (2012) argue that any economic distortion might lead to additional uncertainty. According to their theoretical model, policy changes are broadly defined as government actions that change the economic environment. They create two types of uncertainty: policy uncertainty, meaning the uncertain impact of a government policy on the profitability of firms, and political uncertainty, meaning the uncertainty about whether the current government policy will change. Finally, several studies have documented that financial constraints and frictions amplify the adverse effect of uncertainty on the real economy (e.g., Alfaro et al., 2018; Caldara et al., 2016; Christiano et al., 2014; Popp and Zhang, 2016). According to Albulescu (2021), the uncertainty associated with COVID-19 amplifies volatility, while Zhang, Hu, and Ji (2020) argue that policy responses might even create further uncertainties in global financial markets. Based on this line of reasoning and the theoretical aspects discussed above, we expect closures to have a negative effect on the performance of emerging capital markets.

In contrast, we might expect economic stimulus programs to have a positive effect on these markets, because these actions are supposed to boost the economy. However, as discussed above, Pastor and Veronesi. (2012) suggest that any economic distortion could produce additional uncertainty. Thus, investors might revise their expectations to include future distortions. In line with the Ricardian equivalence theory (Cochrane, 2009; Seater, 1993), any attempt to stimulate an economy today by increasing debt-financed government spending will not be effective. Indeed, investors might respond negatively because they know that such support will eventually have to be repaid through future taxation. Moreover, such types of economic support might be interpreted as official acknowledgement of a poor economic outlook. For example, Harjoto et al. (2020a, 2020b) document a consistent negative response in emerging economies to two announcements about government economic support for firms. Therefore, we posit that economic support has a negative relationship with emerging market returns.

Health interventions are crucial in emerging markets where healthcare systems are less developed (Harjoto et al., 2020a, 2020b, Hsiang et al., 2020). Therefore, these health interventions can be interpreted as a positive signal regarding fighting COVID-19, thereby improving investors' confidence and economic activity. Testing policies or contact tracing, for example, can help identify new cases and prevent the disease from spreading, indirectly allowing the economy and labor force to recover. Thus, we expect a positive relationship between health measures and emerging market returns.

To summarize, we posit that any disruption to conventional economic activity created by government interventions will be associated with a negative response. This expectation is based on three factors: a) the disruption to economic activity, which is the foundation of the supply of stock returns hypothesis; b) the unique features and voids that, according to the institutional theory (North, 1990, 1991), shape emerging countries and create real obstacles for emerging economies attempting to return to business as usual or adjust to the new business conditions; and, finally, c) the theoretical model of Pastor and Veronesi. (2012), according to which market interventions create further uncertainty, and other studies, such as Zhang et al. (2020), that highlight the pivotal role of uncertainty in intensifying the adverse effect of COVID-19. Thus, we posit that in emerging markets, closures and economic interventions will be associated with a negative market response, while health interventions will be associated with a positive market response.

3. Data and methodology

Our first step in conducting the event study requires properly defining the event of interest and determining the event test window. We define the event as the first day on which a government intervention is announced publicly, i.e., reported in Hale et al.'s (2020) OxCGRT database, which we refer to as t_0. We focus on relatively short test windows due to the possible proximity of the events under scrutiny.

To balance the possible delay in the response of emerging markets due to their relatively low levels of liquidity (e.g., Khanna et al., 2005) and our desire to avoid the impact of confounding events, we also use other test windows, such as t_0, t_{-1} through t_{+1}, t_{-3} through t_{+3}, and t_0 through t_{+2}. In addition, we use the major capital market indices rather than a sample of firms from each country to address the liquidity concern. The event dates appear in Appendix A1.

3.1. Historical prices, returns and global market portfolios

The sample includes the market indices of the 25 emerging markets countries included in the MSCI Emerging Markets Index and the corresponding first set of interventions in these countries between January 1, 2020 and April 21, 2020. In line with Ashraf (2020a) we

used the end-of-day prices for each country from the investing.com website. For each country, we used the adjusted index price for dividends, stock splits, and rights offerings. Then, we computed the log daily returns of index i for day t as follows:

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

Table 1 presents a list of the countries, with the corresponding leading stock market index for each and its performance during the first four months of the COVID-19 pandemic. As the table indicates, the markets generally experienced negative returns, with March being the worst month, followed by a moderate recovery in April. These results accord with Harjoto et al.'s (2020a, 2020b) contention about the overreaction of emerging markets. The mean value of the cumulative returns across all countries during the entire period is −25.3 %.

To create a global market portfolio, we collected historical daily data for the MSCI Emerging Markets Index and MSCI ACWI from investing.com. To address potential discrepancies concerning non-trading days in each country, we used both trade-to-trade and lumped returns (Campbell et al., 2010; Maynes and Rumsey, 1993). In addition, we also employed the Scholes and Williams (1977) approach to control for potential non-synchronous trading in emerging markets.

3.2. Abnormal returns

Following He et al. (2020), we estimated abnormal returns by the residuals from the Capital Asset Pricing Model (CAPM) by Sharpe (1964):

$$R_{i,t} = \widehat{\alpha}_i + \widehat{\beta}_i R_{mt} + \varepsilon_{CAPM,i,t}\,, \tag{2}$$

where $R_{i,t}$ is the daily return of the local capital market index i on day t, R_{mt} is the global market portfolio return on day t, $\widehat{\alpha}_i$ and $\widehat{\beta}_i$ are regression estimates for the true parameters using 252 historical trading days prior to the official outbreak of COVID-19 on December 31, 2019; that is, from December 31, 2018 to December 30, 2019 (henceforth, the 2019 estimation period). Finally, $\varepsilon_{CAPM,i,t}$ is the representation for the unexpected or abnormal returns (AR) that can be attributed to the new information. Thus, these abnormal returns for index i on day t can be computed as follows:

$$AR_{i,t} = \varepsilon_{CAPM,i,t} = R_{i,t} - (\widehat{\alpha}_i + \widehat{\beta}_i R_{mt}) \tag{3}$$

Next, we aggregated the abnormal returns in the test time window for each index to obtain the cumulative abnormal returns (CAR). Then, we computed the average abnormal returns (AAR) and the cumulative average abnormal returns (CAAR) across all emerging market indices. Finally, we used the Cross-Sectional Standard Deviation *t*-test with both the average abnormal returns and the cumulative average abnormal returns. The test statistics for the average abnormal returns on day t in the event time are given in Eqs. (4) – (5):

$$t_{AAR} = \frac{AAR_t}{\widehat{\sigma}_{AAR_t}/\sqrt{N}}\,, \tag{4}$$

where,

$$\widehat{\sigma}^2{}_{AAR_t} = \frac{1}{N-1}\sum_{i=1}^{N}\left(AR_{i,t} - \frac{1}{N}\sum_{i=1}^{N} AR_{i,t}\right)^2. \tag{5}$$

Similarly, we computed the t-statistics for the cumulative average abnormal returns in the period T_1, T_2, where T_1, T_2 is the time window spanning from T_1 to T_2. The test statistics are given in Eqs. (6) – (7):

$$t_{CAAR} = \frac{CAAR_{T1,T2}}{\widehat{\sigma}_{CAAR_{T1,T2}}/\sqrt{N}} \tag{6}$$

and $\widehat{\sigma}^2{}_{CAAR_{T1,T2}}$ is estimated as follows:

$$\widehat{\sigma}^2{}_{CAAR_{T1,T2}} = \frac{1}{N-1}\sum_{i=1}^{N}\left(CAR_{i,T1,T2} - \frac{1}{N}\sum_{i=1}^{N} CAR_{i,T1,T2}\right)^2 \tag{7}$$

3.3. Non-synchronous trading

According to Brown and Warner (1985), the use of the event study methodology is far from flawless. Several potential problems could arise, which might create biased estimates of regression coefficients in the market model. One such problem, which is relevant to the use of emerging capital markets, is non-synchronous trading.[2] Scholes and Williams (1977) suggested that instead of using a single

[2] We would like to thank an anonymous referee for highlighting this important point.

Table 1
Descriptive Statistics for the Indices in Each Country.

Country	Leading Index	Jan	Feb	March	Apr	Total
Argentina	S&P Merval	−4.4%	−15.4%	−31.5%	27.1 %	−29.5%
Brazil	Bovespa	−7.7%	−12.3%	−39.8%	4.6 %	−49.0%
Chile	S&P CLX IPSA (SPIPSA)	−7.8%	−11.8%	−19.2%	16.9 %	−23.1%
Colombia	COLCAP	−6.2%	−7.5%	−37.0%	4.2 %	−43.0%
Mexico	S&P/BMV IPC	1.5 %	−10.0%	−30.8%	3.6 %	−34.6%
Peru	S&P Lima General	−5.6%	−9.8%	−20.3%	3.9 %	−29.5%
Czech Rep.	PX	−4.1%	−10.3%	−24.7%	10.7 %	−28.3%
Egypt	EGX30	1.4%	−10.8%	−22.4%	9.9 %	−22.8%
Greece	Athens General Composite	−1.7%	−21.4%	−22.5%	11.8 %	−33.0%
Hungary	BUX	−9.1%	−5.4%	−22.0%	17.4 %	−21.3%
Poland	WIG20	−5.8%	−15.5%	−18.8%	8.5 %	−29.8%
Qatar	QE	−0.1%	−11.7%	−10.9%	6.1 %	−16.6%
Russia	MOEX	−2.0%	−13.5%	−23.2%	11.4 %	−27.5%
Saudi Arabia	MSCI TaDaWwul 30	−3.2%	−11.8%	−11.4%	9.8 %	−17.0%
South Africa	South Africa Top 40	−8.4%	−12.3%	−22.0%	9.6 %	−31.3%
Turkey	BIST 100 Turkey	3.2 %	−14.7%	−20.2%	6.8 %	−25.0%
UAE	ADX General	1.3 %	−7.6%	−21.6%	13.3 %	−16.9%
China	Shanghai Composite (SSEC)	−10.1%	9.1 %	−5.7%	4.3 %	−6.9%
India	BSE SENSEX India	−2.3%	−7.2%	−25.9%	14.8 %	−22.9%
Indonesia	JKSE	−3.8%	−12.6%	−26.8%	13.9 %	−29.9%
Malaysia	FTSI Malaysia KLSI	−5.0%	−5.9%	−11.0%	4.6 %	−16.7%
Pakistan	KARACHI	2.1 %	−8.6%	−28.7%	20.9 %	−19.5%
Philippines	PSEI Philippines composite	−8.1%	−5.7%	−21.5%	8.0 %	−25.9%
Taiwan	TWII	−5.5%	−1.3%	−14.2%	15.1 %	−7.9%
Thailand	SET	−8.1%	−12.3%	−19.2%	16.6 %	−24.0%
Average		−4.0%	−9.9%	−22.0%	11.0 %	−25.3%
Std. Dev		3.8 %	5.6 %	7.8 %	5.8 %	9.3 %
Min		−10.1%	−21.4%	−39.8%	3.6 %	−49.0%
Max		3.2 %	9.1 %	−5.7%	27.1 %	−6.9%
	MSCI Emerging Markets	−5.0%	−5.3%	−15.6%	9.0 %	−17.3%
	MSCI - ACWI	−1.0%	−8.2%	−13.7%	10.6 %	−13.3%

Note: The table lists the countries in the sample, their corresponding leading local capital market index, and their returns for each of the months under scrutiny (January, February, March and April). The last two lines report the statistics for the proxies for the global market portfolio.

beta estimate, a weighted beta could be constructed by using the lead, the lag, and the synchronous market returns, resulting in three beta coefficients. More specifically, they proposed estimating beta as follows:

$$\widehat{\beta}_i^{'} = (\widehat{\beta}_i^{-} + \widehat{\beta}_i + \widehat{\beta}_i^{+})/(1 + 2\widehat{\rho}_m) \tag{8}$$

where the $\widehat{\beta}_i^{-}$ and the $\widehat{\beta}_i^{+}$ in the equation estimate the lag and lead series of market returns versus the single country stock index, respectively, and $\widehat{\rho}_m$ is the first order autocorrelation coefficient of the market portfolio's returns. Then, the intercept alpha is estimated as follows:

$$\widehat{\alpha}_i^{'} = \overline{R}_i - \widehat{\beta}_i^{'} \bullet \overline{\mathrm{R}}_{\mathrm{m}}, \tag{9}$$

where $\overline{R}_i$ is the average return of a given country equity index over the entire estimation period, $\widehat{\beta}_i^{'}$ is the estimated lag-lead beta from the previous step, and $\overline{R}_m$ is the average return of the market portfolio proxy over the entire estimation period.

3.4. Government interventions

Following recent studies (Ashraf, 2020a; Baig et al., 2020a; Kizys et al., 2020; Topcu and Gulal, 2020; Zaremba et al., 2020, 2021a), we used Hale et al.'s (2020) OxCGRT database to identify the governments' responses. The database distinguishes between three types of government interventions: closures, economic and health policies. Table 2 lists the ID and description of each intervention.[3] Overall, the database tracks eight closure measures, two economic measures, and three health measures. Table 3 presents the prevalence of government interventions. In some cases, several countries did not impose a particular intervention. In other cases, two or more interventions were announced on the same day, while in other cases, only a single intervention was imposed with no other kinds of intervention. Accordingly, we divided our tests into *Sole* and *Joint* interventions.

[3] More detailed information can be found on the OxCGRT database website at: https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker.

Table 2
Events Codes and Description.

10 **Closure policies**	
ID	**Description of the Intervention Announcement**
C1	Closing of schools and universities
C2	Closing of workplaces
C3	Cancelling public events
C4	Restrictions on private gatherings
C5	Closing of public transport
C6	Stay-at-home requirements
C7	Restrictions on internal movement between cities/regions
C8	Restrictions on international travel
Economic policies	
E1	Income support – The government provides direct cash payments to people/ households who lose their jobs or cannot work.
E2	Debt/contract relief – The government freezes financial obligations for households (e.g., Stopping loan repayments, preventing utilities from being cut off or banning evictions).
Health system policies	
H1	Presence of public information campaigns
H2	Government policy on who has access to testing for current infection
H3	Government policy on contact tracing after a positive diagnosis.

Note: Table 2 lists the types of intervention announcements under investigation and their description. C, E, and H stand for closure, economic, and health interventions, respectively. Overall, there are eight types of closure interventions (C_1 through C_8), two types of economic interventions (E_1 and E_2), and three types of health interventions (H_1, H_2, and H_3). Detailed information can be found on the Oxford COVID-19 Government Response Tracker (OxCGRT) database by Hale et al. (2020): https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker. Data retrieved on 17 May 2020.

Table 3
Events' Mapping.

Event	Sole	Joint	None	Countries in which the event was solely announced
C_1	16	9	0	Argentina, Chile, Colombia, Mexico, Egypt, Greece, Qatar, Saudi Arabia, South Africa, India, Indonesia, Malaysia, Pakistan, Philippines, Taiwan, Thailand.
C_2	8	16	1	Colombia, Mexico, Czech Rep., Egypt, Greece, Poland, Russia, Thailand.
C_3	12	13	0	Egypt, Greece, Poland, Qatar, Saudi Arabia, United Arab Emirates, India, Indonesia, Malaysia, Philippines, Taiwan, Thailand.
C_4	8	15	2	Brazil, Czech Rep, Qatar, United Arab Emirates, India, Indonesia, Malaysia, Thailand.
C_5	9	12	4	Brazil, Poland, Qatar, Russia, Saudi Arabia, Turkey, United Arab Emirates, Indonesia, Thailand.
C_6	8	16	1	Czech Rep., Greece, Hungary, Saudi Arabia, Turkey, United Arab Emirates, Indonesia, Thailand.
C_7	10	14	1	Argentina, Peru, Czech Rep., Greece, Saudi Arabia, South Africa, Turkey, United Arab Emirates, Indonesia, Thailand.
C_8	16	9	0	Chile, Czech Rep., Hungary, Poland, Qatar, Russia, Saudi Arabia, South Africa, Turkey, United Arab Emirates, China, Indonesia, Malaysia, Pakistan, Philippines, Taiwan.
H_1	17	8	0	Argentina, Brazil, Chile, Colombia, Peru, Czech Rep., Greece, Poland, Qatar, Saudi Arabia, South Africa, Turkey, United Arab Emirates, China, Indonesia, Pakistan, Philippines.
H_2	17	8	0	Brazil, Chile, Colombia, Mexico, Peru, Czech Rep. Egypt, Greece, Poland, Qatar, Russia, Saudi Arabia, United Arab Emirates, Indonesia, Pakistan, Philippines, Thailand.
H_3	12	10	3	Chile, Colombia, Czech Rep., Egypt, Hungary, Qatar, Saudi Arabia, United Arab Emirates, Malaysia, Philippines, Taiwan, Thailand.
E_1	14	5	6	Brazil, Chile, Colombia, Czech Rep., Hungary, Poland, Qatar, Saudi Arabia, South Africa, Turkey, Pakistan, Philippines, Taiwan, Thailand.
E_2	16	2	7	Argentina, Chile, Colombia, Peru, Czech Rep., Greece, Hungary, Poland, Russia, Saudi Arabia, Turkey, United Arab Emirates, India, Pakistan, Philippines, Thailand.

Note: The table details the prevalence of "Sole" versus "Joint" types of interventions. "Sole" refers to an event in which only one kind of intervention was announced on a certain date, while "Joint" represents several interventions. Each column reports the number of countries in the final sample. "None" is the number of countries that did not use the particular intervention.

4. Empirical findings

As described earlier, several countries took more than a single step on a given day in their attempts to curb the adverse effects of the COVID-19 pandemic. For example, as Appendix A1 indicates, while the H_1 intervention in Argentina was the only one imposed on the public on January 23, 2020 ("sole intervention"), health steps H_2 and H_3 were announced together ("joint intervention") on March 4, 2020. Table 3 presents the prevalence of such sole and joint interventions. Accordingly, we conducted two sets of event tests to differentiate between the impact of a single versus several interventions on the capital market's performance. The first set of studies limited the sample to governments that announced a single intervention, with no additional measures. The second set of tests referred to a group of interventions imposed jointly. Table 4 presents the basic results using the market model and 2019 as the estimation

Table 4
AAR and CAAR for Government Interventions (Market model – *2019* Estimation Period).

11 Panel A: Closure Interventions									
12 C1 School closures									
Joint					Sole				
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−4.78%	−8.20%	−5.76%	−13.28%	Emerging	−3.69%	−6.92%	−4.03%	−10.56%
	(-4.88)	(-4.90)	(-4.29)	(-5.73)		(-3.37)	(-3.00)	(-2.75)	(-3.84)
ACWI	−4.07%	−7.60%	−6.16%	−12.79%	ACWI	−2.90%	−6.01%	−4.55%	−9.63%
	(-4.34)	(-4.51)	(-4.29)	(-5.21)		(-2.93)	(-2.63)	(-2.64)	(-3.28)
C2 Workplace closures									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.72%	−5.41%	−5.00%	−13.22%	Emerging	−1.46%	−6.13%	−6.50%	−14.15%
	(-1.57)	(-3.21)	(-3.35)	(-5.50)		(-1.03)	(-2.43)	(-2.08)	(-2.97)
ACWI	−1.48%	−5.47%	−5.16%	−12.91%	ACWI	−1.58%	−6.31%	−6.12%	−13.24%
	(-1.59)	(-3.28)	(-3.50)	(-5.38)		(-1.35)	(-2.80)	(-2.13)	(-2.93)
C3_Cancellation of public events									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−3.05%	−6.82%	−5.50%	−12.96%	Emerging	−0.36%	−2.69%	−2.82%	−5.51%
	(-3.06)	(-3.49)	(-4.04)	(-5.01)		(-0.59)	(-1.14)	(-1.88)	(-1.77)
ACWI	−2.63%	−6.37%	−5.28%	−12.25%	ACWI	−0.03%	−1.71%	−2.23%	−4.14%
	(-2.93)	(-3.35)	(-3.85)	(-4.55)		(-0.06)	(-0.74)	(-1.53)	(-1.30)
C4_Restrictions on gatherings									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−3.18%	−6.43%	−4.94%	−12.48%	Emerging	−3.48%	−8.65%	−3.81%	−12.82%
	(-2.85)	(-2.93)	(-3.47)	(-4.52)		(-1.85)	(-3.01)	(-3.18)	(-2.42)
ACWI	−2.68%	−5.91%	−5.08%	−11.96%	ACWI	−2.98%	−8.13%	−3.77%	−12.40%
	(-2.71)	(-2.75)	(-3.62)	(-4.31)		(-1.57)	(-2.95)	(-3.59)	(-2.39)
C5_Closing public transport									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.01%	−2.06%	−1.37%	−5.39%	Emerging	0.31 %	−0.01%	−0.57%	−0.79%
	(-0.01)	(-1.20)	(-0.88)	(-2.02)		(0.25)	(0.00)	(-0.33)	(-0.22)
ACWI	0.07 %	−2.30%	−1.57%	−5.72%	ACWI	0.25 %	−0.36%	−0.87%	−1.21%
	(0.06)	(-1.31)	(-1.04)	(-2.17)		(0.19)	(-0.18)	(-0.53)	(-0.33)
13 C6 Stay-at-home requirements									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.67%	−1.78%	−2.43%	−5.98%	Emerging	−4.26%	−6.56%	−4.70%	−9.26%
	(-0.62)	(-1.05)	(-1.48)	(-2.21)		(-3.14)	(-2.31)	(-1.86)	(-1.59)
ACWI	−0.67%	−2.03%	−2.68%	−6.26%	ACWI	−4.20%	−7.27%	−4.93%	−9.72%
	(-0.65)	(-1.19)	(-1.65)	(-2.35)		(-3.19)	(-2.75)	(-1.90)	(-1.69)
C7 Restrictions on internal movement									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.99%	−1.97%	−1.44%	−7.38%	Emerging	−2.63%	−2.41%	2.10 %	−5.51%
	(-1.72)	(-0.96)	(-0.72)	(-2.61)		(-2.12)	(-0.82)	(1.02)	(-1.21)
ACWI	−1.40%	−1.97%	−2.23%	−7.34%	ACWI	−1.42%	−2.03%	1.31 %	−5.77%
	(-1.23)	(-0.97)	(-1.09)	(-2.60)		(-1.00)	(-0.69)	(0.56)	(-1.24)
C8 International travel controls									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−2.23%	−5.02%	−4.40%	−10.34%	Emerging	−2.94%	−5.91%	−5.05%	−12.66%
	(-2.21)	(-3.52)	(-3.86)	(-4.11)		(-2.17)	(-3.55)	(-3.29)	(-3.83)
ACWI	−1.88%	−4.62%	−4.26%	−9.98%	ACWI	−2.36%	−5.36%	−4.97%	−12.26%
	(-2.07)	(-3.35)	(-3.60)	(-4.02)		(-1.96)	(-3.42)	(-3.13)	(-3.80)
Panel B: Economic Interventions									
E1 Income support									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.62 %	0.78 %	0.16 %	−1.61%	Emerging	0.43 %	1.66 %	0.36 %	1.21 %
	(1.17)	(0.73)	(0.16)	(-0.90)		(0.88)	(1.93)	(0.36)	(0.72)
ACWI	0.77 %	0.60 %	−0.05%	−2.28%	ACWI	0.68 %	1.64 %	0.18 %	0.56 %
	(1.64)	(0.54)	(-0.06)	(-1.27)		(1.48)	(2.10)	(0.20)	(0.33)
E2 Debt/contract relief									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.95%	−1.10%	−2.47%	−3.99%	Emerging	−1.39%	−1.15%	−1.55%	−3.00%
	(-1.17)	(-0.62)	(-1.14)	(-1.25)		(-1.69)	(-0.58)	(-0.76)	(-0.90)
ACWI	−1.02%	−1.50%	−3.21%	−4.48%	ACWI	−1.37%	−1.30%	−2.22%	−3.38%
	(-1.56)	(-0.86)	(-1.48)	(-1.44)		(-1.94)	(-0.67)	(-1.10)	(-1.05)
14 Panel C: Health Interventions									
15 H1_Public information campaigns									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.69%	−3.04%	−1.30%	−3.52%	Emerging	−0.92%	−3.95%	−1.59%	−3.82%
	(-1.02)	(-2.06)	(-1.81)	(-2.74)		(-1.11)	(-2.73)	(-1.94)	(-2.44)

(*continued on next page*)

Table 4 (*continued*)

11 Panel A: Closure Interventions								
12 C1 School closures								
Joint					Sole			
ACWI	−0.63% (-1.09)	−3.06% (-2.26)	−1.48% (-2.07)	−3.50% (-2.93)	ACWI	−0.74% (-1.02)	−3.72% (-2.7)	−1.65% (-1.89)	−3.77% (-2.61)
H2_Testing policy								
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.01 % (0.02)	−0.15% (-0.24)	0.00 % (0.00)	−0.63% (-0.44)	Emerging	0.09 % (0.15)	−0.15% (-0.18)	0.09 % (0.1)	0.13 % (0.07)
ACWI	−0.08% (-0.18)	−0.12% (-0.21)	0.06 % (0.09)	−0.54% (-0.43)	ACWI	−0.01% (-0.01)	−0.16% (-0.22)	0.05 % (0.06)	−0.16% (-0.22)
H3_Contact tracing								
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.38 % (0.54)	−0.43% (-0.44)	−0.67% (-0.43)	−2.09% (-0.97)	Emerging	1.64 % (1.73)	1.38 % (1.27)	1.54 % (0.68)	1.64 % (0.68)
ACWI	0.24 % (0.41)	−0.34% (-0.38)	−0.23% (-0.16)	−1.36% (-0.71)	ACWI	1.23 % (1.37)	1.21 % (1.07)	2.01 % (0.97)	2.11 % (0.99)

Note: Table 4 presents the average abnormal returns and cumulative average abnormal returns resulting from the government's health policies. The left-hand side reports the results of the "Joint" types of interventions, while the right-hand side presents the results of the "Sole" type of interventions. "Sole" intervention refers to cases where only one kind of government measure was announced to the public, while "Joint" intervention refers to cases where two or more government steps were announced on the same day. Average abnormal returns and cumulative average abnormal returns are measured by the market model using an estimation period of 252 days prior to the outbreak of the COVID-19 epidemic on December 31, 2019. The t-statistics are computed according to the Cross-Sectional Standard Deviation *t*-test. Three market portfolios are considered: MSCI Emerging, which refers to The MSCI Emerging Markets Index, the MSCI ACWI Index, representing the performance of large- and mid-cap stocks across 23 developed and 26 emerging markets, and the FTSE All World Index, which is a representation of the market performance of large- and mid-capitalization stocks of companies located around the world. Since the results of the FTSE were very similar to the ACWI index, we do not report them here, but they are available upon request.

period. Specifically, **Panel A** reports the findings of the closures (i.e., C_1 through C_8), **Panel B** reports the empirical findings for the impact of the economic measures (i.e., E_1 and E_2), and **Panel C** shows the outcomes of the effect of the health responses (i.e., H_1 through H_3). The left-hand side of each table reports the joint intervention results, while the right-hand side presents the sole intervention findings.

4.1. Closure interventions

The results in Table 4 indicate that the emerging capital markets responded negatively to closures. Most of the events are associated with significantly negative results that are not limited to the event day, but are also reflected in the market response several days around the event. The results are consistent with the findings of Ashraf (2020a); Baig et al. (2020a); Ding et al. (2020); Topcu and Gulal (2020), and Zaremba et al. (2020) who documented the direct negative impact of closures on capital markets. Our findings show that the immediate response of emerging capital markets was negative, due to expectations of a forthcoming deterioration in the economic environment because of the closure restrictions. For example, school closings (C_1) at the top of Table 4, are associated with significant negative average abnormal returns. For the sole and joint events, the average abnormal returns on the event day (when the MSCI Emerging Markets Index represents the global market portfolio) are −3.69 %, (t-stat = −3.37), and −4.78 % (t-stat = −4.88), respectively. Results are essentially the same when using different definitions of the global market portfolio. A comparison between the effects of joint versus sole interventions also finds essentially similar negative impacts. However, a closer analysis reveals that in several cases, such as C1 and C3, joint interventions led to a more intense negative trend than did sole events. It is important to note that according to the OECD report,[4] in the case of school closings, the total cost of closing schools alone could amount to 69 % of the current GDP for a typical country, even in the absence of other types of closures, such as movement restrictions, stay-at-home requirements, and closures of public transportation and businesses. Our results are also consistent with Zaremba et al. (2021a), showing that liquidity declines in response to workplace and school closures. They report that this negative impact is limited to emerging economies and explain that it might stem from their difficulties in adapting to the new situation. For example, the limited technological infrastructure in such economies impedes their ability to respond to the conditions created by the pandemic.

Overall, these findings suggest that regulatory restrictions could be harmful to financial markets. The results accord with those of previous studies arguing that regulatory restrictions negatively affect financial markets (e.g., Baig et al., 2019, 2020b; Blau et al., 2014) and might have an adverse effect on long-term expectations (Zhang et al., 2020). In addition, comparing the [−1, +1] results with day zero [0] and [−3, +3] time windows reveals that the capital markets tend to respond with negative returns on the days prior to the announcement of the closures. These findings lend support to existing studies that demonstrate the possible leaking of regulatory information, prompting early market reactions (Blau et al., 2016).

[4] https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020.pdf

It is also interesting to note that workplace closings prompted the strongest response of −14.15 % in a [−3, +3] time window. This intervention could have the most severe impact given that work absenteeism directly disrupts economic activity, which supports the thinking behind the supply of stock returns hypothesis. In addition, work absenteeism intensifies the general effect of the lack of an adequate labor force, which is a problem in emerging markets. The negative response to the closures is in line with our expectations.

A deeper examination reveals that there are countries that are more sensitive to closures than others. For example, Greece is the most sensitive to workplace closures (C2), with an AR of −10.89 %, perhaps because of its negative experience during the 2011 European debt crisis. In contrast, the Czech Republic exhibits the mildest response to C2 with AR = −0.07 %. Similarly, in South America, Chile is the most sensitive to government measures C1 (AR = −13.79 %) and C8 (AR = −12.92 %), while Brazil demonstrates the strongest negative response (in absolute terms) to C4 interventions. The full results are reported in Appendix A2.

4.2. Economic interventions

The general response to the economic interventions listed in **Panel B** of Table 4 varies depending on the type of economic measure. For the E_1 intervention (direct income support), the abnormal returns around the event are positive (AAR = 0.62 %, t-stat = 1.17) for joint events and for sole events (AAR = 0.43 %, t-stat = 0.88). In contrast, for the E_2 intervention (debt contract relief), the impact is negative (AAR = −0.95 %, t-stat = −1.17) for joint events and for sole events (AAR = −1.39 %, t-stat = −1.69). However, only in a few cases are these results statistically significant. Previous studies exploring the Oxford Economic Support Index (ESI), or E_1 and E_2 separately, resulted in insignificant findings. Zaremba et al. (2020) as well Zaremba et al. (2021a), for example, showed that direct income support and debt contract relief have an insignificant impact in both developed and emerging markets. Ashraf (2020a) reported positive but insignificant returns for the ESI containing both E_1 and E_2. He explained the insignificance by noting that both of these economic interventions target individuals and households rather than firms. Similarly, Harjoto et al. (2020a, 2020b) documented a consistent and significant negative response to economic stimulus money given directly to firms rather than to individuals.

Clearly, emerging markets respond differently depending on the type of economic support provided. While the response of direct income support (E_1) is generally positive and confirms attitudes supporting economic interventions, the deferring of debt or contract relief (E_2) is generally followed by a negative response. This reaction supports the idea that people regard this step as just a deferral of liabilities that ultimately must be repaid, as the Ricardian equivalence theory postulates. This difference might also signal a preference for direct financial support, rather than the deferral of financial obligations. Using this information may help policy makers understand the differences in the impact of each economic step, allowing them to fine-tune their economic support plans to avoid or calm negative responses in financial markets.

4.3. Health measures

Finally, **Panel C** of Table 4 presents the impacts of health interventions on capital market returns in emerging countries. Examining the sole events on the right-hand side of **Panel C** reveals that the results of H_2 and H_3 support Ashraf's (2020a) findings. Although statistically insignificant, both lead to a positive response. However, the impact of public information campaigns (H_1) is generally and significantly negative. It is important to note that H_1 is the first of three steps in 21 out of 25 countries (84 %). What differentiates H_1 from other health interventions is the information shared with the public. In fact, this intervention marks the beginning of the government's campaign, which might intensify public panic and anxiety. This result is consistent with Zaremba et al. (2020), who demonstrated that information campaigns are a main driver of increased volatility.

In contrast, the positive response to health interventions, H_2 and H_3, are in line with our expectations, because they are designed to curb the spread of the epidemic. The market may regard such actions as supportive in the long run and as essential steps in emerging markets that generally suffer from weak healthcare systems (Harjoto et al., 2020a, 2020b, Hsiang et al., 2020). Testing policies (H_2) or contact tracing (H_3) can help identify new cases and prevent the spread of the disease. Doing so saves lives, allows the labor force to recover, and supports economic activity.

4.4. Multivariate regression analysis

To provide additional insights into the effect of government interventions and control for other factors that might influence the response of emerging capital markets to such steps, we also used a multivariate regression approach. Following former studies, we specified the following regression equation:

$$Y_{i,\tau_1,\tau_2} = \gamma_1 CL_i + \gamma_2 E_i + \gamma_3 \Delta inf_i + \gamma_4 AMERICA_i + \gamma_5 EUROPE_i + \gamma_6 ASIA_i + \gamma_7 GDP_{PER\,CAPITA,i} + C + \varepsilon_i, \quad (10)$$

where Y_{i,τ_1,τ_2} is the cumulative abnormal returns for country i over the event period τ_1, τ_2 [CAAR [3, +3], CAAR [−1, +1], CAAR [0, +2] and AAR [0], in the case where $\tau_1 = \tau_2 = 0$]. CL is a binary dummy variable representing the type of closure. It takes a value of 1 for a closure, and 0 otherwise. Similarly, E is a binary dummy variable representing the type of economic support.

Due to possible differences between emerging countries from different locations around the globe, we also used dummy variables representing their geographical location. We suggest that the response of the financial markets may also stem from differences in social, cultural, perceptual, and behavioral aspects in different countries (Ashraf, 2020c). Thus, we included dummy variables for each continent as control variables. AMERICA, EUROPE, and ASIA are the geographical binary dummy variable for each country's location.

Ashraf (2020c) also stated that the stock markets' negative reaction is significantly correlated, in general, with the growth in

Table 5
Regression Results – 2019 Estimation Period.

Panel A: Dependent Variable: CAAR [-3,3]								
	Joint				**Sole**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
CL	−0.0812***	−0.0428***	−0.0449***	−0.0449***	−0.0757***	−0.0465**	−0.0533***	−0.0522**
	(0.0166)	*(0.0161)*	*(0.0150)*	*(0.0149)*	(0.0222)	(0.0215)	(0.0204)	(0.0204)
E	0.0067	−0.0035	0.0022	0.0022	0.0052	0.0070	0.0116	0.0139
	(0.0241)	*(0.0221)*	*(0.0206)*	*(0.0206)*	*(0.0285)*	*(0.0266)*	*(0.0250)*	*(0.0249)*
Δinf		−0.0502***	−0.0480***	−0.0471***		−0.0470***	−0.0423***	−0.0418***
		(0.0067)	*(0.0065)*	*(0.0065)*		*(0.0095)*	*(0.0093)*	*(0.0093)*
America			−0.0737***	−0.0593***			−0.0836***	−0.0624**
			(0.0170)	*(0.0186)*			*(0.0242)*	*(0.0277)*
Europe			−0.1182***	−0.1110***			−0.1136***	−0.1023***
			(0.0176)	*(0.0180)*			*(0.0240)*	*(0.025)*
Asia			−0.0727***	−0.0552***			−0.0711***	−0.0466*
			(0.0162)	*(0.0186)*			*(0.0221)*	*(0.0271)*
GDP per Capita				0.0010*				0.0011
				(0.0005)				*(0.0007)*
C	−0.0210	0.0281**	0.0903***	0.0653***	−0.0155	0.0284	0.0879***	0.0551*
	(0.0142)	*(0.0146)*	*(0.0171)*	*(0.0217)*	*(0.0180)*	*(0.0190)*	*(0.0224)*	*(0.0308)*
Durbin-Watson stat	1.8980	1.9045	1.9785	2.0085	2.0305	1.9785	2.0257	2.0398
F-statistic	15.2355***	30.6806***	25.5589***	22.5926***	8.3762***	14.6114***	12.5809***	11.2171***
Adjusted R-squared	0.0875	0.2307	0.3316	0.3373	0.0835	0.2013	0.3002	0.3362
Panel B: Dependent Variable: CAAR [0,2]								
CL	−0.0350***	−0.0270**	−0.0274**	−0.0272**	−0.0354**	−0.0265*	−0.0325**	−0.0316**
	(0.0114)	*(0.0113)*	*(0.0110)*	(0.0109)	*(0.0134)*	*(0.0137)*	*(0.0131)*	(0.0131)
E	0.0113	0.0086	0.0115	0.0117	0.0160	0.0158	0.0184	0.0198
	(0.0165)	*(0.0162)*	*(0.0157)*	(0.0156)	*(0.0173)*	*(0.0170)*	*(0.0162)*	(0.0162)
Δinf		−0.0345***	−0.0328***	−0.0317***		−0.0280**	−0.0199*	−0.0201*
		(0.0093)	*(0.0092)*	(0.0092)		*(0.0110)*	*(0.0107)*	(0.0107)
America			−0.0165	−0.0045			−0.0485***	−0.0355*
			(0.0129)	(0.0141)			*(0.0157)*	(0.018)
Europe			−0.0625***	−0.0565***			−0.0616***	−0.0546***
			(0.0134)	(0.0136)			*(0.0156)*	(0.0163)
Asia			−0.0218*	−0.0074			−0.0177	−0.0029
			(0.0122)	(0.0140)			(0.0142)	(0.0175)
GDP per Capita				0.0008**				0.0006
				(0.0004)				(0.0005)
C	−0.0127	0.0037	0.0263**	0.0057	−0.0144	−0.0038	0.0231*	0.0034
	(0.0097)	*(0.0105)*	*(0.0127)*	*(0.0162)*	*(0.0109)*	*(0.0115)*	*(0.0139)*	*(0.0195)*
Durbin-Watson stat	1.7951	1.8012	1.7543	1.7552	1.8525	1.8337	1.8766	1.8580
F-statistic	8.1098***	10.2500***	9.3443***	8.6970***	6.9938**	6.9865***	7.0663***	6.3951***
Adjusted R-squared	0.0457	0.0855	0.1443	0.1536	0.0689	0.0998	0.1835	0.1890
Panel C: Dependent Variable: CAAR [-1,1]								
CL	−0.0379***	−0.0230**	−0.0234**	−0.0235**	−0.0292**	−0.0178	−0.0201	−0.0195
	(0.0116)	*(0.0117)*	*(0.0113)*	*(0.0112)*	*(0.0133)*	*(0.0137)*	*(0.0133)*	*(0.0133)*
E	−0.0003	0.0015	0.0048	0.0048	0.0007	0.0031	0.0060	0.0072
	(0.0169)	*(0.0164)*	*(0.0158)*	*(0.0157)*	*(0.0171)*	*(0.0168)*	*(0.0162)*	*(0.0161)*
Δinf		−0.0460***	−0.0450***	−0.0432***		−0.0306***	−0.0268**	−0.0264**
		(0.0103)	*(0.0101)*	*(0.0100)*		*(0.0115)*	*(0.0112)*	*(0.0112)*
America			−0.0320**	−0.0194			−0.0296*	−0.0178
			(0.0129)	*(0.0142)*			*(0.0156)*	*(0.0179)*
Europe			−0.0691***	−0.0628***			−0.0626***	−0.0562***
			(0.0135)	*(0.0137)*			*(0.0155)*	*(0.0161)*
Asia			−0.0319**	−0.0168			−0.0340**	−0.0203
			(0.0123)	*(0.0142)*			*(0.0141)*	*(0.0174)*
GDP per Capita				0.0008**				0.0006
				(0.0004)				*(0.0004)*
C	−0.0109	0.0064	0.0376***	0.0160	−0.0072	0.0021	0.0304***	0.0122
	(0.0099)	*(0.0104)*	*(0.0128)*	*(0.0163)*	*(0.0108)*	*(0.0112)*	*(0.0138)*	*(0.0194)*
Durbin-Watson stat	1.8497	1.9101	1.8879	1.8835	1.9581	4.6768	1.9531	1.9523
F-statistic	7.0838***	11.7202***	10.7149***	9.9327***	3.3445**	4.6768***	5.3345***	4.8468***
Adjusted R-squared	0.0394	0.0977	0.1641	0.1739	0.0281	0.0637	0.1383	0.1425
Panel D: Dependent Variable: AAR [0]								
CL	−0.0212***	−0.0168**	−0.0163**	−0.0161**	−0.0242***	−0.0225***	−0.0239***	−0.0235***
	(0.0066)	*(0.0068)*	*(0.0066)*	*(0.0066)*	*(0.0074)*	*(0.0076)*	(0.0075)	*(0.0075)*
E	−0.0001	0.0011	0.0024	0.0025	−0.0058	−0.0054	−0.0042	−0.0038
	(0.0096)	*(0.0096)*	*(0.0093)*	*(0.0093)*	*(0.0095)*	*(0.0095)*	(0.0093)	*(0.0093)*
Δinf		−0.0030**	−0.0328***	−0.0331***		−0.0113	−0.0101	−0.0011
		(0.0122)	*(0.0120)*	*(0.0119)*		*(0.0121)*	(0.0118)	*(0.0119)*

(*continued on next page*)

Table 5 (*continued*)

Panel A: Dependent Variable: CAAR [-3,3]								
	Joint				**Sole**			
America			−0.0013	0.0036			−0.0170*	−0.0131
			(0.0076)	*(0.0084)*			(0.0089)	*(0.0104)*
Europe			−0.0296***	−0.0272***			−0.0267***	−0.0247***
			(0.0079)	*(0.0081)*			(0.0088)	*(0.0093)*
Asia			−0.0053	0.0004			−0.0048	−0.0003
			(0.0072)	*(0.0084)*			(0.0081)	*(0.0101)*
GDP per Capita				0.0003				0.0002
				(0.0002)				*(0.0003)*
C	−0.0013	0.0012	0.0093	0.0014	0.0003	0.0012	0.0123	0.0065
	(0.0057)	*(0.0057)*	*(0.0073)*	*(0.0093)*	(0.*0060*)	(0.0061)	(0.0078)	(0.011)
Durbin-Watson stat	1.6642	1.6518	1.6769	1.6864	1.9087	1.8963	1.9249	1.9332
F-statistic	6.8642***	6.6722***	6.4772***	5.8262***	6.1963***	4.4171***	4.1741***	3.6453***
Adjusted R-squared	0.0380	0.0542	0.0996	0.1021	0.0603	0.0595	0.1052	0.1026

Note: The table presents Eq. (10)'s regression results. The left-hand side shows the results obtained using the abnormal returns from Joint events and the right-hand side displays the results using the abnormal returns from Sole events. Standard errors are in parentheses. Panels A, B, C, and D present the results using each of four time windows [-3,3], [0,2] [-1,1], and [0] as the dependent variable. The estimation period ends on December 31, 2019. Δinf is the change in the number of confirmed cases, CL and E are dummy variables representing closure and economic interventions, and America, Europe, and Asia are dummy variables for the geographical location of each country. Finally, GDP per CAPITA is a proxy for economic strength. The table reports the Durbin-Watson test for serial correlation as well as the F statistic and the adjusted coefficient of variation (Adjusted R-squared). ***, ** and * indicate significance at 1%, 5% and 10 %, respectively.

confirmed COVID-19 cases, but not the increase in deaths. Therefore, he measured the severity of the COVID-19 pandemic in terms of the daily increase in confirmed cases. The use of the change in the number of deaths may be problematic in that it substantially limits the sample size due to the large number of cases at the beginning of the pandemic when mortalities were still absent. We follow Ashraf (2020a, 2020b, 2020c), Zaremba et al. (2020), and Zaremba et al. (2021a), among others, and define Δinf as the log change in the number of new cases daily. We also use GDP (per capita) as our loading factor for the degree of economic strength in each country. Finally, C is the constant term and captures the omitted categories of the impact of health interventions and geographic location in the Middle East. Finally, ε_i is the regression error term.

The results of our multivariate regression described in Eq. (10) are reported in Table 5. As the table indicates, there is a clear negative effect for both closures (CL) and growth in the number of new infected cases (Δinf). These effects are not weakened when we augment our regression to include GDP and/or geographic location variables or use any different event period [CAAR (3, +3), CAAR (0, +2), and CAAR (−1, +1) and AAR (0)]. The results of these different event periods appear in **Panels A, B, C and D** of Table 5, respectively. Economic interventions are generally positively but insignificantly related to the returns, in accordance with Ashraf's results (2020a). According to our results, European emerging markets responded most severely to COVID-19. The strongest measures were implemented in developed countries such as Italy, Spain, and France, which led to increased panic and uncertainty in the nearby emerging countries. It appears that markets in emerging countries reacted in this way because they considered that the worst-case scenario was unfolding in the nearby developed countries.

4.5. Robustness tests

To verify whether our results are robust, we took an additional step. First, we repeated our examinations using the MSCI ACWI Index (e.g., Ru et al., 2020) and the FTSE All World Index (Beckers et al., 1996), in addition to the MSCI Emerging Markets Index. The overall results remained essentially the same and are available upon request.

Next, we considered the possibility that, given the unusual market conditions, using an estimation period of 252 trading days from the 2019 calendar year may risk ignoring important recent market information. Therefore, we also used an alternative estimation period that we called the "trailing estimation period." For each event, we estimated the market model regression parameters with 252 days ending seven trading days prior to each event, thereby providing proximity to the event itself. The results for the trailing estimation period are like our original findings, using 2019 as the estimation period. The full results are presented in Appendix A3 in the online appendix.

Importantly, the results of the Scholes and Williams (1977) approach in Appendix A4 remained essentially similar to our market model findings. They are consistent with previous studies, such as that by Brown and Brenner (1985), who reported that methods based on an OLS market model using standard parametric tests are well-specified under a variety of conditions. Specifically, they found that even the failure to address non-synchronous trading in the estimation of the market model's coefficients does not result in misspecification of event study methodologies using an OLS market model (see: Brown and Warner (1985), p.16, Section 5). In addition, Campbell and Wasley (1993) and Cowan and Sergeant (1996) reported that using the Scholes and Williams (1977) approach versus an OLS estimation for daily data and short event windows did not alter the event study's test specification and power.

In addition, we also used an alternative method to estimate the AAR and CAAR. We used the naïve model, according to which the abnormal returns are the simple subtraction of the returns on the benchmark index return from the returns of the index (AR = Index Return − Benchmark Index Return). We report the findings, which remained essentially the same, in Appendix A5.

Finally, to further test the robustness of our multivariate regression results and verify that they are independent of the choice of estimation period, we repeated the regressions using CAARs based on the trailing market model's parameters rather than the 2019 period. The results, which appear in Appendix A6, are essentially similar and underscore the conclusion that closures generally prompt a negative response in capital markets. Similarly, the severity of the crisis, captured by the growth in the number of confirmed cases, negatively affects emerging markets.

5. Summary and conclusions

How did capital markets in emerging countries respond to government interventions to curb the spread of COVID-19? To answer this question, we used Hale et al.'s (2020) Oxford COVID-19 Government Response Tracker to conduct several analyses. The overall results suggest that government interventions might have a harmful effect on these capital markets. These results support several theoretical viewpoints, such as the supply of stock market returns (Diermier et al., 1984; Harjoto et al., 2020a, 2020b; Ibbotson and Chen, 2003). They also underscore the fact that interventions, particularly closures, disrupt economic activity, as reflected in negative returns in financial capital markets. Most of these interventions seem to be associated with creating additional economic uncertainty (Pastor and Veronesi., 2012), which exacerbates the negative response to government measures. Another explanation for this negative response is the institutional voids (Khanna and Palepu, 1997, 2011; North, 1990, 1991, 2005) that characterize emerging markets. These voids include a set of internal conditions that hamper the ability of emerging countries to cope with market crises, particularly global pandemics such as COVID-19.

Using an event study methodology and multivariate regressions analysis, we examined three types of interventions: eight closure measures, two economic measures and three health interventions. Overall, we found that closures are associated with the most negative response compared with other types of interventions. The markets interpret closures, such as stay-at-home requirements or restrictions on gatherings as a barrier to future economic growth, which is extremely important in emerging capital markets. In addition, the market response to economic measures depends on the type of economic measure. We found a positive market response to direct income support and a negative response to debt or contract relief. This contrasting result might reflect the preference of the market for direct income support rather than a deferral of contractual obligations. Finally, emerging capital markets react negatively to public information campaigns. The markets appear to be concerned that in increasing awareness of and information about the virus, such campaigns may also increase public fear. On the other hand, these markets respond in a positive manner to testing policies or contact tracing that can help fight COVID-19. Such a response might reflect the idea that these steps not only keep people alive, but also enable the labor force to recover and support economic activity.

The information presented here may be useful for policy makers when evaluating the response of the stock market to government interventions. While event study methods are usually used at the stock level, and might be a potential limitation of this study, extending this approach to examine the impact of government measures on the level of individual stocks represents an interesting topic for possible future study. Future studies should also test the impact of government interventions on other types of assets, such as commodities and cryptocurrencies, which may reveal any hedging attempts in response to government actions.

While our study focuses on the first set of interventions employed in each emerging economy, another interesting research question is the extent and magnitude of markets' response to the second and subsequent rounds of the same types of government interventions. Future research could test whether the market response conforms to the overreaction hypothesis (De Bondt and Thaler, 1985, 1987; Harjoto et al., 2020a, 2020b; Phan and Narayan, 2020). Does the market tend to overreact to the first set of interventions during the beginning of the pandemic and then demonstrate a more balanced reaction to subsequent sets of interventions when more information is gathered? Such a study might help map the impact of government interventions throughout the COVID-19 pandemic.

CRediT authorship contribution statement

David Y. Aharon: Project administration, Conceptualization, Investigation, Data curation, Methodology, Resources, Formal analysis, Writing - original draft, Writing - original draft, Writing - review & editing. **Smadar Siev:** Conceptualization, Investigation, Data curation, Methodology, Resources, Formal analysis, Writing - original draft, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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None

Appendix A1

Argentina		Brazil		Chile		Colombia		Mexico		Peru	
H1	23jan20	H1	29jan20	H1	14mar20	H1	21jan20	C8	28feb20	H2	31jan20
H2	04mar20	H2	23jan20	C1	15mar20	H2	31jan20	H3	28feb20	H1	05mar20
H3	04mar20	C1	12mar20	C2	16mar20	C2	24feb20	C1	23mar20	C8	06mar20
C3	11mar20	C3	12mar20	C3	16mar20	C3	12mar20	C3	24mar20	H3	06mar20
C8	11mar20	C2	13mar20	C4	16mar20	C4	12mar20	C4	24mar20	C1	12mar20
C1	16mar20	C6	13mar20	C8	18mar20	C8	12mar20	C7	24mar20	C3	12mar20
C2	19mar20	C8	13mar20	C6	25mar20	C1	16mar20	H1	24mar20	C4	12mar20
C4	19mar20	C4	14mar20	C7	25mar20	E2	17mar20	C2	26mar20	C7	14mar20
C6	19mar20	C7	17mar20	H2	26mar20	C5	25mar20	C5	30mar20	C5	15mar20
C7	20mar20	E2	17mar20	E2	27mar20	C6	25mar20	C6	30mar20	C6	15mar20
C5	23mar20	C5	19mar20	H3	30mar20	C7	25mar20	H2	06apr20	C2	16mar20
E1	23mar20	E1	02apr20	E1	02apr20	H3	26mar20	E1	NA	E1	16mar20
E2	25mar20	H3	NA	C5	NA	E1	07apr20	E2	NA	E2	18mar20
Czech Rep.		**Egypt**		**Greece**		**Hungary**		**Poland**		**Qatar**	
H1	24jan20	H2	25jan20	H1	25feb20	H3	28jan20	H1	23jan20	C8	24jan20
C8	27jan20	H3	14feb20	C3	29feb20	H1	28feb20	C8	09mar20	H1	30jan20
H3	01mar20	C1	15mar20	C1	05mar20	H2	28feb20	C3	10mar20	H2	27feb20
H2	09mar20	C2	16mar20	H2	08apr20	C8	09mar20	C1	12mar20	H3	08mar20
C4	10mar20	C5	19mar20	C2	12mar20	C1	11mar20	C7	12mar20	C1	10mar20
C1	11mar20	C8	19mar20	C5	14mar20	C3	11mar20	C2	14mar20	C3	12mar20
C3	11mar20	C3	21mar20	C8	14mar20	C4	11mar20	E1	18mar20	C5	15mar20
E2	12mar20	C4	24mar20	C4	18mar20	C7	11mar20	H2	22mar20	C2	17mar20
C2	13mar20	C6	24mar20	E1	18mar20	C6	12mar20	E2	25mar20	C6	17mar20
C6	15mar20	C7	24mar20	C7	21mar20	C2	16mar20	C4	31mar20	C7	17mar20
C7	16mar20	H1	24mar20	C6	23mar20	C5	16mar20	C6	31mar20	C4	22mar20
E1	31mar20	E1	NA	E2	25mar20	E2	18mar20	C5	09apr20	E1	28mar20
C5	NA	E2	NA	H3	NA	E1	16apr20	H3	NA	E2	NA
Russia		**Saudi Arabia**		**South Africa**		**Turkey**		**UAE**		**China**	
C8	30jan20	H1	30jan20	C8	23jan20	H2	14jan20	C8	23jan20	H2	01jan20
H2	31jan20	H3	01feb20	H1	05mar20	H3	14jan20	H3	01feb20	H3	01jan20
H3	05mar20	H2	05mar20	H2	07mar20	C8	24jan20	C1	01mar20	H1	05jan20
C6	05mar20	C7	08mar20	H3	07mar20	H1	07feb20	C2	01mar20	C3	22jan20
C7	05mar20	C1	09mar20	C7	15mar20	C6	09mar20	H2	10mar20	C4	22jan20
C3	10mar20	C3	13mar20	C3	16mar20	C1	16mar20	H1	11mar20	C5	23jan20
C4	10mar20	C8	15mar20	C4	16mar20	C2	16mar20	C6	13mar20	C6	23jan20
C1	16mar20	C2	16mar20	C1	18mar20	C3	16mar20	C3	18mar20	C7	23jan20
H1	16mar20	C4	16mar20	C2	26mar20	C7	18mar20	E2	21mar20	C1	26jan20
C2	17mar20	C5	21mar20	C5	26mar20	C5	24mar20	C7	23mar20	C2	26jan20
C5	30mar20	C6	23mar20	C6	26mar20	E1	07apr20	C5	26mar20	C8	25feb20
E2	01apr20	E1	03apr20	E1	21apr20	E2	12apr20	C4	27mar20	E1	NA
E1	NA	E2	11apr20	E2	NA	C4	NA	E1	NA	E2	NA
India		**Indonesia**		**Malaysia**		**Pakistan**		**Philippines**		**Taiwan**	**Thailand**
H1	25jan20	H1	03jan20	H1	16jan20	C8	31jan20	H1	24jan20	H1	02jan20	H2	02mar20
H2	25jan20	C8	18jan20	H2	16jan20	H1	12feb20	C8	31jan20	H2	20jan20	H3	03mar20
C6	26jan20	C1	03feb20	H3	24jan20	H2	25feb20	C3	07feb20	H3	21jan20	C8	06mar20
C8	26jan20	H2	17feb20	C8	30jan20	C1	27feb20	H2	11feb20	C8	23jan20	H1	06mar20
H3	26jan20	C3	03mar20	C3	07mar20	C3	13mar20	C1	10mar20	C1	02feb20	C3	10mar20
E2	01mar20	C2	15mar20	C4	12mar20	C4	13mar20	H3	13mar20	C3	05mar20	C1	15mar20
C1	04mar20	H3	15mar20	C1	14mar20	C2	23mar20	C2	15mar20	E1	21apr20	C4	16mar20
C3	05mar20	C5	23mar20	C2	18mar20	C5	23mar20	C4	15mar20	C2	NA	C2	17mar20
C2	16mar20	C7	29mar20	C6	18mar20	C6	23mar20	C5	15mar20	C4	NA	C6	21mar20
C7	16mar20	C4	07apr20	C7	18mar20	H3	24jan20	C6	15mar20	C5	NA	C7	25mar20
C4	19mar20	C6	10apr20	E1	06apr20	C7	24mar20	C7	15mar20	E2	NA	E2	01apr20
C5	20mar20	E1	NA	E2	06apr20	E1	09apr20	E2	06apr20	C7	NA	E1	02apr20
E1	20mar20	E2	NA	C5	NA	E2	16apr20	E1	13apr20	C6	NA	C5	03apr20

Note: Appendix A reports the government interventions in each country chronologically. C, E, and H stand for closure, economic, and health interventions, respectively. The rest of the notations are as in Table 2.

Appendix A2

The Most and Least Affected Countries

	Most affected		Least affected	
Event	Country	AR	Country	AR

(*continued on next page*)

(*continued*)

	Most affected		Least affected	
C1	Chile	−13.79%	Philippines	−0.16%
C2	Greece	−10.89%	Czech Republic	−0.07%
C3	Malaysia	−4.89%	India	0.10 %
C4	Brazil	−16.04%	United Arab Emirates	0.04 %
C5	Indonesia	−7.64%	Thailand	−0.02%
C6	Czech Republic	−10.29%	Indonesia	−0.03%
C7	Poland	−14.28%	Argentina	0.14 %
C8	Chile	−12.92%	Qatar	0.05 %

Note: Appendix A2 reports the most and least impacted emerging capital markets with respect to closure interventions. The first column refers to the type of closure. The reported values are the abnormal returns (AR) on the announcement day of each intervention using the market model.

Appendix A3

AAR and CAAR for Government Interventions (Market model – Trailing Estimation Period)

Panel A: Closure Interventions									
C1 School closures									
Joint					Sole				
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−4.62%	−7.81%	−5.46%	−12.46%	Emerging	−3.60%	−6.67%	−3.83%	−10.03%
	(-4.72)	(-4.76)	(-4.22)	(-5.60)		(-3.31)	(-2.93)	(-2.76)	(-3.81)
ACWI	−3.66%	−6.78%	−5.74%	−11.39%	ACWI	−2.77%	−5.49%	−4.27%	−8.77%
	(-3.99)	(-4.10)	(-4.13)	(-4.70)		(-2.89)	(-2.41)	(-2.53)	(-2.99)
C2 _Workplace closures									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.50%	−4.84%	−4.43%	−12.03%	Emerging	−1.21%	−5.33%	−5.68%	−12.49%
	(-1.38)	(-2.88)	(-3.13)	(-5.20)		(-0.87)	(-2.11)	(-1.91)	(-2.69)
ACWI	−0.77%	−4.34%	−4.51%	−10.60%	ACWI	−0.84%	−4.82%	−4.64%	−9.54%
	(-0.86)	(-2.73)	(-3.14)	(-4.55)		(-0.67)	(-2.13)	(-1.75)	(-2.12)
C3 _Cancellation of public events									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−3.00%	−6.63%	−5.32%	−12.50%	Emerging	−0.30%	−2.54%	−2.69%	−5.24%
	(-3.05)	(-3.47)	(-4.03)	(-5.04)		(-0.54)	(-1.10)	(-1.90)	(-1.76)
ACWI	−2.40%	−5.64%	−4.85%	−11.02%	ACWI	−0.12%	−1.26%	−1.93%	−3.48%
	(-2.76)	(-3.08)	(-3.63)	(-4.33)		(-0.19)	(-0.60)	(-1.45)	(-1.21)
C4 _Restrictions on gatherings									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−3.00%	−5.82%	−4.49%	−11.33%	Emerging	−3.36%	−7.86%	−3.20%	−11.44%
	(-2.66)	(-2.66)	(-3.18)	(-4.19)		(-1.74)	(-2.74)	(-2.92)	(-2.20)
ACWI	−2.28%	−4.95%	−4.58%	−10.48%	ACWI	−2.84%	−7.17%	−3.20%	−11.05%
	(-2.30)	(-2.28)	(-3.31)	(-3.85)		(-1.46)	(-2.47)	(-3.04)	(-2.16)
C5 Closing public transport									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.20%	−1.55%	−0.94%	−4.51%	Emerging	0.16 %	0.42 %	−0.10%	−0.13%
	(-0.19)	(-0.93)	(-0.65)	(-1.77)		(0.13)	(0.24)	(-0.05)	(-0.04)
ACWI	0.09 %	−1.55%	−1.38%	−4.51%	ACWI	−0.28%	−0.42%	−0.97%	−1.28%
	(0.09)	(-0.94)	(-0.98)	(-1.82)		(-0.24)	(-0.22)	(-0.57)	(-0.34)
C6 Stay-at-home requirements									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.62%	−1.26%	−2.10%	−5.10%	Emerging	−4.47%	−5.85%	−4.13%	−8.28%
	(-0.58)	(-0.76)	(-1.30)	(-1.91)		(-3.65)	(-2.03)	(-1.55)	(-1.43)
ACWI	−0.50%	−1.30%	−2.40%	−5.23%	ACWI	−4.32%	−6.14%	−4.44%	−8.45%
	(-0.50)	(-0.78)	(-1.49)	(-1.94)		(-3.79)	(-2.14)	(-1.60)	(-1.45)
C7 _Restrictions on internal movement									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.90%	−1.57%	−1.28%	−6.66%	Emerging	−2.72%	−1.80%	2.63 %	−4.59%
	(-1.71)	(-0.78)	(-0.62)	(-2.37)		(-2.34)	(-0.62)	(1.27)	(-1.02)
ACWI	−0.92%	−0.96%	−1.99%	−6.12%	ACWI	−1.10%	−0.90%	1.63 %	−4.05%
	(-0.86)	(-0.01)	(-0.99)	(-2.22)		(-0.85)	(-0.32)	(0.71)	(-0.92)
C8 _International travel controls									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−2.14%	−4.85%	−4.29%	−10.07%	Emerging	−2.85%	−5.74%	−4.97%	−12.41%
	(-2.13)	(-3.50)	(-3.82)	(-4.08)		(-2.12)	(-3.58)	(-3.30)	(-3.84)

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Panel A: Closure Interventions									
C1 School closures									
Joint					Sole				
ACWI	−1.62% (-1.84)	−4.18% (-3.17)	−3.93% (-3.34)	−9.14% (-3.84)	ACWI	−2.02% (-1.73)	−4.83% (-3.30)	−4.63% (-2.92)	−11.27% (-3.63)
Panel B: Economic Interventions									
E1 _Income support									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.54 % (1.09)	1.49 % (1.31)	0.59 % (0.57)	−0.15% (-0.08)	Emerging	0.54 % (0.96)	2.42 % (2.47)	0.66 % (0.65)	2.81 % (1.66)
ACWI	0.92 % (1.86)	1.89 % (1.58)	0.41 % (0.41)	−0.16% (-0.09)	ACWI	0.90 % (1.63)	2.81 % (2.79)	0.45 % (0.44)	2.79 % (1.61)
E2 _Debt/contract relief									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.78% (-1.03)	−0.68% (-0.40)	−1.86% (-0.82)	−2.99% (-0.90)	Emerging	−1.18% (-1.53)	−0.41% (-0.22)	−0.47% (-0.25)	−1.45% (-0.44)
ACWI	−0.77% (-1.15)	−0.63% (-0.37)	−2.01% (-0.92)	−2.87% (-0.03)	ACWI	−1.12% (-1.70)	−0.38% (-0.20)	−0.74% (-0.39)	−1.39% (-0.42)
Panel C: Health Interventions									
H1 _Public information campaigns									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.64% (-1.01)	−2.92% (-2.15)	−1.21% (-1.77)	−3.25% (-2.73)	Emerging	−0.93% (-1.08)	−3.94% (-2.63)	−1.55% (-1.84)	−3.80% (-2.34)
ACWI	−0.32% (-0.69)	−2.51% (-2.22)	−1.29% (-1.98)	−2.71% (-2.97)	ACWI	−0.54% (-0.90)	−3.26% (-2.68)	−1.50% (-1.75)	−3.16% (-2.57)
H2 _Testing policy									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.06 % (0.11)	−0.08% (-0.13)	0.19 % (0.26)	−0.28% (-0.18)	Emerging	0.16 % (0.26)	−0.04% (-0.05)	0.34 % (0.35)	0.66 % (0.35)
ACWI	0.10 % (0.23)	0.14 % (0.24)	0.39 % (0.55)	0.18 % (0.13)	ACWI	0.20 % (0.33)	0.10 % (0.13)	0.44 % (0.45)	0.78 % (0.42)
H3 _Contact tracing									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.42 % (0.62)	−0.14% (-0.16)	−0.47% (-0.32)	−1.60% (-0.78)	Emerging	1.60 % (1.73)	1.62 % (1.51)	1.74 % (0.82)	2.16 % (0.91)
ACWI	0.50 % (0.92)	0.25 % (0.27)	0.32 % (0.22)	0.11 % (0.05)	ACWI	1.37 % (1.64)	1.69 % (1.34)	2.69 % (1.31)	3.77 % (1.25)

Note: The table presents the AAR and CAAR for different testing windows [0], [0,2], [-1,1], and [-3,3], around different types of government interventions: closures, economic, and health policies. The left-hand side reports the results of "Joint" types of interventions, while the right-hand side presents the results of "Sole" types of interventions. "Sole" intervention refers to intervention events where only one kind of government measure was announced to the public, while "Joint" intervention refers to mixed cases where two or more types of government steps were announced on the same day. Average abnormal returns and cumulative average abnormal returns are measured by the market model using an estimation period of 252 days ending seven days before the intervention. The t-statistics are computed according to the *t*-test and are presented in parentheses. Three market portfolios are considered: MSCI Emerging, which refers to The MSCI Emerging Markets Index, the MSCI ACWI Index representing the performance of large- and mid-cap stocks across 23 developed and 26 emerging markets, and the FTSE All World Index, which represents the market performance of large- and mid-capitalization stocks of companies located around the world. Since the results of the FTSE were very similar to the ACWI index, we do not report them here, but they are available upon request.

Appendix A4

AAR and CAAR for Government Interventions (Market model using Scholes and Williams' (1977) approach for controlling potential non-synchronous bias – 2019 Estimation Period)

Panel A: Closure Interventions									
C1 _School closures									
Joint					Sole				
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−3.57% (-4.44)	−5.89% (-4.29)	−4.17% (-3.30)	−8.52% (-4.44)	Emerging	−2.74% (-3.11)	−5.16% (-2.67)	−2.78% (-1.91)	−6.73% (-2.94)
ACWI	−1.98% (-2.77)	−4.63% (-3.50)	−4.81% (-3.67)	−7.55% (-3.94)	ACWI	−1.43% (-1.73)	−3.96% (-2.14)	−4.03% (-2.24)	−6.03% (-2.44)

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Panel A: Closure Interventions									
C1 _School closures									
Joint					Sole				
C2 _Workplace closures									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.67%	−3.03%	−3.19%	−8.64%	Emerging	−0.68%	−3.71%	−4.31%	−9.80%
	(-0.71)	(-1.92)	(-2.44)	(-4.18)		(-0.57)	(-1.44)	(-1.58)	(-2.43)
ACWI	−0.44%	−3.54%	−3.67%	−8.46%	ACWI	−0.83%	−4.18%	−3.63%	−7.95%
	(-0.59)	(-2.18)	(-2.96)	(-4.25)		(-0.62)	(-1.65)	(-1.74)	(-2.17)
C3 _Cancellation of public events									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−2.35%	−4.62%	−3.77%	−8.43%	Emerging	−0.17%	−1.26%	−1.58%	−2.88%
	(-2.97)	(-2.81)	(-3.01)	(-3.73)		(-0.29)	(-0.58)	(-1.14)	(-0.95)
ACWI	−1.51%	−3.54%	−3.26%	−6.59%	ACWI	−0.02%	−0.03%	−1.06%	−1.27%
	(-2.30)	(-2.43)	(-2.58)	(-2.98)		(-0.03)	(-0.01)	(-0.89)	(-0.46)
C4 _Restrictions on gatherings									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−2.21%	−4.41%	−3.42%	−8.15%	Emerging	−2.57%	−7.10%	−2.96%	−9.92%
	(-2.37)	(-2.34)	(-2.50)	(-3.57)		(-1.57)	(-3.17)	(-2.86)	(-2.44)
ACWI	−1.47%	−3.47%	−3.64%	−7.64%	ACWI	−2.02%	−6.34%	−3.13%	−9.60%
	(-1.94)	(-1.87)	(-2.83)	(-3.43)		(-1.40)	(-3.26)	(-3.42)	(-2.48)
C5 _Closing public transport									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.58 %	−1.48%	−1.42%	−4.30%	Emerging	−0.08%	−0.84%	−1.21%	−1.90%
	(0.58)	(-0.95)	(-1.06)	(-1.89)		(-0.07)	(-0.42)	(-0.91)	(-0.55)
ACWI	0.51 %	−2.35%	−2.19%	−5.72%	ACWI	−0.05%	−0.90%	−1.29%	−2.15%
	(0.53)	(-1.41)	(-1.84)	(-2.53)		(-0.04)	(-0.44)	(-0.99)	(-0.63)
C6 _Stay-at-home requirements									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.07%	−0.72%	−1.92%	−3.95%	Emerging	−2.90%	−5.62%	−3.99%	−6.91%
	(-0.07)	(-0.48)	(-1.44)	(-1.80)		(-2.44)	(-2.49)	(-1.96)	(-1.43)
ACWI	−0.14%	−1.07%	−2.19%	−4.49%	ACWI	−2.58%	−6.28%	−4.06%	−6.81%
	(-0.17)	(-0.68)	(-1.74)	(-2.17)		(-2.48)	(-3.33)	(-1.85)	(-1.54)
C7 _Restrictions on internal movement									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.28%	−0.63%	−0.61%	−4.36%	Emerging	−1.38%	−1.14%	2.98 %	−2.39%
	(-1.35)	(-0.36)	(-0.35)	(-1.95)		(-1.37)	(-0.46)	(1.57)	(-0.65)
ACWI	−0.33%	−0.74%	−1.91%	−4.52%	ACWI	0.59 %	−0.63%	1.67 %	−2.82%
	(-0.36)	(-0.42)	(-1.09)	(-2.09)		(0.48)	(-0.26)	(0.68)	(-0.76)
C8 _International travel controls									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.41%	−3.55%	−2.80%	−7.24%	Emerging	−2.04%	−4.17%	−3.18%	−8.73%
	(-1.64)	(-2.89)	(-2.93)	(-3.50)		(-1.77)	(-3.01)	(-2.44)	(-3.22)
ACWI	−0.79%	−2.82%	−2.54%	−6.12%	ACWI	−1.03%	−3.02%	−2.80%	−7.27%
	(-1.18)	(-2.54)	(-2.40)	(-3.13)		(-1.17)	(-2.47)	(-1.90)	(-2.77)
Panel B: Economic Interventions									
E1 _Income support									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.88 %	0.59 %	0.57 %	−1.21%	Emerging	0.53 %	1.33 %	0.65 %	1.02 %
	(1.82)	(0.56)	(0.52)	(-0.73)		(1.37)	(1.69)	(0.62)	(0.62)
ACWI	1.43 %	0.47 %	−0.01%	−2.19%	ACWI	0.96 %	1.44 %	0.22 %	0.13 %
	(2.96)	(0.36)	(-0.01)	(-1.22)		(2.39)	(1.80)	(0.25)	(0.08)
E2 _Debt/contract relief									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.82%	−0.92%	−2.53%	−3.31%	Emerging	−1.23%	−1.09%	−1.87%	−2.60%
	(-1.10)	(-0.56)	(-1.39)	(-1.25)		(-1.66)	(-0.60)	(-1.05)	(-0.92)
ACWI	−0.92%	−1.31%	−4.07%	−3.91%	ACWI	−1.04%	−1.08%	−3.53%	−3.30%
	(-1.66)	(-0.79)	(-1.97)	(-1.58)		(-1.77)	(-0.59)	(-1.65)	(-1.23)
Panel C: Health Interventions									
H1 _Public information campaigns									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.31%	−1.87%	−0.56%	−1.76%	Emerging	−0.51%	−2.51%	−0.76%	−1.92%
	(-0.56)	(-1.66)	(-0.91)	(-1.84)		(-0.73)	(-2.17)	(-1.036)	(-1.61)
ACWI	−0.06%	−1.79%	−0.97%	−1.75%	ACWI	−0.15%	−2.05%	−1.01%	−1.90%
	(-0.15)	(-1.84)	(-1.54)	(-2.08)		(-0.29)	(-1.87)	(-1.25)	(-1.98)
H2 _Testing policy									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.37 %	0.17 %	0.34 %	0.30 %	Emerging	0.34 %	−0.01%	0.27 %	0.67 %
	(1.04)	(0.32)	(0.59)	(0.27)		(0.73)	(-1.91)	(0.33)	(0.47)

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Panel A: Closure Interventions									
C1 _School closures									
Joint					Sole				
ACWI	0.21 % (0.71)	0.10 % (0.18)	0.39 % (0.72)	0.53 % (0.67)	ACWI	0.18 % (0.46)	−0.23% (-0.31)	0.18 % (0.24)	0.36 % (0.35)
H3 Contact tracing									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.80 % (1.32)	0.51 % (0.62)	0.12 % (0.09)	−0.37% (-0.21)	Emerging	1.78 % (1.97)	1.80 % (1.70)	2.05 % (1.06)	2.71 % (1.39)
ACWI	0.48 % (0.10)	0.45 % (0.55)	0.40 % (0.30)	0.30 % (0.19)	ACWI	1.02 % (1.21)	1.15 % (0.95)	2.11 % (1.09)	2.42 % (1.24)

Note: The table presents the AAR and CAAR for different testing windows [0], [0,2], [-1,1], and [-3,3]), around different types of government interventions: closures, economic, and health policies. The left-hand side reports the results of a "Joint" type of interventions, while the right-hand side presents the results of a "Sole" type of interventions. "Sole" intervention refers to intervention events where only one kind of government measure was announced to the public, while "Joint" intervention refers to mixed cases where two or more types of government steps were announced on the same day. Average abnormal returns and cumulative average abnormal returns were calculated based on the Scholes and Williams (1977) approach for controlling potential non-synchronous bias, thus constructing a weighted beta by using the lead, the lag and the synchronous market returns (2019 estimation period). The t-statistics are computed according to the Cross-Sectional Standard Deviation *t*-test and are presented in parentheses. Three market portfolios are considered: MSCI Emerging, which refers to The MSCI Emerging Markets Index, the MSCI ACWI Index representing the performance of large- and mid-cap stocks across 23 developed and 26 emerging markets, and the FTSE All World Index, which represents the market performance of large- and mid-capitalization stocks of companies located around the world. Since the results of the FTSE were very similar to the ACWI index, we do not report them here, but they are available upon request.

Appendix A5

AAR and CAAR for Government Interventions (Naïve Market Model)

Panel A: Closure Interventions									
C1 School closures									
Joint					Sole				
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−2.31% (-2.68)	−3.17% (-2.23)	−2.39% (-1.85)	−2.84% (-1.36)	Emerging	−1.54% (-1.43)	−2.60% (-1.24)	−1.28% (-0.76)	−1.67% (-0.57)
ACWI	−1.02% (-1.21)	−2.86% (-1.92)	−3.74% (-2.65)	−3.74% (-1.68)	ACWI	−0.57% (-0.51)	−2.25% (-1.02)	−3.27% (-1.58)	−2.74% (-0.84)
C2 Workplace closures									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	1.04 % (1.19)	0.25 % (0.16)	−0.46% (-0.36)	−1.76% (-0.80)	Emerging	0.77 % (0.63)	0.40 % (0.16)	−0.79% (-0.34)	−2.11% (-0.49)
ACWI	0.97 % (1.08)	−1.75% (-1.08)	−2.73% (-2.22)	−3.88% (-1.76)	ACWI	−0.02% (-0.01)	−2.38% (-0.95)	−1.81% (-1.06)	−3.09% (-0.73)
C3 Cancellation of public events									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.51% (-1.88)	−2.75% (-1.71)	−1.89% (-1.46)	−3.94% (-1.59)	Emerging	1.07 % (1.26)	0.78 % (0.33)	0.45 % (0.25)	1.94 % (0.51)
ACWI	−0.87% (-1.17)	−2.33% (-1.44)	−2.18% (-1.77)	−4.01% (-1.65)	ACWI	1.06 % (0.94)	1.75 % (0.75)	0.22 % (0.14)	2.30 % (0.64)
C4 Restrictions on gatherings									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−1.48% (-1.5)	−2.86% (-1.48)	−1.90% (-1.39)	−4.07% (-1.92)	Emerging	−0.87% (-0.5)	−4.33% (-2.29)	−1.39% (-1.41)	−5.21% (-2.01)
ACWI	−0.82% (-0.84)	−2.82% (-1.48)	−3.43% (-2.74)	−5.70% (-2.75)	ACWI	−0.17% (-0.11)	−4.16% (-2.26)	−2.84% (-2.07)	−7.07% (-2.65)
C5 Closing public transport									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	1.67 % (1.83)	−0.47% (-0.28)	−0.99% (-0.76)	−1.76% (-0.77)	Emerging	1.63 % (1.26)	−0.43% (-0.18)	−1.63% (-0.88)	−0.70% (-0.18)
ACWI	1.28 % (1.30)	−1.74% (-0.95)	−2.09% (-1.81)	−4.23% (-1.85)	ACWI	0.19 % (0.12)	−2.04% (-0.74)	−2.27% (-1.86)	−2.86% (-0.74)
C6 Stay-at-home requirements									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]

(*continued on next page*)

(*continued*)

Panel A: Closure Interventions									
C1 School closures									
Joint					Sole				
Emerging	0.96 % (0.01)	0.13 % (0.09)	−0.81% (-0.63)	−1.00% (-0.55)	Emerging	−0.56% (-0.53)	−3.79% (-2.42)	−2.40% (-1.46)	−2.24% (-0.65)
ACWI	0.39 % (0.43)	−1.09% (-0.66)	−1.66% (-1.29)	−2.57% (-1.39)	ACWI	−1.16% (-0.95)	−5.54% (-3.24)	−2.32% (-1.06)	−3.26% (-0.94)
C7 Restrictions on internal movement									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.51% (-0.53)	0.06 % (0.04)	0.15 % (0.09)	−1.32% (-0.70)	Emerging	0.32 % (0.28)	−0.17% (-0.09)	3.01 % (1.50)	−0.09% (-0.03)
ACWI	−0.13% (-0.12)	−0.78% (-0.42)	−2.19% (-1.26)	−2.76% (-1.38)	ACWI	1.29 % (0.99)	−0.15% (-0.11)	0.29 % (0.17)	−1.99% (-0.54)
C8 International travel controls									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.39% (-0.49)	−1.89% (-1.64)	−1.07% (-1.28)	−4.05% (-2.19)	Emerging	−1.27% (-1.25)	−2.78% (-2.16)	−1.72% (-1.5)	−5.96% (-2.45)
ACWI	−0.36% (-0.64)	−2.01% (-1.92)	−1.66% (-1.77)	−4.86% (-2.74)	ACWI	−0.75% (-1.00)	−2.71% (-2.37)	−2.61% (-2.14)	−7.05% (-3.00)
Panel B: Economic Interventions									
E1 Income support									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.75 % (1.72)	0.31 % (0.27)	0.93 % (0.80)	−1.05% (-0.62)	Emerging	0.41 % (1.12)	0.80 % (0.97)	0.64 % (0.59)	0.17 % (0.10)
ACWI	1.92 % (1.95)	3.70 % (2.63)	0.49 % (0.36)	0.11 % (0.05)	ACWI	1.06 % (1.00)	3.24 % (2.40)	−0.80% (-0.67)	0.05 % (0.02)
E2 Debt/contract relief									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.20% (-0.28)	−0.73% (-0.53)	−2.28% (-1.52)	−1.93% (-0.88)	Emerging	−0.44% (-0.62)	−0.82% (-0.53)	−1.62% (-1.07)	−1.17% (-0.49)
ACWI	−0.53% (-0.98)	−1.30% (-0.86)	−3.60% (-2.21)	−3.10% (-1.51)	ACWI	−0.38% (-0.70)	−0.82% (-0.50)	−3.02% (-1.79)	−2.47% (-1.10)
Panel C: Health Interventions									
H1 Public information campaigns									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	−0.19% (-0.28)	−1.44% (-1.32)	0.20 % (0.30)	−0.23% (-0.19)	Emerging	−0.20% (-0.28)	−1.47% (-1.29)	0.13 % (0.17)	−0.06% (-0.04)
ACWI	−0.16% (-0.23)	−2.00% (-1.78)	−0.59% (-0.71)	−0.98% (-0.74)	ACWI	0.03 % (0.06)	−1.66% (-1.47)	−0.41% (-0.41)	−0.87% (-0.54)
H2 Testing policy									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	0.62 % (1.82)	0.74 % (1.21)	1.04 % (1.58)	1.64 % (1.42)	Emerging	0.62 % (1.62)	0.81 % (1.02)	1.15 % (1.28)	2.65 % (1.99)
ACWI	0.35 % (0.98)	0.57 % (0.75)	0.87 % (1.23)	1.26 % (1.18)	ACWI	0.35 % (0.77)	0.67 % (0.65)	0.96 % (0.99)	2.06 % (1.60)
H3 Contact tracing									
Window	[0]	[0,2]	[-1,1]	[-3,3]	Window	[0]	[0,2]	[-1,1]	[-3,3]
Emerging	1.18 % (1.87)	1.34 % (1.75)	1.02 % (0.85)	1.44 % (0.93)	Emerging	2.01 % (2.10)	2.21 % (1.85)	2.79 % (1.56)	4.60 % (2.47)
ACWI	0.76 % (1.20)	0.74 % (0.84)	0.86 % (0.67)	1.25 % (0.79)	ACWI	1.02 % (0.98)	1.20 % (0.84)	2.74 % (1.57)	4.01 % (1.94)

Note: Table A5 presents the average abnormal returns (window [0]) and cumulative average abnormal returns for selected time periods (windows [0,2], [-1,1], and [-3,3]), resulting from the governmental closures, economic, and health policies. The left-hand side reports the results of the "Joint" types of interventions and the right-hand side presents the results of the "Sole" types of interventions. "Sole" intervention refers to cases where only one kind of government measures was announced to the public, while "Joint" intervention refers to cases where two or more government steps were announced on the same day. Average abnormal returns and cumulative average abnormal returns were calculated using the naïve model. The t-statistics are computed according to the Cross-Sectional Standard Deviation *t*-test and are presented in parentheses. Three market portfolios are considered: MSCI Emerging, which refers to The MSCI Emerging Markets Index, the MSCI ACWI Index representing the performance of large- and mid-cap stocks across 23 developed and 26 emerging markets, and the FTSE All World Index, which represents the market performance of large- and mid-capitalization stocks of companies located around the world. Since the results of the FTSE were very similar to the ACWI index, we do not report them here, but they are available upon request.

Appendix A6

Regression Results – Trailing Estimation Period

Panel A: Dependent Variable: CAAR [-3,3]								
	Joint				Sole			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CL	−0.0723***	−0.0350**	−0.0372	−0.0372	−0.0723***	−0.0453**	−0.0515**	−0.0507**
	(0.0161)	*(0.0156)*	*(0.0149)*	*(0.0149)*	*(0.0214)*	*(0.0209)*	*(0.0202)*	*(0.0202)*
E	0.0020	0.0051	0.0101	0.0101	0.0167	0.0184	0.0228	0.0244
	(0.0234)	*(0.0215)*	*(0.0204)*	*(0.0204)*	*(0.0275)*	*(0.0259)*	*(0.0246)*	*(0.0247)*
Δinf		−0.0487***	−0.0462***	−0.0456***		−0.0435***	−0.0387***	−0.0384***
		(0.0065)	*(0.0065)*	*(0.0065)*		*(0.0092)*	*(0.0092)*	*(0.0092)*
America			−0.0644***	−0.0553***			−0.0674***	−0.0519*
			(0.0168)	*(0.0185)*			*(0.0239)*	*(0.0274)*
Europe			−0.1002***	−0.0957***			−0.1012***	−0. 0929***
			(0.0175)	*(0.0179)*			*(0.0237)*	*(0.0248)*
Asia			−0.0574***	−0.0465**			−0.0557**	−0.0377
			(0.0160)	*(0.0185)*			*(0.0218)*	*(0.0269)*
GDP per Capita				0.0006				0.0008
				(0.0005)				*(0.0007)*
C	−0.0173	0.0303**	0.0815***	0.0659***	−0.0114	0.0293	0.0778***	0.0537*
	(0.0138)	*(0.0142)*	*(0.0170)* **	*(0.0216)* **	*(0.0174)*	*(0.0185)*	*(0.0221)*	*(0.0305)*
Durbin-Watson stat	1.8799	1.9113	1.9619	1.9755	2.026	2.015	2.039	2.051
F-statistic	13.7855***	29.5002***	22.0960***	19.1616***	9.459***	14.595***	11.319***	9.908***
Adjusted R-squared	0.0793	0.2235	0.2988	0.2997	0.095	0.201	0.277	0.278
Panel B: Dependent Variable: CAAR [0,2]								
CL	−0.0317***	−0.0232**	−0.0237**	−0.0234**	−0.0311**	−0.0215	−0.0277**	−0.0269**
	(0.011)	*(0.011)*	*(0.0107)*	(0.0107)	*(0.0132)*	*(0.0134)*	*(0.0129)*	(0.0129)
E	0.0155	0.0126	0.0153	0.0154	0.0221	0.0218	0.0240	0.0252
	(0.0161)	*(0.0157)*	*(0.0153)*	(0.0152)	*(0.0170)*	*(0.0166)*	*(0.0159)*	(0.0159)
Δinf		−0.0366***	−0.0347***	−0.0337***		−0.0306***	−0.0229*	−0.0230**
		(0.0090)	*(0.0090)*	(0.0090)		*(0.0108)*	*(0.0105)*	(0.0105)
America			−0.0188	−0.0079			−0.0517***	−0.0406*
			(0.0126)	(0.0138)			*(0.0154)*	(0.0177)
Europe			−0.0549***	−0.0495***			−0.0571	−0.0511***
			(0.0131)	(0.0133)			*(0.0153)*	(0.0160)
Asia			−0.0208*	−0.0077			−0.0186	−0.0006
			(0.0119)	(0.0137)			(0.0139)	(0.0727)
GDP per Capita				0.0007**				0.0006
				(0.0004)				(0.0004)
C	−0.0111	0.0063	0.0274**	0.0087	−0.0130	−0.0014	0.0258*	0.0091
	(0.0095)	*(0.0102)*	*(0.0124)*	*(0.0158)*	*(0.0108)*	*(0.0113)*	*(0.0137)*	*(0.0191)*
Durbin-Watson stat	1.7657	1.7718	1.7299	2.1214	1.819	1.803	1.879	1.863
F-statistic	6.9083***	11.1448***	8.8784***	7.9967***	7.060***	2.126***	7.321***	6.521***
Adjusted R-squared	0.0450	0.0929	0.1373	0.1451	0.007	0.109	0.119	0.193
Panel C: Dependent Variable: CAAR [-1,1]								
CL	−0.0309***	−0.0203**	−0.0207**	−0.0208**	−0.0266**	−0.0184	−0.0214*	−0.0209*
	(0.0097)	*(0.0099)*	*(0.0096)*	*(0.0096)*	*(0.0114)*	*(0.0119)*	*(0.0117)*	*(0.0117)*
E	−0.0010	0.0003	0.0029	0.0029	0.0031	0.0049	0.0067	0.0075
	(0.0142)	*(0.0139)*	*(0.0134)*	*(0.0134)*	*(0.0147)*	*(0.0145)*	*(0.0142)*	*(0.0142)*
Δinf		−0.0327***	−0.0317***	−0.0305***		−0.0221**	−0.0181*	−0.0178*
		(0.0087)	*(0.0085)*	*(0.0086)*		*(0.0099)*	*(0.0098)*	*(0.0098)*
America			−0.0263**	−0.0018			−0.0279**	−0.0199
			(0.011)	*(0.0121)*			*(0.0137)*	*(0.0157)*
Europe			−0.0551***	−0.0508***			−0.0464***	−0.0421***
			(0.0114)	*(0.0117)*			*(0.0135)*	*(0.0142)*
Asia			−0.0253**	−0.0153			−0.0197	−0.0105
			(0.0105)	*(0.0121)*			*(0.0124)*	*(0.0153)*
GDP per Capita				0.0006*				0.0004
				(0.0003)				*(0.0004)*
C	−0.0051	0.0072	0.0322***	0.0179	−0.0025	0.0042	0.0249**	0.0127
	(0.0083)	*(0.0088)*	*(0.0108)*	*(0.0139)*	*(0.0093)*	*(0.0097)*	*(0.0121)*	*(0.0170)*
Durbin-Watson stat	2.0918	2.1060	2.1242	2.1214	2.122	2.126	2.113	2.110
F-statistic	6.6145***	9.3426***	8.8403***	8.0079***	2.026**	4.420***	4.360***	3.887***
Adjusted R-squared	0.0364	0.0777	0.1367	0.1418	0.0361	0.059	0.111	0.111
Panel D: Dependent Variable: AAR [0]								
CL	−0.0208***	−0.0167**	−0.0163**	−0.0161**	−0.0243***	−0.0228***	−0.0240***	−0.0238***
	(0.006)	*(0.0067)*	*(0.0065)*	*(0.0065)*	*(0.0073)*	*(0.0075)*	(0.0074)	*(0.0075)*
E	−0.0002	0.0009	0.0021	0.0021	−0.0045	−0.0042	−0.0032	−0.0028

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(*continued*)

Panel A: Dependent Variable: CAAR [-3,3]								
	Joint				Sole			
	(0.009)	*(0.0093)*	*(0.0092)*	*(0.0092)*	*(0.0093)*	*(0.0094)*	(0.0092)	*(0.0092)*
Δinf		−0.0276**	−0.0300**	−0.0303**		−0.0098	−0.0090	−0.0096
		(0.0119)	*(0.0117)*	*(0.0117)*		*(0.0119)*	(0.0117)	*(0.0118)*
America			−0.0001	0.0038			−0.0131*	−0.0102
			(0.0075)	*(0.0083)*			(0.0089)	*(0.0103)*
Europe			−0.0256***	−0.0237***			−0.0221***	−0.0205**
			(0.0078)	*(0.0080)*			(0.0088)	*(0.0092)*
Asia			−0.0019	0.0027			−0.0001	−0.0032
			(0.0071)	*(0.0082)*			(0.0080)	*(0.0100)*
GDP per Capita				0.0003				0.0001
				(0.0002)				*(0.0003)*
C	−0.0008	0.0014	0.0074	0.0010	0.0007	0.0015	0.0093	0.0050
	(0.006)	*(0.0056)*	*(0.0071)*	*(0.0092)*	*(0.0059)*	*(0.0060)*	*(0.0077)*	*(0.0109)*
Durbin-Watson stat	1.6376	1.6297	1.6580	1.6673				
F-statistic	6.9083***	6.4560***	5.8669***	5.2084***	1.921	1.910	1.948	1.956
Adjusted R-squared	0.0383	0.0522	0.10895	0.0902	6.646***	4.648***	3.905***	3.376***

Note: The table presents Eq. (10)'s regression results. The left-hand side shows the results obtained using the abnormal returns from Joint events and the right-hand side displays the results using the abnormal returns from Sole events. Standard errors are in parentheses. Panels A, B, C and D present the results using each of four time windows [-3,3], [0,2] [-1,1] and [0] as the dependent variable. Estimation period is 252 trading days ending seven trading days prior to each event. Δinf is the change in the number of confirmed cases, CL and E are dummy variables representing closure and economic interventions, and America, Europe, and Asia are dummy variables for the geographical location of each country. Finally, GDP per CAPITA is a proxy for economic strength. The table reports the Durbin-Watson test for serial correlation as well as the F statistics and the adjusted coefficients of variation (Adjusted R-squared). ***, ** and * indicate significance at 1%, 5%, and 10 %, respectively.

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