Stock Market Reactions to COVID-19 Announcement: Developed Versus Emerging Markets and Large Versus Small Firms

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Abstract: Research Question: How do stock markets around the world react to the World Health Organization (WHO)'s announcement on 11 March 2020 declaring COVID-19 as a global pandemic? Are there any differences in the reaction between developed and emerging markets? Are there any differences in the reaction between large and small firms? **Motivation:** There is a need to have a better understanding on whether different markets react differently to COVID-19 announcement. It is also important to know what factors make some markets more resilient than others. **Idea:** We envisage that developed markets, large firms, large stock markets, and markets with international exposure would demonstrate greater degree of resiliency than their respective counterparts. The results of this study would have profound implications on the ability of markets to withstand against global pandemic such as the COVID-19. **Data:** The sample consists of 30 world's largest stock markets based on their market capitalization on 31 December 2019, consisting of 18 developed markets and 12 emerging markets. For each market, we collect two indices: the main index representing large firms and the small-firm index representing small firms. **Method/Tools:** This is an event study using the market model and market-adjusted model to estimate abnormal returns. We then use the OLS and feasible GLS for cross-sectional regression analysis of the CARs. **Findings:** This study finds that the WHO's pandemic announcement negatively impacts stock market returns around the world in the short-term, while in the intermediate-term the markets recover some of the losses. Developed markets are less affected than emerging markets and large firms are better able to withstand the pandemic impact. The multiple regression results show that stock market size is positively related to CARs, and a country's international exposure is negatively associated with short-run CARs but is positively associated with intermediate-term CARs. **Contributions:** This study documents evidence of stock market reactions around the world to the announcement of the COVID-19 pandemic by the WHO. The study focuses on the difference in the reaction by developed versus emerging markets and by large versus small firms. Further, this study provides several institutional factors that influence the extent of the impact of the COVID-19 pandemic on share prices. Knowing these factors would be useful to governments, policymakers and companies to design strategies to

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help markets becoming more resilient to systemic risks such as the COVID-19 pandemic.

Keywords: Abnormal returns, COVID-19, event study, market model, stock market reaction.
JEL Classification: G10, G14, G18

1. Introduction

The World Health Organization (WHO) officially declared the COVID-19 outbreak to be a global pandemic on 11 March 2020. Since the outbreak, many studies have been conducted focusing on the economic impact of the pandemic. These studies include Fernandes (2020), He *et al.* (2020b), Sayed and Eledum (2021), Bannigidadmath *et al.* (2021), Harjoto *et al.* (2021a, 2021b), Liu *et al.* (2020a), Mishra *et al.* (2020), and Rahman *et al.* (2021). Generally, all these studies document the negative reaction of the stock markets to the announcements of the pandemic. These results are to be expected because the immediate reaction to the pandemic is economic and social lockdowns, thereby putting a break to all economic activities and business operations. However, very few studies explore the differences in the market reaction between developed and emerging countries, and between large and small firms.

The few studies that investigate the global pandemic impact on emerging countries include Huo and Qiu (2020), and Topcu and Gulal (2020). Topcu and Gulal (2020) indicate that the negative effect of COVID-19 is greatest in Asian emerging markets compared to European emerging markets. Harjoto *et al.* (2021b) show that investors from developed countries react differently compared to emerging countries. The evidence relating to how different sizes of firms react to COVID-19 is even more limited. Harjoto *et al.* (2021a) in the US and Rahman *et al.* (2021) in Australia find that small firms are more vulnerable to the COVID-19 pandemic compared to large firms. Harjoto *et al.* (2021a) analyse the response of MSCI World Index (MXWO), MSCI Emerging Markets Index (MXEF), and large and small cap index of US market due to the COVID-19 pandemic. They analyse the CARs of two event windows (-5, 5) and (-10, 10), and find that CAR of developed markets is positive while the CAR of emerging markets is negative. In another study, Harjoto *et al.* (2021b) use multiple regression to investigate whether COVID-19 cases and mortality rates are related to returns, volatility, and trading volume.

In this study we bring new evidence concerning the impact of the COVID-19 pandemic on stock markets around the world, focusing on developed versus emerging markets and on large versus small firms. Drawing inferences from institutional theory (Harjoto *et al.* 2021b), we argue that there are sound reasons to expect developed markets to be more resilient compared to emerging markets in facing the COVID-19 onslaught. Developed markets are generally characterised by traits such as large companies, good governance, market depth and width, price efficiency, large number of analysts and informed traders. These institutional characteristics necessarily lead to market strength and stability. Therefore, developed markets are expected to be able to withstand a global pandemic better than emerging markets. A similar argument can also be applied to large firms versus small firms; one may hypothesize that large firms are likely to be less impacted by the pandemic compared to smaller firms.

The objective of this study is to examine the impact on stock prices around the world of the 11 March 2020 WHO announcement declaring COVID-19 a global pandemic. Specifically, the study focuses on the differences in the market reaction in developed versus emerging countries as well as by firm size. We also analyse several factors that may influence the impact of COVID-19 on stock returns in the short-run and in the intermediate

period. These factors include stages of a country's economic development, firm size, size of stock market, and the country's international trade exposure. This study contributes in the following ways. Firstly, it brings additional evidence on the impact of COVID-19 on stock markets. We focused on a single event, that is, the WHO announcement on 11 March 2020. We use event study methodology to trace market reactions before, during, and after the announcement; this allows us to identify the period markets are worse hit and the period recovery starts taking place. Secondly, we explore four factors that possibly determine the degree of impact of the announcement to stock markets. These factors are stages of a country's economic development, firm size, stock market size and a country's international trade exposure. We hope this will give us a deeper understanding on why some markets are more resilient than others facing the onslaught of the pandemic.

The rest of the paper is organized as follows. Section 2 discusses the literature review and describes in greater detail issues studied. Section 3 presents our data and methodology. This is followed by presentation and discussion of results in Section 4. Section 5 concludes the paper.

2. Literature Review

In general, prior studies on the COVID-19 pandemic report a negative reaction to the news of the pandemic. This is to be expected because the immediate reactions of many countries, such as economic lockdown, border closures, travel restrictions, and stay-at-home orders, brought economic activities to an immediate halt. Among the studies documenting a negative impact on stock markets are Fernandes (2020), Liu *et al.* (2020a), Huo and Qiu (2020), He *et al.* (2020a), Harjoto *et al.* (2021a, 2021b), Fernandes (2020), Bannigidadmath *et al.* (2021), Singh *et al.* (2020), Sayed and Eledum (2021), Mishra *et al.* (2020), and Rahman *et al.* (2021). These studies suggest that the degree of the negative effect of COVID-19 on the stock markets around the world varies. For example, Bannigidadmath *et al.* (2021) examine the top-25 most influenced economies in terms of the total number of infected and death cases. They find that country lockdown announcements have adverse effects on stock market returns, but only in 14 out of 25 countries, while in some countries stock market returns are statistically positive. This suggests that equity markets respond differently to the pandemic announcement and some markets are more resilient than others.

2.1 Developed Versus Emerging Markets

There are many reasons to expect that developed markets are better able to withstand the COVID-19 pandemic as opposed to emerging markets. One reason is to argue based on the institutional set-up of firms and markets. The institutional theory (North, 1990; North, 2005) assumes that business organizations and management practices are the product of the social characteristics of the society rather than economic considerations. The institutional theory considers the processes by which structures, including schemes, rules, norms, and procedures, become established as authoritative guidelines for business conduct. Harjoto *et al.* (2021b) and Khanna and Palepu (1997) state that emerging countries are generally saddled with weak institutional contexts in the regulatory systems, labour, and product markets. Using institutional theory, Harjoto *et al.* (2021b) argue that the stock markets of developed and emerging economies respond differently to COVID-19 shocks. The authors use multivariate regression to examine the impact of coronavirus death rates and new cases on stock prices in developed and emerging markets. They indicate that COVID-19 deaths and infections increase trading volume and volatility, and negatively influence stock returns in emerging markets whereas developed markets are generally unaffected. Studies like ElBannan (2017), Khanna *et al.* (2005), and Bhagat *et al.* (2011) state that capital markets in emerging economies usually have more information asymmetry and lower liquidity than

markets in developed countries. Thus, any unanticipated global economic shock to emerging countries intensifies the variability and negatively impacts their equity market returns (Tran *et al.*, 2018). Based on these discussions, it is reasonable to assume that in developed markets, business organizations are better structured than those in emerging markets. This implies that firms in developed markets should be more resilient in facing a pandemic compared to those in emerging markets.

Further studies focusing on emerging countries, specifically China, show that COVID-19 has a negative impact on stock returns in the short-run (Huo and Qiu, 2020; Liu *et al.*, 2020b; He *et al.*, 2020a). In another study, Singh *et al.* (2020) focus on G20 countries and find that the pandemic negatively affects the equity markets in developed and developing economies, but that the impact is uneven across the G20 stock markets, with countries close to China, geographically or economically, suffering more than others. The authors also find that emerging stock markets experience more negative effects of COVID-19 than those in developed markets. Djankov and Panizza (2020) reason that the damage caused by the pandemic is more serious in emerging countries because of the generally weak economic condition and high policy uncertainties. Topcu and Gulal (2020) and Arellano *et al.* (2020) state that emerging countries usually have less advanced monetary and fiscal policies, and lower capacity to weather the negative effect of the global pandemic. This is because emerging countries have poor healthcare infrastructure (McKibbin and Fernando, 2021; Hsiang *et al.* 2020). Thus, any unexpected global shocks will significantly increase the uncertainties and negatively impact the emerging stock markets (Tran *et al.*, 2018). Harjoto *et al.* (2021a) find that the shock from the 11 March 2020 WHO announcement creates significant negative stock returns for emerging countries but positive returns for developed economies.

2.2 Large Versus Small Firm

Harjoto *et al.* (2021a) also look at the firm size effect and find that small firms are more vulnerable while large firms are more resilient to the pandemic shock. They find that the impact of the Fed stimulus announcement on 9 April 2020 is negative for small firms, while it is positive for large firms. The firm size effect is consistent with the findings of Rahman *et al.* (2021). The results show that firm size is negatively related to the CARs, indicating that small firms react more strongly towards the COVID-19 event. Similarly, Harjoto *et al.* (2021a) indicate that small firms suffer more negative impacts compared to large firms. The authors reason that, unlike large firms, small firms generally lack capital cushions and have limited access to the capital market to weather significant and sustained pandemic shocks. In China, Yan (2020) investigates the stock reactions of A-shares to COVID-19 between 20 January 2020 and 7 April 2020. Yan's results indicate that larger businesses are more resilient to the pandemic shock because they suffer less from the supply chain break and have greater monopoly power on resources.

2.3 Stock Market Size

Incidentally, developed markets are generally dominated by large stock markets, measured by total market capitalization (Bayraktar, 2014). Large capitalization markets tend to be more mature and consist of large and stable firms that have already experienced a great deal of growth and captured a large market share. Large and developed markets are also, in turn, dominated by institutional traders dealing with huge volumes of securities. Badhani *et al.* (2023) find that institutional investors tend to invest in high market capitalization and low-risk stocks. In contrast, institutional investors are relatively low in emerging markets. Given these arguments, it is expected that large markets are better able to withstand the impact of the COVID-19 pandemic.

2.4 International Exposure

Au Yong and Laing (2021) examine the US equity market response to the COVID-19 announcement, focusing on firms' international exposure. They discover that companies with more international exposure through exports and imports are negatively related to stock returns in the short-term, while the reverse is true in the long-term. The authors conclude that international trade and globalization make multinational companies more resilient to economic shocks from COVID-19. Our focus in this study is on the country's level. One may argue that the more exposed a country is to international trade, the more susceptible and vulnerable it becomes to global pandemics. But conversely, a well exposed country is also well-diversified in terms of its imports and exports, with many suppliers and buyers, thereby reducing its dependence on and vulnerability to any unique shock from any particular supplier or buyer. Given these opposing arguments, we tend to agree with the findings of Au Yong and Laing (2021) that international exposure leads to a market being more resilient towards the COVID-19 pandemic.

3. Data and Methodology

3.1 Data

The data for this study consists of 30 world's largest stock markets based on their market capitalization as of 31 December 2019, of which 18 are classified as developed markets and 12 are emerging markets, based on the MSCI classification. For each market, we collect two indices, the main index of the market, and the small-firm index. The main market indices usually consist of top largest firms in the market, and based on this premise we consider the main market index to represent large firms; in this way we can compare and contrast large firms versus small firms based on the indices.

Table 1 presents an overview of our data. The table shows the markets represented, classification of the markets into developed and emerging markets, market capitalization and the two indices for each market representing the large firms and small firms respectively. All daily stock indices are obtained from the DataStream database. The stock market capitalization of the countries as of 31 December 2019 are obtained from the World Bank database. The country's international exposure is obtained from World Bank data by adding the country's total imports and total exports and dividing them by the country's GDP for the year 2019.

Table 1: The data used in this study consists of the 30 largest markets based on market capitalization as at 31 December 2019

Country	Market capitalization as at 31/12/2019 (USD million)	Main index (proxy for large firm index)	Small firm index
Panel A Developed Markets			
United State	33905.98	DJUS large-cap total stock market	DJUS small-cap total stock market
Japan	6191.07	TOPIX 100	TOPIX small-cap
United Kingdom	5204.79	FTSE 100	FTSE small-Cap
Hong Kong	4899.23	Hang Seng Index	Hang Seng Comp small
Canada	2409.00	TSX Composite	TSX small-cap
France	2365.95	CAC40	CAC small-cap
Germany	2098.17	DAX 30	SDAX small-cap
Switzerland	1834.45	SMI	Swiss small-cap
Australia	1487.60	ASX 50 Index	ASX small-cap
Netherlands	1372.00	AEX index	AEX small-cap
Sweden	850.20	Stockholm 30	Stockholm small-cap
Spain	797.29	IBEX 35	IBEX small-cap

Table 1 *(continued)*

Country	Market capitalization as at 31/12/2019 (USD million)	Main index (proxy for large firm index)	Small firm index
Singapore	697.27	STI	STI small-cap
Italy	534.58	FTSEMIB	FTSEMIB small cap
Denmark	392.89	OMXC25	OMX small-cap
Belgium	321.10	BFX20	BEL small-cap
Norway	295.55	MSCI Norway large-cap	MSCI Norway small-cap
Finland	245.93	OMXH25	OMXH small-cap
Panel B: Emerging Markets			
China	8515.50	SSE 50	SSE small-cap
Saudi Arabia	2406.82	MT 30 index	MSCI Saudi small-cap
India	2179.78	BSE 30	BSE small-cap
South Korea	1463.00	KOSPI 200	KOSPI small-cap
Brazil	1187.36	BOVESPA	MSCI Brazil small-cap
South Africa	1056.34	MSCI S.Africa large-cap	MSCI S.Africa small-cap
Russia	791.52	MOEX	MSCI MVIS small-cap
Thailand	569.23	SET	SET small-cap
Indonesia	523.32	IDX LQ45	MSCI Indonesia small-cap
Mexico	413.62	IPC	FTSE Mexico small-cap
Malaysia	403.96	FTSEBM KLCI	FTSEBM small-cap
Philippines	275.30	PSEi	FTSE PHI small-cap

Notes: The sample consists of 18 developed markets and 12 emerging markets.

3.2 Methodology

This paper uses the event study method to analyse the stock market reaction to the WHO's announcement on 11 March 2020 that declares COVID-19 as a global pandemic. This date is chosen as the event date (day 0) for this study because it sends an unambiguous message to the world that we are facing a global pandemic from COVID-19. Following Harjoto *et al.* (2021a), and Au Yong and Laing (2021), this study uses the market model and market-adjusted model to estimate the abnormal return. However, the analysis shows remarkably similar results between the two abnormal return models, so we only present the market model in this paper. Our study uses the S&P 500 Index as the market benchmark for the US market. The Dow Jones global world emerging index and Dow Jones global world developed index (excluding the US) are used as market benchmarks for the emerging and developed markets, respectively.

The daily abnormal return (AR_{it}) of the market model is estimated using the following procedure:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \quad (1)$$

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are OLS values estimated over a 90-day period, from day -130 to -41 before the event. The 90-day estimation period follows Liu *et al.* (2020a) and Ho *et al.* (2022). The estimates of α_i and β_i are obtained by equation (2):

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (2)$$

For each given day t during the event window, the cross-section average AR_t is calculated as:

$$AR_t = 1/n \sum_{i=1}^{N} AR_{it} \quad (3)$$

where *n* denotes the total number of indices. The CAR is calculated over a particular event period as below:

$$CAR_{(t_1,\, t_2)} = \sum_{t=t_1}^{t_2} AR_t \tag{4}$$

To test the significance of AR_t, the AR_{it} is divided by its estimated standard deviation, $S(AR_{it})$ to derive a standardized abnormal return, AR'_{it}.

$$AR'_{it} = \frac{AR_{it}}{S(AR_{it})} \tag{5}$$

where $S(AR_{it}) = \sqrt{\left(\frac{1}{90-1}\right)\sum_{T_1}^{T_2}(AR_{it} - AR_i^*)^2}$ and $AR_i^* = \frac{1}{90}\sum_{t_1}^{t_2} AR_{it}$, where T_1 and T_2 denote the beginning and ending days of the estimation window. The *t*-test statistic for any specific day is:

$$T_t = \left(\sum_{i=1}^{N_t} AR'_{it}\right) * (N_t)^{-1/2} \tag{6}$$

The *t*-test for CAR is as below equation:

$$t(CAR_w) = \frac{\widehat{CAR}_w}{\sigma(CAR_w)\sqrt{N}} \tag{7}$$

where the $\sigma(CAR_w)$ is the standard deviation and $\widehat{CAR}_w$ is the cross-sectional average of the CAR for a particular window, *w*.

The CARs are calculated over various event windows: (-35, -1), (-10, 10), (0, 30) and (0, 60), where 0 denotes the day of the WHO announcement. The event windows are chosen to capture the pre-event (-35, -11) period, and the short-term (-10, 10), the intermediate-term (0, 30) and the longer-term (0, 60) effect of the announcement.

This study also extends the analysis to examine factors that may influence the degree of impact of the pandemic on stock returns, as shown by the CARs. For this analysis, we run the following regression model:

$$\begin{aligned} CARs_{(t1,t2)} = {} & \beta_0 + \beta_1(EMD) + \beta_2(Small\text{-}capD) + \beta_3(EMD{*}Small\text{-}capD) \\ & + \beta_4(LnMV) + \beta_5(International\ exposure) + \varepsilon_t \end{aligned} \tag{8}$$

where $CARs_{(t1,t2)}$ is the cumulative abnormal returns of the specified windows. *EMD* is the emerging market dummy variable that carries the value of 1 if the index is from an emerging stock market and 0 otherwise, *Small-capD* is the dummy variable and equals 1 for small capitalization index and 0 otherwise, *EMD*Small-capD* dummy is an interaction variable, *LnMV* is the natural logarithm of stock market capitalization, and *International exposure* is the sum of total exports and imports divided by the total GDP of the country for the year 2019.

4. Results

4.1 Daily Returns Analysis

Table 2 presents the daily average abnormal returns (ARs) and cumulative abnormal returns (CARs) around the event date (day 0), for the developed markets and emerging markets, and, within each market, for the large-firm index and the small-firm index. The CARs are also drawn in Figure 1. Day 0 is the day of the WHO announcement (11 March 2020) declaring COVID-19 as a global pandemic. Our event window starts on day -35, which corresponds with the announcement of the Wuhan coronavirus outbreak (23 January 2020). Table 2 shows that on this day (day -35) there do not seem to be much reaction in the stock market, except for the small firm index of the emerging markets. Five days after that, on 30 January 2020 (day -30), WHO made an announcement declaring COVID-19 as a public health emergency of international concern (PHEIC). The table shows that all ARs are significantly negative on this day. As can be seen in Figure 1, from day -35 to about day -10, there is a mild reaction in the world stock markets, with some markets even showing a positive trend, particularly the large firms in developed markets, while the small companies in emerging markets seem to show a mild decline. On the whole, it seems that global markets are not taking serious heed of the Wuhan coronavirus outbreak announcement or the WHO's PHEIC announcement.

Our main focus in Table 2 is the daily movements of stock prices within the window (-10, 10) that captures the short-term market movements around the WHO's 11 March 2020 announcement. As can be seen in Table 2, as well as in Figure 1, there is a clear downward movement for all the markets over the (-10, 10) window. It can be assumed that by day -10, the disease has spread to other geographical areas and our results show that stock markets around the world are beginning to show negative reactions to the pandemic. The downward trend continues for about 20 days, until day +10. We also notice that there is a significant drop for all markets on day 0, which is the WHO announcement day. Table 2 shows that within the short-term window (-10, 10) there are more negative ARs than those with positive signs and without exception all the significant ARs are negative. The large drops in all markets within this window could be due to the market reactions to the immediate lockdowns implemented by many countries.

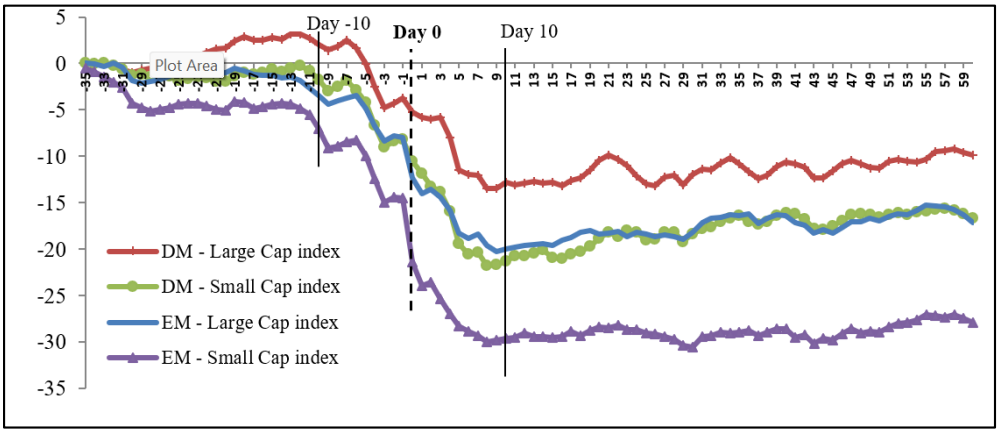
Across Table 2, we can see that the impact of the WHO announcement is felt greatly by emerging markets, showing the largest single day drop on day 0 in the entire window. But for developed markets the day 0 drop is rather mild. Table 2 and Figure 1 also clearly indicate that emerging stock markets are much more negatively impacted compared to developed markets. Within the developed and emerging markets, small firms seem to suffer greater negative returns than large firms. This is consistent with the findings of prior studies on the vulnerability of small firms compared to large firms. In sum, our short-term results indicate that there is a clear global negative reaction of stock markets around the world to the COVID-19 global pandemic announcement by WHO.

Figure 1 also captures market movements in the intermediate-term (0, 30) and in the longer-run (0, 60). The Figure shows that the longer-run effect of the pandemic seems to be fading away shortly after day 10. The graphs show that after day 10, stock markets remain more or less stable with a slight uptrend until the end of our study window. Looking at Table 2, day 60 CARs are lower than day 10 CARs, which indicates that most markets are on a recovery trend, possibly due to the many incentives and initiatives taken by governments around the world to revive their respective economies.

Table 2: Daily ARs and CARs of developed and emerging markets, large-firm and small-firm indices

Day	Panel A: Developed markets				Panel B: Emerging markets			
	Large market cap		Small market cap		Large market cap		Small market cap	
	AR	CAR	AR	CAR	AR	CAR	AR	CAR
-35	0.034	0.034	0.046	0.046	0.028	0.028	-0.519**	-0.519
-30	-0.394***	-0.983	-0.677**	-1.290	-1.479*	-1.876	-1.678**	-4.261
-20	0.088	1.622	-0.023	-1.940	0.105	-0.991	-0.099	-5.046
-10	-0.626*	2.067	-0.933**	-1.736	-0.769*	-3.487	-1.490**	-7.037
-9	-0.651**	1.417	-1.221***	-2.957	-0.877**	-4.364	-2.101***	-9.138
-8	0.402	1.819	0.496	-2.460	0.336	-4.028	0.241	-8.897
-7	0.656	2.474	0.593	-1.867	0.263	-3.765	0.483	-8.414
-6	-0.783***	1.692	-1.015***	-2.882	0.309	-3.455	0.162	-8.252
-5	-1.706***	-0.015	-1.338**	-4.220	-1.430***	-4.886	-1.719**	-9.971
-4	-2.506***	-2.520	-2.413***	-6.633	-1.898***	-6.784	-2.484***	-12.455
-3	-2.296***	-4.816	-2.396***	-9.029	-1.567***	-8.351	-2.521***	-14.977
-2	0.553	-4.263	0.693	-8.336	0.534	-7.817	0.581	-14.396
-1	0.547	-3.716	0.122	-8.215	-0.156	-7.973	-0.140	-14.536
0	-1.534*	-5.250	-2.304**	-10.518	-4.369***	-12.342	-6.843***	-21.379
1	-0.604	-5.854	-1.331*	-11.849	-1.717**	-14.059	-2.565**	-23.944
2	-0.168	-6.022	-1.376*	-13.225	0.548	-13.511	0.357	-23.587
3	0.222	-5.800	-0.647	-13.872	-0.913	-14.424	-1.804***	-25.391
4	-2.165**	-7.965	-2.075***	-15.947	-1.372**	-15.796	-1.569***	-26.961
5	-3.525*	-11.49	-3.462***	-19.409	-2.499***	-18.295	-1.362***	-28.322
6	-0.431	-11.921	-1.116	-20.525	-0.512	-18.807	-0.507	-28.830
7	-0.150	-12.071	0.167	-20.359	0.419	-18.387	-0.518	-29.347
8	-1.361***	-13.432	-1.427***	-21.786	-1.194**	-19.581	-0.638**	-29.985
9	-0.048	-13.481	0.103	-21.683	-0.690	-20.271	0.160	-29.825
10	0.639	-12.842	0.367	-21.316	0.258	-20.014	0.252	-29.573
20	1.084***	-10.394	0.822**	-18.866	-0.381	-18.332	0.343	-28.401
30	1.111**	-11.941	0.810	-18.365	0.667**	-18.227	-0.140	-30.533
40	0.408*	-10.661	0.323	-16.079	-0.054	-16.397	-0.019	-28.612
50	-0.065	-11.307	-0.236	-16.532	-0.318	-17.004	-0.010	-28.912
60	-0.303	-9.883	-0.467*	-16.696	-0.869**	-17.127	-0.504	-27.940

Notes: Large market cap and small market cap denote large and small market capitalizations, respectively. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively.



Notes: Day 0 denotes the (11 March 2020) WHO announcement.

Figure 1: CARs for developed and emerging markets, large-firm and small-firm indices

4.2 CARs Analysis

Table 3 presents the results on CARs for various sub-windows. The windows are designed to cover market reactions in the pre-event period, in the short-run period around the announcement, and in the longer-run period after the announcement. In the pre-event period, as shown by CAR (-35, -11), the developed markets are doing better than the emerging markets in response to the Wuhan coronavirus outbreak. In fact, the large companies in the developed markets are showing positive returns. It seems the developed markets are not really concerned about the disease, particularly investors of large companies. However, market reactions among emerging markets are entirely different; both large and small firms react negatively, more so for small firms. Columns 7 and 8 of Table 3 show our analysis on the difference between developed markets and emerging markets for large firms and small firms, respectively. The results clearly show that emerging markets suffered a greater loss in market value compared to developed markets, both for large as well as for small firms. This means developed markets are more resilient facing the onslaught of COVID-19 pandemic.

The short-term period around the WHO announcement is represented by CAR (-10, 10). It can be seen during this period, all markets are suffering great losses. As we have presented in the previous section, beginning from day -10, which is about 2 weeks before the WHO's announcement, markets are already showing negative reaction. The negative reaction of the markets continues rapidly after day 0 due to many countries taking immediate action by implementing lockdown measures in an effort to prevent the spread of the disease. Our results show that the biggest losers are the small firms in emerging markets, followed by small firms in the developed markets. The difference in the losses between small firms and large firms is statistically significant in both the developed and emerging markets. Large firms seem to be less affected compared to small firms in both, developed and emerging markets. Firm size seems to play a critical role in determining the extent of losses suffered by the companies. Comparing developed versus emerging markets for large and small firms, column 7 and 8 show that developed markets suffered less compared to emerging markets during the 20 day period around the WHO announcement. Although all markets suffered a great loss in value during this short-term period, it seems that emerging markets are clearly more vulnerable.

After the announcement we focus on market recoveries in the intermediate period CAR (0, 30) and the longer-term period CAR (0, 60). For the CAR (0, 30) the results indicate that there is some amount of recovery in the market indices. The net cumulative abnormal losses are lowest in the developed markets. Comparing the CAR figure of days (-10, 10) and days (0, 30) the largest recovery is the small firms index in the developed markets, recovering about 10% of the losses incurred in the CAR (-10, 10) window, followed by small firms in emerging markets. Market recoveries during the days (0, 30) may be due to market overreaction during the WHO announcement, as well as due to various incentives implemented by governments to revive their economies. In the longer-term period, the CAR (0, 60) shows they are still negative indicating that the world stock markets have not fully recovered three months after the WHO announcement. However, there are signs of further recovery in the last 30 days in our study period because all the CARs (0, 60) are less negative than CARs (0, 30). As for the firm size effect, the results show that small firms recover faster than large firms in both developed and emerging markets. Between markets it our results show that developed markets demonstrate faster recoveries than emerging markets, for both large-cap and small-cap indices.

Overall, our negative results on the short-term market reaction to the pandemic announcement are consistent with many prior studies, such as Singh *et al.* (2020), He *et al.* (2020b), Rahman *et al.* (2021), and Huo and Qiu (2020). Our results on the market recovery in the intermediate and longer-run periods are also consistent with the findings of Topcu and

Gulal (2020), and Singh *et al.* (2020). We also document unambiguously that emerging markets are more affected compared to developed markets and that small firms are worse affected compared to large firms. These results are in line with the findings of Harjoto *et al.* (2021a). These findings support the argument of Tran *et al.* (2018) that unexpected shock adversely affects emerging stock markets. Our evidence is also consistent with the argument that the effect of an adverse event is greater on small stocks (Lanfear *et al*., 2019).

Table 3: CARs around WHO announcement (11 March 2020)

Event window	Panel A: Developed markets			Panel B: Emerging markets			(1)-(4)	(2)-(5)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Large-cap	Small-cap	Diff	Large-cap	Small-cap	Diff	Diff	Diff
CAR	2.693***	-0.802	3.495***	-2.718***	-5.546***	2.828**	5.411***	4.744***
(-35, -11)	(3.729)	(-0.931)	(3.109)	(2.973)	(-6.189)	(2.209)	(3.220)	(4.780)
CAR	-15.536***	-20.514***	4.978**	-17.296***	-24.027***	6.731**	1.760*	3.513**
(-10, +10)	(-5.058)	(-6.039)	(1.994)	(-4.782)	(-5.640)	(2.022)	(1.815)	(2.190)
CAR	-8.224**	-10.150***	1.926	-10.254**	-16.016***	5.762	2.030***	5.866***
(0, +30)	(-2.067)	(-2.649)	(0.494)	(-2.363)	(-3.048)	(1.169)	(2.374)	(4.745)
CAR	-6.166	-8.481**	2.315	-9.153*	-13.404**	4.251	2.987***	4.923***
(0, +60)	(-1.496)	(-2.311)	(0.563)	(-1.792)	(-2.005)	(0.723)	(3.341)	(3.098)

Notes: Large-cap and small-cap denote large and small market capitalizations. Figures in parentheses are *t*-statistics. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Column 7 shows the difference between large-cap developed markets and large-cap emerging markets. Column 8 shows the difference between small-cap developed markets and small-cap emerging markets.

4.3 Regression Results

In this section, we extend the analysis to examine possible factors that may influence the impact of COVID-19 on stock returns. We run the OLS multiple regression Equation (8) cross-sectionally with CARs for various windows as dependent variables. The independent variables are chosen based on a survey of previous studies on the possible factors that can influence CARs. Specifically, this analysis focuses on four factors; these are: (1) developed versus emerging markets, (2) large versus small firms, (3) size of stock market capitalization, and (4) the extent of the country's international trade exposure. Our results are presented in Table 4. The mean-centred variance inflation factor (VIF) for the independent variables specified is 2.07. This indicates that there is no collinearity issue in the regression model.

In Table 4 we find that the dummy variable for emerging market (EMD) has a negative coefficient for all CARs. This means emerging markets are more severely impacted than developed markets. Hence emerging markets is an important factor determining the impact of COVID-19 pandemic on stock prices. As for firm size, the coefficient for small-capD dummy and for the interaction term, EMD*Small-capD, are negative for pre-event (-35, -11) and short-term (-10, 10) CARs, but insignificant for the intermediate-term (0, 30) and longer-term (0, 60) CARs. This means small firms are more severely affected compared to large firms, and more so for emerging markets. Hence firm size is an important factor during the early stage of the pandemic, possibly due to increased uncertainty especially for small firms.

The third factor analysed in the regression is the stock market valuation, which is a proxy for stock market size. It is expected that large markets are better able to withstand systemic events such as the COVID-19 pandemic. Table 4 shows that the coefficients for stock market size (LnMV) are significantly positive for all regressions, which means that market size would reduce the negative impact of the pandemic on stock values. The last factor analysed is the international exposure. Table 4 shows that international exposure is insignificant for the pre-event CAR, it is negative for short-term CAR (-10, 10) but it is positive for CAR (0, 30) and CAR (0, 60). The results indicate that international trade

exposure would worsen the impact of the pandemic when it was first announced. But after the initial shock, international trade exposure helps to recover from previous losses. This finding is consistent with Au Yong and Laing (2021) who argue that countries with higher trade openness or companies with greater international exposure are more able to withstand the impact of the global pandemic in the longer-run due to the benefits of geographical diversification.

In summary, our analysis indicates that four factors are important in determining the severity of the impact of COVID-19 pandemic on the stock market in the short-run; these are: stages of economic development, firm size, size of stock market, and country's international trade exposure. During the recovery period, it is found that only three factors are significant: stages of economic development, size of stock market and country's international trade exposure.

As a robustness check to our OLS regression, and following Liu *et al.* (2020a), we rerun the regression using feasible generalized least squares (FGLS) estimation with heteroscedastic error correction. The results (not presented) are qualitatively similar to the OLS results presented in Table 4.

Table 4: Regression results

	(1) CAR(-35,-11)	(2) CAR(-10,+10)	(3) CAR(0,30)	(4) CAR(0,60)
EMD	-6.045***	-6.154**	-3.522***	-5.928**
	(0.858)	(2.489)	(1.197)	(2.842)
Small-capD dummy	-1.642**	-4.021**	-2.916	-2.928
	(0.915)	(1.966)	(3.562)	(2.842)
EMD*Small-capD dummy	-3.178**	-3.739*	-5.285	-1.611
	(1.162)	(2.070)	(4.751)	(1.176)
LnMV	0.482*	4.903***	2.848*	4.393**
	(0.257)	(1.322)	(1.740)	(1.971)
International exposure	0.433	-1.024*	1.794**	1.212**
	(0.546)	(0.554)	(0.869)	(0.535)
Intercept	6.589**	-31.125***	-18.210	-18.425
	(2.948)	(10.024)	(13.192)	(16.615)
R-squared	0.527	0.355	0.243	0.189
F-statistic	13.926***	5.834***	3.405**	2.463**
N	60	60	60	60

Notes: Figures in parentheses are standard errors. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

5. Conclusion

On 11 March 2020, the World Health Organization (WHO) officially announced that COVID-19 was considered a global pandemic. This study examines the impact of this announcement on stock markets around the world. Specifically, we select 30 world's largest stock markets for analysis, consisting of 18 markets in developed countries and 12 markets in emerging economies. This study focuses on the differences in the market reaction in developed versus emerging markets as well as by firm size. Our study also analyses several factors that may influence the impact of COVID-19 on stock returns in the short-run and intermediate-run. This study uses the standard event methodology and the market model, to analyse market reaction around the announcement.

Our findings indicate that the COVID-19 pandemic has a negative impact on stock market returns around the world. In the 20-days around the announcement (short-run period), evidence shows that all markets suffer great losses, with emerging markets losing more than developed markets. Within the developed and emerging markets, small firms seem to suffer greater negative returns than large firms. In the longer-run, the study finds that all markets are recovering from the initial losses, but that the net effect is still negative.

The results show that developed markets recover faster than emerging markets. Our cross-sectional multiple regressions reveal that stock markets in developed countries and markets with large capitalization are better able to cope with the pandemic compared to markets in emerging countries and smaller capitalization markets. The results also show that larger firms suffer less than smaller firms in the short-term. Country's international trade exposure is an interesting factor. We find that international exposure hurts stock markets in the short-term, but helps in market recovery in the intermediate and longer-term.

This study has several practical implications. Firstly, the findings suggest that emerging markets are worse affected than developed markets. The implication is that the authorities of emerging markets should take the necessary steps to strengthen themselves, particularly in areas that lead to their vulnerability to international shocks such as the COVID-19 pandemic. Secondly, our results indicate that large firms are more resilient than small firms. The size effect is present in both the developed and emerging markets. Being small means increased vulnerability. The implications for the management of small firms are to focus on the company's strength to develop resilience to the pandemic. Thirdly, the results show that international diversification contributes positively to the market's recovery. Countries that are more open in terms of international trade should stand to benefit from this finding. This has implications for governments as well as for individual companies as proper diversification strategies will help cushion the impact of pandemics as well as help in the recovery stages. Lastly, the findings have practical implications for investors. It is clear from our results that markets are negatively affected, particularly in the short-run period. The worse hit are emerging markets and small firms. These findings represent an opportunity to investors who can take positions in appropriately selected stocks. These shares are due to recover as the pandemic subsides and recovery plans take effect.

One possible extension of this study is to focus on government incentives and recovery plans. In facing this systemic calamity, all governments have devised and implemented various recovery plans in their efforts to revive the economy. However, our analysis reveals that only partial recovery took place after three months. For further studies, an event-study methodology may be adopted focusing on the effectiveness of the plans. The extent of the effectiveness of the incentive plans will provide important feedback to authorities concerned in planning follow-up strategies. Another possible extension of this research is to look at the long-term recovery phase. The question of interest is how long does it take for the markets to fully recover from the impact of the COVID-19 pandemic? In this paper, our analysis runs for only 60 days after the event. Future research on this issue should consider a much longer period for analysis, for example, over a one to two-year calendar period, in order to capture the actual recovery phase of the markets. Analysis may also be made to determine the micro and macro factors that contribute to the recovery of these companies.

References

Arellano, C., Bai, Y., & Mihalache, G. P. (2020). *Deadly debt crises: COVID-19 in emerging markets* (No. w27275). National Bureau of Economic Research.

Au Yong, H. H., & Laing, E. (2021). Stock market reaction to COVID-19: evidence from U.S. firms' international exposure. *International Review of Financial Analysis*, *76*, 101656.

Badhani, K. N., Kumar, A., Vo, X. V., & Tayde, M. (2023). Do institutional investors perform better in emerging markets?. *International Review of Economics & Finance*, *86*, 1041-1056.

Bannigidadmath, D., Narayan, P. K., Bach Phan, D. H., & Gong, Q. (2021). How stock markets reacted to COVID-19? Evidence from 25 countries. *Finance Research Letters*, *45*, 102161.

Bayraktar, N. (2014). Measuring relative development level of stock markets: Capacity and effort of countries. *Borsa Istanbul Review*, *14*(2), 74-95.

Bhagat, S., Malhotra, S., & Zhu, P. (2011). Emerging country cross-border acquisitions: Characteristics, acquirer returns and cross-sectional determinants. *Emerging Markets Review, 12*(3), 250-271

Djankov S., & Panizza, U. (2020). *COVID-19 in developing economies*. CEPR Press.

ElBannan, M. A. (2017). Stock market liquidity, family ownership, and capital structure choices in an emerging country. *Emerging Markets Review, 33*, 201-231.

Fernandes, N. (2020). *Economic effects of coronavirus outbreak (COVID-19) on the World Economy* (IESE Business School Working Paper No. WP-1240-E). Retrieved from SSRN: https://ssrn.com/abstract=3557504

Harjoto, M. A., Rossi, F., & Paglia, J. K. (2021a). COVID-19: stock market reactions to the shock and the stimulus. *Applied Economics Letters, 10*, 795-801.

Harjoto, M. A., Rossi, F., Lee, R., & Sergi, B. S. (2021b). How do equity markets react to COVID-19? Evidence from emerging and developed countries. *Journal of Economics and Business, 115*, 105966.

He, P., Sun, Y., Zhang, Y., & Li, T. (2020a). COVID-19's impact on stock prices across different sectors – An event study based on the Chinese stock market. *Emerging Markets Finance and Trade, 56*(10), 2198-2212.

He, Q., Liu, J. Y., Wang, S. Z., & Yu, J. H. (2020b). The impact of COVID-19 on stock markets. *Economic and Political Studies, 8*(3), 275-288.

Ho, K. C., Gao, Y., Gu, Q., & Yang, D. (2022). COVID-19 vaccine approvals and stock market returns: The case of Chinese stocks. *Economic letters, 215*, 110466.

Hsiang, S., Allen, D., Annan-Phan, S., Bell, K., Bolliger, I., Chong, T., ... & Wu, T. (2020). The effect of large-scale anti-contagion policies on the COVID-19 pandemic. *Nature, 584*(7820), 262-267.

Huo, Z. L., & Qiu, Z. G. (2020). How does China's stock market react to the announcement of the COVID-19 pandemic lockdown?. *Economic and Political Studies, 8*(4), 436-461.

Khanna, T., & Palepu, K. G. (1997). Why focused strategies may be wrong for emerging markets. *Harvard Business Review, 75*, 41-51.

Khanna, T., Palepu, K. G., & Sinha, J. (2015). Strategies that fit emerging markets. In *International Business Strategy* (pp. 615-631). Routledge.

Lanfear, M. G., Lioui, A., & Siebert, M. G. (2019). Market anomalies and disaster risk: evidence from extreme weather events. *Journal Financial Markets, 46*, 1-29.

Liu, H. Y., Manzoor, A., Wang, C. Y., Zhang, L., & Manzoor, Z. (2020a). The COVID-19 outbreak and affected countries stock markets response. *International Journal of Environmental Research and Public Health, 17*, 2800.

Liu, H. Y., Wang, Y. L., He, D. M., & Wang, C. Y. (2020b). Short term response of Chinese stock markets to the outbreak of COVID-19. *Applied Economics, 52*(53), 5859-5872.

McKibbin, W., & Fernando, R. (2021). The global macroeconomic impacts of COVID-19: Seven scenarios. *Asian Economic Papers, 20*(2), 1-30.

Mishra, A. K., Rath, B. N., & Dash, A. K. (2020). Does Indian financial market nosedive by COVID-19 outbreak in comparison to post-implementation of demonetization and GST?. *Emerging Markets Finance and Trade, 56*(10), 2162-2180.

North, D. C. (1990). *Institutions, institutional change and economic performance.* Cambridge, MA: Cambridge University Press.

North, D. C. (2005). *Understanding the process of economic change.* Princeton, NJ: Princeton University Press.

Rahman, M. L., Amin, A., & Al Mamun, M. A. (2021). The COVID-19 outbreak and stock market reactions: Evidence from Australia. *Finance Research Letters, 38*, 101832.

Sayed, O. A., & Eledum, H. (2021). The short-run response of Saudi Arabia stock market to the outbreak of COVID-19 pandemic: An event-study methodology. *International Journal of Finance and Economics*, *28*(3), 1-15.

Singh, B., Dhall, R., Narang, S., & Rawat, S. (2020). The outbreak of COVID-19 and stock market responses: An event study and panel data analysis for G-20 countries. *Global Business Review*, 1-26.

Topcu, M., & Gulal, O. S. (2020). The impact of COVID-19 on emerging stock markets. *Finance Research Letters*, *36*, 101691.

Tran, L. T. H., Hoang, T. T. P., & Tran, H. X. (2018). Stock liquidity and ownership structure during and after the 2008 Global Financial Crisis: Empirical evidence from an emerging market. *Emerging Markets Review*, *37*, 114-133.

World Health Organization. (2020). *Coronavirus disease (COVID-19) dashboard (2020)*. Retrieved from https://covid19.who.int

Yan, C. (2020). COVID-19 Outbreak and stock prices: Evidence from China. *Available at SSRN 3574374*.