INTERNATIONAL REAL ESTATE REVIEW

2023 Vol. 26 No. 3: pp. 267 – 298

From Outbreak to Vaccination: An Analysis of the Commercial Property Market Reaction to COVID-19 in Malaysia

Wong, Woei Chyuan*
School of Economics, Finance & Banking, Universiti Utara Malaysia Kedah, Malaysia. E-mail: wwchyuan@uum.edu.my

Che Johari, Edie Erman
School of Economics, Finance & Banking, Universiti Utara Malaysia Kedah, Malaysia. E-mail: edie@uum.edu.my

Mohd Khan, Shazida Jan
School of Economics, Finance & Banking, Universiti Utara Malaysia Kedah, Malaysia. E-mail: sjmohd@uum.edu.my

Mohd Daud, Siti Nurazira
School of Economics, Finance & Banking, Universiti Utara Malaysia Kedah, Malaysia. E-mail: sitinurazira@uum.edu.my

Mat Yusoff, Mohd Yushairi
School of Economics, Finance & Banking, Universiti Utara Malaysia Kedah, Malaysia. E-mail: mohdyushairi@uum.edu.my

Musaddad, Hafirda Akma
Faculty of Management and Information Technology, Universiti Sultan Azlan Shah, Kuala Kangsar, Malaysia. E-mail: hafirda_akma@usas.edu.my

This paper examines the impact of the COVID-19 pandemic on the performance of the commercial property market in Malaysia. Differing from previous studies that focus on the first wave of COVID-19 that erupted in March 2020, we examine how the commercial property market reacted to the resurgence of COVID-19 cases and the subsequent response (lockdowns, fiscal support, and vaccination program) of the government in dealing with the threat of the COVID-19 pandemic. We find that abnormal returns of listed property companies,

* Corresponding Author

REITs, and hotel operators decrease following the implementation of the first nationwide lockdown. Subsequent nationwide lockdowns, however, do not exert a significant impact on abnormal returns. Moreover, we find that 1-day window abnormal returns during the first and third nationwide lockdowns increase with increases in COVID-19 cases. This suggests that investors believe in the ability of these nationwide lockdowns to slow down the spread of the COVID-19 virus. In addition, we document a positive impact of blanket loan moratorium announcements and change in vaccination rate on abnormal returns. The economic magnitude of the stock price changes in response to these announcements could be used as a reference point by policymakers and investors when faced with future pandemics of a similar scale.

Keywords

COVID-19, Lockdowns, Vaccination, Commercial properties, Malaysia

1. Introduction

The global economy and international travel came to a halt in March 2020 when governments worldwide started to impose various forms of lockdowns to stop the spread of the COVID-19 virus. This was a year of fear and uncertainty prior to the discovery of the first COVID-19 vaccine, Pfizer-BioNTech, on 2 December 2020. Worldwide GDP growth contracted by -3.29% in 2020.[1] The number of flights undertaken by the global airline industry dropped by 41.9% (per annum (p.a.)) to 16.9 million in 2020.[2] Foreign direct investment (FDI) dropped by 18.1% during the same period.[3] Similar figures were also observed in the performance of commercial markets; in particular, the hotel and retail sectors were severely affected by the lockdown restrictions. Total returns for these property types in the US, as proxied by the National Council of Real Estate Investment Fiduciaries (NCREIF) index, dropped by 25.6% and 7.5% in the year 2020 p.a.[4] In Malaysia, the total property transaction volume and value dropped by -27.9% and -31.5%, respectively, during the first half of 2020 as compared to 2019.[5]

[1] Available at https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG
[2] Available at https://www.statista.com/statistics/564769/airline-industry-number-of-flights/
[3] Available at https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS
[4] Based on NCREIF property return index for hotel and retail properties from Datastream.
[5] Available at https://napic.jpph.gov.my/portal

There is a burgeoning stream of academic literature that is attempting to quantify the negative impact of the COVID-19 pandemic on the real economy and financial markets.[6] The exogenous and unpredictable nature of COVID-19 allows researchers to cleanly establish the impact of this health crisis on the performance of various market indicators of their interest. This unique setting also allows researchers to gauge which market or firm characteristics tend to immunize against or mitigate the negative effects of a crisis (Ramelli and Wagner, 2020; D'Lima et al. 2022). Most of the stock market studies were published during the first wave of COVID-19 between January 2020 to June 2020. These studies do not consider the resurgence of cases, the subsequent government lockdowns and fiscal policies, or, more importantly, the impact of vaccination programs on stock price returns. An exception is Apergis (2022), who considers the impact of the COVID-19 vaccination program on house prices in the US.

Three years later, as of February 2023, 64% of the world population is fully vaccinated.[7] Denmark became the first European country to lift all COVID-19 restrictions on 1 February 2022, despite its high infection rate per capita at the time.[8] China, on the other hand, became the last country to discard its strict "zero-COVID" policy in December 2022. All of these recent developments set the stage for a more complete analysis of the evolution of the impact of COVID-19 beyond the first wave in March 2020.

The initial fear and uncertainty regarding COVID-19, as expected, have decreased over time as people are more prepared for new COVID-19 waves given the availability of COVID-19 vaccines, government fiscal support and more familiarity with restriction rules. We intend to quantify this change in the reaction to the COVID-19 threat by focusing on the performance of the commercial property market in Malaysia. This information is important for policymakers and investors to predict the negative impact of future pandemics of a similar scale to COVID-19 on the commercial property market. The lockdown coefficient values in a regression analysis further allow stakeholders to assess the cost and benefits of implementing lockdown policies during a pandemic.

The study period covers four nationwide lockdowns and the rollout of government assistance and vaccination programs. To the best of our knowledge,

[6] The literature has examined the impact of COVID-19 on employment rate (Coibion et al., 2020), consumption patterns (Chen et al., 2021), mutual fund performance (Pastor and Vorsaltz, 2020), treasury yields (He et al., 2020), stock market performance (Alfaro et al. 2020; Gormsen and Koijen, 2020), bond and equity issues (Halling et al., 2020), and use of digital real estate platforms (Shaheen Ali and Song, 2022).

[7] Available at https://ourworldindata.org/COVID-vaccinations?country=OWID_WRL

[8] Available at https://edition.cnn.com/2022/02/01/europe/denmark-lifts-COVID-restrictions-intl/index.html

no studies have considered the evolution of market reactions toward COVID-19 (from lockdowns to the introduction of a vaccination program) in a single regression equation.

Malaysia provides a cleaner test to examine the economic impact of lockdowns for the following reasons. First, unlike the US where the shutdown declaration (i.e., "Stay at Home" or "Shelter in Place") orders are in the hands of state governments, there are clear nationwide lockdown announcement dates that apply to all states in Malaysia. Declaration of the lockdown order (known as "Movement Control Order") is under the sole discretion of the federal government in Malaysia, and all states in Malaysia are subjected to the same set of lockdown restrictions during the nationwide lockdowns. This is different from the US, where a state can opt not to declare a shutdown order or declare such orders on a county basis, which covers a smaller area than a full state (see D'Lima et al., 2020, Table 1).

Second, the four nationwide lockdowns in Malaysia afford us the opportunity to examine the efficacy of and reaction to lockdown policies over time. This is not possible in the US, since statewide lockdowns were only implemented during March to June 2020. Third, unlike Western countries where lockdowns and the subsequent vaccination program received strong reactions (strikes) that could have contaminated the stock price returns, there has been no such massive aversion to lockdowns or the vaccination program in Malaysia. This is evidenced by the high vaccination rate of 81.1% in Malaysia as measured by percentage of fully vaccinated people as of January 2023.[9] This is much higher than the 69.2% rate in the US during the same period of time, even though the US started its vaccination program much earlier than Malaysia. In other words, the stock price return in Malaysia is more able to reflect the economic impact of lockdowns and government policy responses than uncertainty due to strikes.

In this paper, we choose to focus on the performance of the commercial property market in Malaysia during the COVID-19 pandemic period. Our sample consists of listed companies with significant ownership in commercial properties. These include real estate investment trusts (REITs), property companies with at least 30% investment properties over total assets, and hotel operators. The availability of location data for each property owned by these companies in annual reports allow us to construct a variable that captures the impact of COVID-19 by taking into consideration the severity of COVID-19 cases across the 16 states and federal territories in Malaysia. Following Ling et al. (2020), we construct a geographically weighted measure of COVID-19 cases at the firm-level to measure the severity of COVID-19. Commercial properties that provide in-person services (e.g., offices) and act as points of sale (e.g., shopping complexes and hotels) were forced to shut down during the lockdown

[9] Available at https://ourworldindata.org/COVID-vaccinations?country=MYS

period. This directly affected the cash-flow-generating ability (rental) of these companies, thus reducing the property value and share price.[10]

The rest of the paper proceeds as follows. Section 2 provides additional details on the COVID-19-related policies implemented by the Malaysian government. Section 3 reviews the extant literature and develops our testable hypotheses, while Sections 4 and 5 describe the methodology and data, respectively. Section 6 discusses our empirical results, and Section 7 concludes.

2. COVID-19 Policies in Malaysia

Table 1 shows important event dates related to the COVID-19 policies in Malaysia. The first COVID-19 case was detected on 25 January 2020. In less than two months, Malaysia was in lockdown due to the surge in COVID-19 cases in March 2020. The first nationwide lockdown order, known as the Movement Control Order (MCO) 1.0, was implemented on 18 March 2020. Similar to stay-at-home orders in other countries, this policy was designed to restrict movement of individuals and prohibit mass gathering.

Among the salient restrictions during the lockdown, individuals were not allowed to travel more than 10 km away from their home, and only two persons per household were allowed to leave their home to buy groceries. People were mandated to wear masks and register their location by using the Mysejahtera application when outside their residence. Most people were working from home while the country borders were closed to tourists and foreign visitors. Roadblocks were set up by the police, and armed forces were seen on major roads to ensure that the public followed the lockdown rules. All government and private services (including education institutions) were closed except for those involved in essential services.

The lockdown rules were later relaxed in May 2020 with the implementation of the Conditional Movement Control Order (CMCO) 1.0 and later, the Recovery Movement Control Order (RMCO) 1.0, which saw the reopening of most of the economic sectors. Instate travel was only allowed during RMCO 1.0 in June 2020. However, the country later reverted to a stricter RMCO 2.0 where instate travel was again prohibited, and subsequently to nationwide lockdowns (MCO 2.0, MCO 3.0 and FMCO) between May and June 2021 following a spike in COVID-19 cases. The government introduced a four-phase plan for different states in Malaysia based on infection rates, hospital usage and vaccination rates

[10] Note that we do not consider the direct commercial property market due to the lack of a commercial property index in Malaysia and the associated inefficiency associated with direct property indexes such as lagging errors and appraisal smoothing biases. There is only office rent index in Malaysia (Purpose Built Office Index) on a quarterly basis.

during the Full Movement Control Order (FMCO). This form of movement restriction eventually ended on 3 January 2022.

Table 1 COVID-19 Policies in Malaysia

Event	Start Date	End Date
Lockdown Order		
Movement Control Order 1.0 (MCO 1.0)	18 March 2020	3 May 2020
Conditional Movement Control Order 1.0 (CMCO 1.0)	4 May 2020	9 June 2020
Recovery Movement Control Order (RMCO)	10 June 2020	13 October 2020
Conditional Movement Control Order (CMCO 2.0)	14 October 2020	12 January 2021
Movement Control Order (MCO 2.0)	13 January 2021	4 March 2021
Conditional Movement Control Order (CMCO 3.0)	5 March 2021	6 May 2021
Movement Control Order (MCO 3.0)	7 May 2021	31 May 2021
Full Movement Control Order (FMCO)	1 June 2021 to 1 June 2021	14 June 2021
National Recovery Plan	15 June 2021	3 January 2022
Loan Moratorium		
Blanket moratorium	1 April 2020	30 September 2020
Targeted moratorium	1 October 2020	31 December 2020
Enhanced targeted moratorium	1 Dec 2020	30 June 2021
Second blanket moratorium	7 July 2021	31 Dec 2021
Government COVID-19 Stimulus Package		
Prihatin (caring) package worth RM250 billion	27 Mar 2020	
Short-Term Economic Recovery Plan (Penjana)	5 June 2020	
Vaccination Program		
First vaccination in Malaysia	24 February 2021	-
90% fully vaccinated adult population	10 October 2021	-
First vaccination for children aged 13-18	9 September 2021	
First vaccination for children aged 5-12	3 February 2022	

Notes: This table shows the dates of key events in this study. These dates are retrieved from various sources such as the Bank Negara Malaysia website, Association of Bank Malaysia, and local news online portal.

In March 2020, the Malaysian government provided financial aid to its citizens and businesses through economic stimulus packages (Prihatin and Penjana) and a loan moratorium to ease the financial burden on affected individuals and businesses and stimulate economic growth. The blanket moratorium announced on 25 March 2021 gave all borrowers in Malaysia, regardless of their loan type

and income status, a 6-month loan moratorium from commercial banks. The targeted and enhanced targeted moratorium implemented after the blanket moratorium was only offered to borrowers whose income was affected by COVID-19 subject to the approval of individual commercial banks. A second blanket loan moratorium was implemented on 1 July 2021 for all individuals and small medium enterprise (SME) borrowers in response to the reinstatement of a nationwide lockdown (MCO 3.0) in May 2021.

Meanwhile, the COVID-19 vaccination program started on 24 February 2021, more than a year after the country was hit by COVID-19. The vaccination rate progress is impressive by international standards. At the time of writing of this paper, 81.1% of the population (adult and children) in Malaysia has been fully vaccinated.

3. Literature Review and Hypothesis Development

Numerous studies have pointed out the unprecedented impact of COVID-19 on economic activity, unparalleled by previous financial or health crises in human history. Baker et al. (2020) show graphically that COVID-19 has exerted a significantly higher impact on stock returns and stock volatility in the US than other previous pandemics such as H5N1, SARS and MERS/Ebola. The authors argue that the main factor that led to the forceful reaction of the US stock market is the implementation of nonpharmaceutical policy intervention and lockdowns that are wider in scope, geography, and duration than any previous lockdowns. They also argue that the impact of these lockdowns outweigh the infectivity (or lethality) of COVID-19 in affecting the performance of the stock market.

Surprisingly, not many empirical papers have directly examined the impact of the announcement or implementation of lockdown restrictions on stock returns. This is partly due to the use of short estimation windows by previous studies surrounding the first COVID-19 wave. Exceptions are Ling et al. (2020) and D'Lima et al. (2022). These papers do not fully support Baker et al. (2020) that lockdowns are more significant than the COVID-19 infection rate in explaining asset returns. Ling et al. (2020) provide graphical evidence to support the negative impact of lockdown announcements on stock return. However, the lockdown dummy in their regression table is positive and strongly related to abnormal returns, thus suggesting that stock prices go up after the implementation of lockdowns. Using evidence from the housing market, D'Lima et al. (2022) do not find that lockdown orders in the US are related to house selling price, whereas COVID-19 infection rates are related. Nevertheless, the authors do find shutdown orders to be negatively related to sales transactions, thus implying lower sales volume during the lockdown period.

Both D'Lima et al. (2022) and Ling et al. (2020) find that the COVID-19 infection rate is negatively related to asset returns. This finding is echoed by Corbet et al. (2021), Alfaro et al. (2020), Milcheva (2022), Chatjuthamarad et al. (2021), Alzyadat and Asfoura, (2021), Hung et al. (2021), Anguera-Torrell et al. (2021) and Lee et al. (2020). Meanwhile, there is another strand of papers that interpret the negative impact of COVID-19 by comparing the performance of the asset of interest (property or shares) before and during the COVID-19 pandemic. This includes Allan et al. (2021), who focus on commercial property rent, Akinsomi (2020) and Chiu et al. (2020) on REIT indexes, Sinagl (2020) and Ramelli and Wagner (2020) on listed US firm performance, Chiu et al. (2020) on listed Mexico REITs, and Alam et al. (2020) on stock market indices in Australia. The above literature leads to the following testable hypotheses:

H1: COVID-19 lockdowns are negatively related to abnormal returns.
H2: The COVID-19 infection rate is negatively related to abnormal returns.

The market reaction or shocks that follow the implementation of subsequent nationwide lockdowns may decrease as people become more familiar with the lockdown restrictions. In the context of Malaysia, the first nationwide lockdown (MCO 1.0) brought about significantly more shocks and uncertainty to the market, as it was the first of its kind in the country and very restrictive as compared to subsequent MCOs. Moreover, the announcement of financial assistance for households and businesses only came 11 days after the MCO 1.0 announcement. This leads to the following testable hypothesis:

H3: MCO 1.0 leads to a larger reduction in abnormal returns than subsequent nationwide MCOs.

To mitigate shocks due to the implementation of lockdowns, governments resorted to various monetary and fiscal policy instruments to help households and businesses weather the health crisis. In Malaysia, the Prihatin economic stimulus packages worth RM295 billion[11] were launched between March to June 2020. These packages involved a wage subsidy program and special relief facility grants for businesses.[12] Under the direction of the Central Bank of Malaysia, commercial banks in Malaysia offered two rounds of 6-month blanket moratoriums in 2020 and 2021. We expect the market to react positively to these announcements, as they helped to alleviate financial distress faced by household and businesses. This leads to the following testable hypothesis:

H4: The announcement of government stimulus packages and loan moratoriums is positively related to abnormal returns.

There is an intense debate in the literature regarding the cost and benefits of implementing lockdown policies during the pandemic. The public health

[11] US$67.82 billion, based on exchange rate of US$1 =RM4.35 on 15 May 2020
[12] https://www.mof.gov.my/portal/arkib/news/2020/Mar/15.pdf

benefit of lockdowns is clear, as they help to contain the spread of COVID-19 and, hence, foster economy recovery. However, the cost of nationwide lockdowns is that they bring the national economy to a standstill, thus leading to widespread unemployment.[13] Ling et al. (2020) argue that the response of investors to the lockdown announcements can be used to assess the efficacy of these policies. Specifically, a lockdown policy is considered cost effective if investors respond less negatively to COVID-19 cases after the implementation of lockdown policies. Ling et al. (2020) find support for this argument with the use of US REIT data. D'Lima et al. (2022), however, find that house buyers impose a larger discount on houses located in states that impose lockdowns as COVID-19 cases increase. This leads to the following testable hypothesis:

H5: The negative impact of COVID-19 infection on abnormal returns decreases after the implementation of a lockdown policy.

Researchers have explored how certain firm and country characteristics immunize firms against the negative impact of COVID-19. Ramelli and Wagner (2020) find that US firms with more exposure to trade with China underperformed during the COVID-19 outbreak period. The authors also find firms with larger cash holdings and lower leverage performed better during COVID-19. In a similar vein, Chu et al. (2021) document that listed Chinese real estate firms with higher leverage report lower returns during the pandemic. These authors relate their results to the importance of cash and debt capacity (smaller leverage ratio) to ensure firms are in a better position to cope with the negative impact of COVID-19. In a similar vein, Acharya and Steffen (2020) and Halling et al. (2020) document that high-credit quality firms are more able to tap into the bond market during COVID-19 compared to low-credit quality firms. This leads to the following testable hypothesis:

H6: The negative impact of COVID-19 on abnormal returns is lower for firms with large cash holdings and lower leverage.

4. Methodology

We employ the event study methodology to calculate abnormal returns (dependent variables) used in the panel regression model. Event study is a commonly used method in the economics literature to examine the immediate effect of corporate or regulatory announcements on the market price of firms (Kothari and Warner, 2007). This methodology requires the calculation of the abnormal returns of firms that surround the event of interest. Investors will react either positively or negatively to the event based on their expectation of the impact of the event on firm prospects. If the event is beneficial to firms, firms

[13] The unemployment rate in Malaysia spiked to an all-time high of 4.55% in 2020 (2019: 3.3%).

will experience positive abnormal returns and vice versa. To this end, we first calculate the predicted returns of firms by using the "market model". The market model employs the return index of Financial Times Stock Exchange (FTSE) Bursa Malaysia Kuala Lumpur Composite Index (FBM-KLCI). This index comprises the 30 largest firms by market capitalization listed on Bursa Malaysia. The following is the model for estimating the predicted returns:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ are the daily stock returns for firm i on day t and $R_{m,t}$ are equally weighted FBM-KLCI index returns for day t. We estimate the model parameters by using daily returns data from 1 January 2019 to 24 January 2020, one day before the first COVID-19 case reported in Malaysia. We then calculate the daily abnormal returns of firms during January 2020 to June 2021 by subtracting the expected return obtained with Equation (1) from the actual return. Formally, we calculate the abnormal returns by using the following model:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t}) \quad (2)$$

The next step involves the use of the panel regression method to establish the magnitude of the COVID-19 pandemic, including infection rates and the announcement of government policies such as nationwide lockdowns (MCOs) and loan moratoriums on abnormal returns. The regression equations, designed as in Ling et al. (2020), are stated below:

$$\begin{aligned} Ret_{i,t} = {} & \alpha_{i,t} + \beta_1 GeoCOVID_{i,t} + \beta_2 MCO1_t + \beta_3 MCO2_t \\ & + \beta_4 MCO2_t + \beta_5 FMCO_t + \beta_6 Blanket_t \\ & + \beta_7 Targeted_t + \beta_8 Enhanced_t + \beta_9 DaySince_{i,t} \\ & + \beta_{10} GeoDensity_{i,t} + \beta_{11} PropHHI_{i,t} + \beta_{12} GeoHHI_{i,t} \\ & + \beta_{13} Controls_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

where $Ret_{i,t}$ are 1-, 2-, and 3-day abnormal returns of firm i on day t calculated by using the daily abnormal returns obtained with Equation (2). $GeoCOVID_{i,t}$ is the geographically weighted COVID-19 daily reported case growth rate of firm i at time t. Similar to Ling et al. (2020), GeoCOVID is a firm-level measure of geographically weighted COVID-19 growth that varies daily during our sample periods. This variable is the weighted average of the daily growth rates of COVID-19 cases in states in which the firm owns properties. The weights are the percentages of the firm portfolio (based on book value) allocated to each state prior to the pandemic outbreak at the end of 2019. Using this measurement rather than national-level COVID-19 cases provides us with more insight into how the effects of the pandemic are transmitted from the asset market to the capital market. For example, a firm with majority assets in the state of Penang would not experience the same impact of COVID-19 cases as a firm with majority assets in the state of Selangor due to the different numbers of cases reported in the two states. In addition to the COVID-19 cases, we also include

several important government policies such as movement control orders and loan moratoriums as proxies of COVID-19 to assess the impact of these events on firm returns.

In particular, $MCO1_t$, $MCO2_t$, $MCO3_t$, and $FMCO_t$ are the dummy variables that capture the period that surrounds the implementation of movement control orders in Malaysia. We consider 7 calendar days before and 7 calendar days after the commencement date of each MCO as the lockdown period. Similarly, we also include the dummy for all three moratoriums announced by the government throughout the sample period. The dates and durations of these events are given in Table 1. Graphical evidence of stock price returns that surround the implementation of lockdown policy in Ling et al. (2020) and our paper suggests that a shorter event window is better at capturing the response of investors toward the announcement/implementation of the lockdown. This approach is similar in spirit to Ramelli and Wagner (2020), who consider the short-term impact of the policy interventions of the Federal Reserve Board during short windows (i.e., 3 to 10 days after the announcement event). Table 2 presents the definitions of the variables in the regression models.

5. Data and Summary Statistics

Our sample consists of 40 Malaysian listed firms: REITs (18), property firms (12) and hotel operators (10). These listed firms are selected based on their high ownership of commercial properties, which makes their stock price performance a good proxy for commercial property market conditions. Note that for property firms, we only include those that own significant investment properties (i.e., at least 30% of their total assets) in 2019. We obtain the financial and stock price data of these firms from Thompson Reuters Datastream. COVID-19-related data, such as daily cases, daily deaths, and vaccination rate, are obtained from the COVIDNOW website of the Ministry of Health. The event dates related to the announcement of MCOs and moratoriums are obtained from various online news portals. Our data span the period from January 2019 to June 2021, which covers all four MCOs implemented by the government. Table 3 tabulates the summary statistics of the variables used in this study.

Table 2 Variable Definitions

Variable	Definition	Source
Ret (1-day)	Daily abnormal returns as calculated by using realized and expected returns generated from the market model	Datastream and own calculations
Ret (2-day)	Non-overlapping cumulative abnormal returns (CAR) from day t to day t+1	Datastream and own calculations
Ret (3-day)	Non-overlapping cumulative abnormal returns (CAR) from day t-1 to day t+1	Datastream and own calculations
GeoCOVID	Geographical exposure of a firm at state level on COVID-19 daily case growth weighted by asset portfolio of firms in states where they have operations.	MOH
MCOs	Dummy variables that measure the period of nationwide movement control orders implemented in Malaysia.	
Vaccination	Daily vaccination doses in 100,000 people	MOH
Days Since	Number of days since first the COVID-19 case detected in the state where firms own a property	MOH
GeoDensity	The average of state-level population density weighted by asset portfolio of firms in states where they have operations.	DOSM
GeoHHI	The Herfindahl-Hirschman indexes of property of each firm across states where it has operations.	Manually collected
Leverage	Ratio of debt to total assets as of 31 December 2019	Datastream
Cash	Ratio of cash and cash equivalents to total assets as of 31 December 2019	Datastream
Size	Natural log of total assets as of 31 December 2019	Datastream
Tobins q	The ratio of the market value of equity plus the book value of debt to the book value of total assets as of 31 December 2019	Datastream
LAG3MRET	Cumulative stock returns over 2019 (in percentage)	Datastream
EBITDA	EBITDA divided by total assets as of 31 December 2019	Datastream

Note: This table provides the definition and source of variables used in this study.

Table 3 Summary Statistics

	N	Mean	Std. Dev.	Min	Median	Max
Ret (1-day)	12951	-0.11	5.54	-60.79	-0.07	92.41
Ret (2-day)	9698	-0.19	6.99	-71.23	-0.10	113.96
Ret (3-day)	6774	-0.25	8.43	-80.68	-0.09	129.63
GeoCOVID	12951	0.04	0.61	-4.00	0.00	4.09
Days Since	12951	248.33	146.22	0.00	250.00	508.00
GeoDensity	12951	7.43	1.37	4.69	7.95	8.90
GeoHHI	12951	0.17	0.16	0.07	0.14	0.89
Leverage	12951	0.26	0.15	0.00	0.26	0.51
Cash	12951	0.04	0.06	0.00	0.01	0.23
Size	12951	21.16	1.60	17.81	21.14	25.35
Tobins q	12951	0.77	0.45	0.17	0.72	2.49
LAG3MRET	12951	0.03	0.19	-0.19	-0.01	1.00
EBITDA	12951	0.05	0.08	-0.09	0.05	0.52

Note: This table shows the summary statistics of variables used in this study.

6. Results and Discussion

6.1 Graphical Analysis

We begin our discussion by analysing the graphical trends of firm stock prices between January 2018 and July 2021. The vertical bars represent three nationwide lockdown periods (MCOs 1.0–3.0). Figure 1 plots the firm raw returns during this period by comparing the firm returns against the market returns represented by the FBM-KLCI. As shown, firm returns were quite stable before the pandemic hit the world in March 2020 and became more volatile thereafter. There is a noticeable steep decline in firm returns in March 2020, the month when the MCO 1.0 and the blanket loan moratorium were announced by the government. Interestingly, the announcements of the subsequent MCOs were also followed by drops in firm returns but at a much lower rate than the first MCO. This suggests that the investors reacted more negatively towards the first MCO than the other MCOs, thus supporting H3. This might be due to the newness of the MCO to the investors as well as the uncertainty that the MCO could bring to firms with regard to short- and long-term conditions.

Next, we plot the same trend, but this time, we split the sample into three different types of firms: REITs, property investment companies, and hotel operators. Figure 2 shows that the hotel sector was the most affected sector during the announcement of MCO 1.0, but in the subsequent MCOs, the difference in stock return does not differ much by firm type. This finding is consistent with Ling et al. (2020), Hoesli and Malle (2022), Akinsomi (2021)

and Ozdemir et al. (2021) who find that the hospitality and retail sectors experienced the steepest drops in abnormal returns during COVID-19 in the US and Europe. These property types rely heavily on international travel and foot traffic, and thus suffered the most from lockdowns.

Figure 1 Movement of Monthly Stock Returns of Sample Firms and FBM-KLC: January 2020 to June 2021

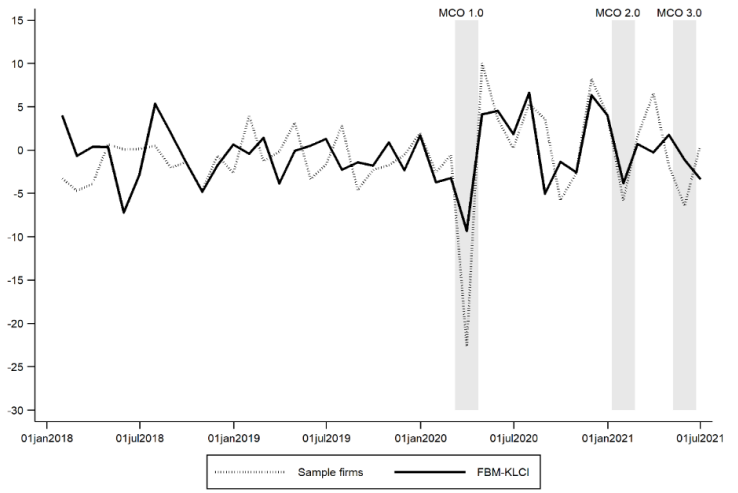


Figure 2 Movement of Monthly Stock Returns by Firm Type: January 2020 to June 2021

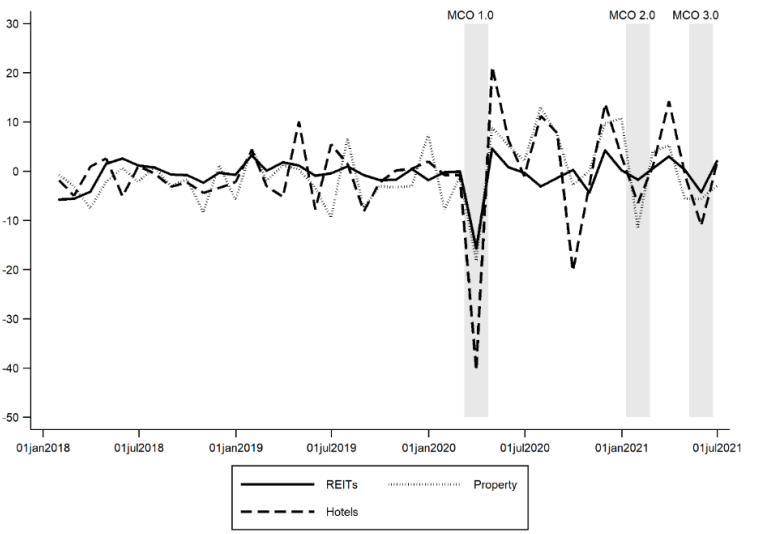


Figure 3 shows the evolution of the cumulative average abnormal returns (CAARs) that surround the four nationwide MCOs implemented in Malaysia. We zoom into the 7-day period before and after the implementation of these lockdown policies. As shown in Figure 3, MCO 1.0 shows the steepest drop in abnormal returns compared to the other MCOs. The CAAR drops from -0.07% on the day before the announcement to -0.13% on the announcement date of MCO 1.0. The CAAR also experiences further significant reduction until Day 3 of the announcement. In contrast, the subsequent MCOs do not result in any significant drop of firm CAARs. It is worth noting that the CAAR shows an increasing trend after the implementation of the FMCO.

Figure 3 Cumulative Abnormal Returns in 14-day Event Windows that Surround Four MCOs: March 2020 to June 2021

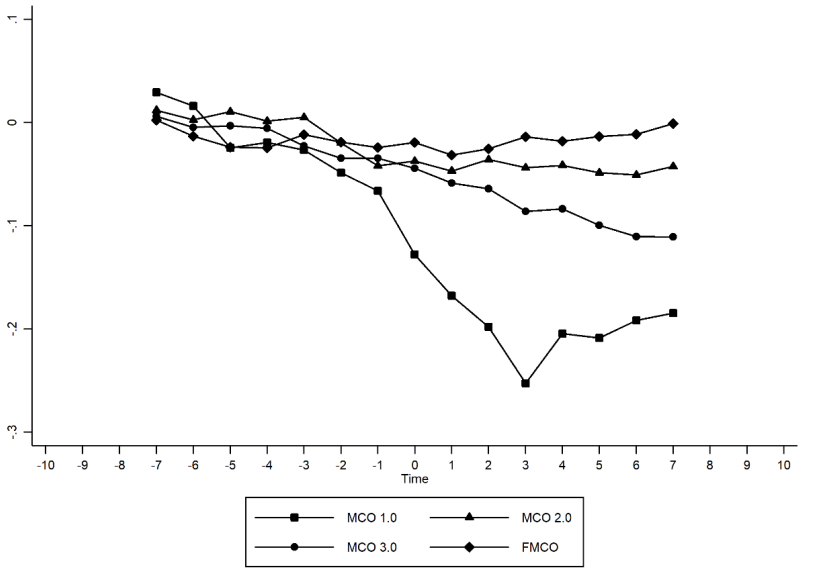
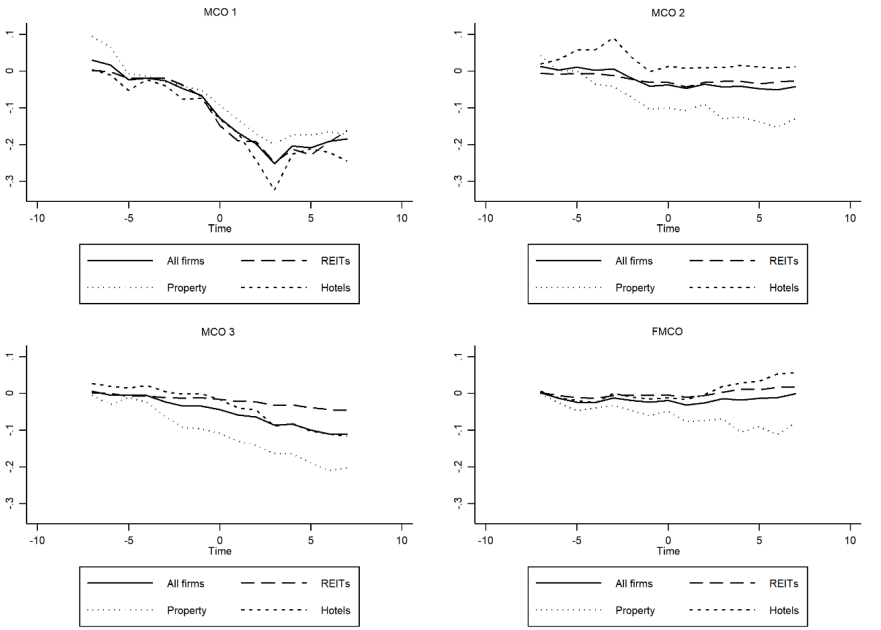


Figure 4 shows the CAARs that surround all MCOs by REITs, property companies, and hotel operators. In MCO 1.0, the CAARs hit their lowest points 3 days after MCO 1.0 was implemented and rebounded slightly after Day 3. As expected, the hotels experienced a steeper drop as compared to the REITs and property companies. In MCO 2.0 and 3.0, the CAARs for REITs and hotels were almost unchanged after the MCO announcement dates. Interestingly, the CAARs of these firms experienced an increasing trend after the date of announcement of the FMCO. For property investment firms, their CAARs were more affected by the announcement of MCO 2.0 to FMCO relative to other types of firms.

Overall, from this analysis, we can observe that the impact of MCO 1.0 on firm returns is the highest among all of the MCO phases. As expected, the hotel operators were more affected than the other firms due to lockdowns that directly hit this sector, which forced them to close down their business entirely.[14]

Figure 4 Cumulative Abnormal Returns in 14-day Event Window in all MCOs by Firm Type



6.2 Regression Results

6.2.1 Base Results

In this section, we discuss the results from our regression analysis. First, we regress the 1-, 2-, and 3-day abnormal returns on the exposure of each firm to the COVID-19 growth rate, nationwide MCOs, and loan moratorium variables by using the model in Equation (3). Following Ling et al. (2020), we resort to a fixed effects estimator. Additionally, we also include month dummies to control for time effects. Our baseline regressions are presented in Table 4. The

[14] The former Deputy of Tourism, Arts and Culture Minister Santhara Kumar told the Malaysian parliament that a total of 55 hotels had closed down while 86 were temporarily shut down due to COVID-19 (https://www.malaysianow.com/news/2021/10/04/55-hotels-closed-down-due-to-COVID-19/).

GeoCOVID variable does not appear to be significantly related to abnormal returns across the three regression specifications. Our results, therefore, do not support those of previous studies such as Ling et al. (2020), Corbet et al. (2021), Alfaro et al. (2020), Milcheva (2022), Chatjuthamard et al. (2021), Alzyadat and Asfoura (2021), Hung et al. (2021), and Lee et al. (2020),[15] who find the number of COVID-19 cases to be negative and significantly related to stock returns.

However, this finding is consistent with Baker et al. (2020) that restrictions imposed during COVID-19 constitute a more plausible explanation for the unprecedented shock in share price return than COVID-19 per se. Consistent with the prediction of H2, the coefficients of MCO 1.0 are negative and highly significant at the 1% level on all 1-, 2-, and 3-day abnormal returns. This implies that the market reacted negatively to the announcement and implementation of MCO 1.0. Meanwhile, 1-day abnormal returns during MC0 1.0 are 1.65% lower compared to other periods in this study. This return reduction is equivalent to 121.8% of the sample mean (0.11%) of abnormal returns.

Consistent with our graphical evidence above, MCO 2.0 and MCO 3.0 do not exert a negative impact on abnormal returns. There are two plausible explanations for this observation. First, the Malaysian people were more familiar with the situation at the time of the implementation of MCO 2.0 and MCO 3.0 as compared to MCO 1.0, thus resulting in a lower negative stock price reaction towards MCO 2.0 and MCO 3.0. Second, MCO 2.0 and MCO 3.0 are less restrictive as compared to MCO 1.0, as more businesses were allowed to operate during those periods as compared to MCI 1.0. This implies fewer adverse effects on the income of commercial properties during these subsequent nationwide MCOs. Interestingly, we find the coefficient of FMCO to be positive and significantly related to 2-day CAARs. The positive impact of lockdowns during this period explains the heightened demand from many parties asking for a full lockdown to contain the virus infection quickly and effectively. Ling et al. (2020) also find lockdowns to be positively related to abnormal returns of US REITs.

Next, we discuss the impact of the loan moratoriums provided by banks on firm stock prices. The blanket moratorium variable, Blanket, shows a positive and highly significant effect (at the 1% significance level) on the 1-, 2-, and 3-day abnormal returns of firms, as predicted by H4. Although the announcement of the blanket moratorium came only one week after the MCO 1.0 announcement, the reactions of firms to these events are different. This indicates that firm

[15] Our results, however, are consistent with a Malaysian study by Lee et al. (2020) when we use raw KLCI price instead of abnormal returns as the dependent variable. In particular, we find a negative and significant relationship between national COVID-19 cases and FBM-KLCI prices from 25 January 2020 to 15 April 2020. The results are not reported here for brevity.

stocks rebounded quickly once the government initiated the loan moratorium facility to ease the financial burden of affected businesses.[16] For the next moratorium announcements, only enhanced targeted moratoriums show a positive effect on firm stock returns in the 3-day CAARs.

Table 4 Effects of COVID-19 Pandemic on Firm Stock Returns

	(1)	(2)	(3)
	Ret (1-day)	**Ret (2-day)**	**Ret (3-day)**
GeoCOVID	-0.068	0.003	0.070
	(0.075)	(0.066)	(0.161)
MCO 1.0	-1.650***	-3.919***	-5.121***
	(0.348)	(0.681)	(0.816)
MCO 2.0	-0.058	-0.128	-0.476
	(0.192)	(0.342)	(0.356)
MCO 3.0	-0.152	-0.310	0.323
	(0.175)	(0.357)	(0.631)
FMCO	0.214	0.937**	0.786
	(0.282)	(0.384)	(0.774)
Blanket	1.671***	2.950***	2.664***
	(0.351)	(0.701)	(0.853)
Targeted	0.241	0.252	0.007
	(0.478)	(0.729)	(1.083)
Enhanced	-0.012	0.746	1.578**
	(0.221)	(0.523)	(0.712)
Days Since	-0.001	0.007	0.019*
	(0.003)	(0.007)	(0.010)
GeoDensity	-0.032	-0.010	0.047
	(0.045)	(0.102)	(0.172)
GeoHHI	-0.209	-0.265	-0.257
	(0.445)	(0.984)	(1.447)
Leverage	0.609	1.326	2.234
	(0.446)	(0.920)	(1.502)
Cash	-1.031	-3.572	-7.353
	(1.543)	(3.480)	(5.993)
Size	-0.023	-0.060	-0.099
	(0.035)	(0.079)	(0.124)
Tobins q	-0.003	-0.042	-0.105
	(0.144)	(0.333)	(0.556)
LAG3MRET	-4.040***	-7.907***	-12.325***
	(0.845)	(1.823)	(2.763)

(Continued…)

[16] These findings echo Kaynak et al. (2021), who find a positive impact of government assisted housing loan packages on residential real estate prices in cities in Turkey. The results however flip to negative when a regional residential real estate index is used instead of a city level residential real estate index.

(Table 4 Continued)

	(1)	(2)	(3)
	Ret (1-day)	**Ret (2-day)**	**Ret (3-day)**
EBITDA	0.354	0.536	0.021
	(0.723)	(1.528)	(2.243)
Constant	0.841	-0.457	-2.990
	(1.397)	(2.710)	(3.988)
Fixed effects	Firm type	Firm type	Firm type
Time effects	Month	Month	Month
Observations	12,951	9,698	6,774
R-squared	0.024	0.065	0.107

Notes: Significant at the 0.1*, 0.05** and 0.01*** levels. P-values are reported in parentheses.

6.2.2 Efficiency of Lockdown Policies

In this section, we further analyze whether the implementation of lockdowns alters the impact of COVID-19 cases on firm abnormal returns as hypothesized in H5. To this end, we interact all the MCOs with GeoCOVID. The results are presented in Table 5. The coefficient of GeoCOVID x MCO 1.0 shows a positive sign and is significant at the 5% level for 1-day abnormal returns. In addition, the GeoCOVID x MCO 3.0 interaction term is positive and significant across the three estimated windows of returns. The positive interactive results are consistent with Ling et al. (2020). This suggests that lockdowns implemented during this period do have a positive impact by reducing the adverse impact of reported COVID-19 cases on abnormal returns. This also implies the efficiency of lockdown policies in containing the COVID-19 virus where investors respond less negatively to the growth of COVID-19 cases after the announcement of MCO 1.0.

We document a negative and significant GeoCOVID x MCO 2.0 interaction term in the 1-day abnormal return model, thus suggesting that abnormal returns decrease for every increase in the COVID-19 growth rate. This result is contrary to the findings of the MCO 1.0 and MCO 3.0 interactive terms. This finding is in line with D'Lima et al. (2022), who document a negative and significant COVID cases x lockdown interactive term effect on house selling price in the US.

Additionally, we also examine whether the response of investors to the loan moratorium announcement is dependent on the number of reported COVID-19 cases. The estimated coefficients on the GeoCOVID x Blanket and GeoCOVID x Targeted interactions are negative and statistically significant in the 2-day and 3-day window models, respectively. This indicates that investors responded less positively to the announcement of the loan moratorium as the number of COVID-19 cases increased.

Table 5 Effectiveness of MCOs during COVID-19 pandemic

	(1)	(2)	(3)
	Ret (1-day)	**Ret (2-day)**	**Ret (3-day)**
GeoCOVID	-0.074	0.030	0.110
	(0.079)	(0.070)	(0.115)
GeoCOVID x MCO 1.0	0.827**	1.144	0.571
	(0.381)	(0.767)	(0.926)
GeoCOVID x MCO 2.0	-1.925***	-0.405	0.149
	(0.711)	(0.984)	(0.923)
GeoCOVID x MCO 3.0	0.904*	1.414*	2.248*
	(0.481)	(0.827)	(1.136)
GeoCOVID x FMCO	-0.530	-2.016*	-2.978*
	(0.842)	(1.096)	(1.721)
GeoCOVID x Blanket	-0.693	-1.612**	-0.327
	(0.449)	(0.663)	(0.823)
GeoCOVID x Targeted	-0.136	0.053	-0.092
	(0.316)	(0.458)	(0.558)
GeoCOVID x Enhanced	0.503	-0.527	-2.183*
	(0.324)	(0.332)	(1.231)
MCO 1.0	-1.640***	-3.955***	-5.111***
	(0.341)	(0.664)	(0.885)
MCO 2.0	0.069	-0.099	-0.491
	(0.201)	(0.355)	(0.337)
MCO 3.0	-0.193	-0.327	-0.071
	(0.187)	(0.350)	(0.741)
FMCO	0.256	0.968**	1.200
	(0.296)	(0.380)	(0.807)
Blanket	1.634***	2.944***	2.684***
	(0.355)	(0.705)	(0.868)
Targeted	0.258	0.236	0.017
	(0.503)	(0.756)	(1.156)
Enhanced	-0.101	0.851	1.693**
	(0.223)	(0.512)	(0.721)
Constant	0.708	-0.554	-3.086
	(1.405)	(2.716)	(3.997)
Controls	Yes	Yes	Yes
Fixed effects	Firm type	Firm type	Firm type
Time effects	Month	Month	Month
Observations	12,951	9,698	6,774
R-squared	0.025	0.066	0.108

Notes*:** Significant at the 0.1*, 0.05** and 0.01 levels. P-values are reported in parentheses.

6.3.3 Interactive Effects of Firm Characteristics and COVID-19 Cases

In this section, we further examine whether certain firm characteristics give firms some advantage during COVID-19. Ramelli and Wagner (2020) find firms with large cash flow and low leverage are more immune from the negative impact of COVID-19. We expand their analysis by considering firm characteristics such as size, firm value, and profitability. These variables are measured by using 2019 (pre-COVID-19) financial data.

To achieve this, we interact GeoCOVID with firm characteristics in our base model. The results are tabulated in Table 6. We find that firm leverage significantly reduces the negative effects of GeoCOVID on firm stock returns. This indicates that firms with a larger debt ratio perform better during the pandemic than firms with a smaller debt ratio, which is not consistent with the prediction of H6. One plausible explanation is that a large debt ratio could be an indication of high debt capacity, as hypothesized by Harrison et al. (2011). The large debt ratio of firms during normal periods may be an indication of their ability to access external financing during a crisis.

Table 6 Moderating Impact of Firm Specific Characteristics on Firm Reactions to COVID-19

	(1)	(2)	(3)
	Ret (1-day)	**Ret (2-day)**	**Ret (3-day)**
GeoCOVID	0.129	-0.368*	-0.567
	(0.135)	(0.214)	(0.365)
GeoCOVID x Leverage	0.111	1.455**	2.196**
	(0.402)	(0.545)	(0.964)
GeoCOVID x Cash	-0.439	1.720	1.050
	(1.627)	(1.234)	(4.030)
GeoCOVID x Size	0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
GeoCOVID x Tobins Q	-0.250	0.013	0.091
	(0.226)	(0.138)	(0.295)
GeoCOVID x EBITDA	-0.452	-0.267	0.595
	(0.322)	(0.297)	(1.105)
MCO 1.0	-1.646***	-3.919***	-5.118***
	(0.352)	(0.678)	(0.799)
MCO 2.0	-0.059	-0.135	-0.497
	(0.193)	(0.342)	(0.359)
MCO 3.0	-0.150	-0.309	0.310
	(0.175)	(0.356)	(0.632)
FMCO	0.215	0.934**	0.771
	(0.282)	(0.384)	(0.777)
Blanket	1.669***	2.946***	2.665***
	(0.352)	(0.701)	(0.855)

(Continued…)

(Table 6 Continued)

	(1)	(2)	(3)
	Ret (1-day)	**Ret (2-day)**	**Ret (3-day)**
Targeted	0.242	0.250	-0.006
	(0.478)	(0.730)	(1.086)
Enhanced	-0.011	0.745	1.564**
	(0.226)	(0.522)	(0.710)
Constant	0.818	-0.443	-2.947
	(1.388)	(2.708)	(3.993)
Controls	Yes	Yes	Yes
Fixed effects	Firm type	Firm type	Firm type
Time effects	Month	Month	Month
Observations	12,951	9,698	6,774
R-squared	0.025	0.065	0.107

Notes*:** Significant at the 0.1*, 0.05**and 0.01 levels. P-values are reported in parentheses.

We do not find that cash holding alters the impact of GeoCOVID on abnormal returns as documented by Ramelli and Wagner (2020). We do find that bigger firms tend to be more negatively affected by GeoCOVID than smaller firms. Compare to big firms, small firms are possibly more agile and able to adjust swiftly to changes in the business environment.

6.3.4 Impact of Vaccination Program

The Malaysian government started its vaccination program in February 2021, almost a year after the first case was detected in the country. Since vaccination is a vital measure to contain the viral infection, it is important for us to document whether the vaccination rate has any significant impact on the stock price of firms. We would expect that vaccination could positively affect their stock price due to the ability of the vaccine to minimize the infection rate and the severity of the disease. To this end, we add a Vaccination variable in our base model in Equation (3).[17] We measure vaccination in two ways. First, we use the number of vaccine injections per 100,000 people. Second, we use the log value of change in the daily injections. The results of these tests are presented in Table 7. We find that change in vaccination does have a positive impact on the 3-day CARRs of firms, as shown in Column 6. The number of vaccinations, on the other hand, does not impact firm returns. This result indicates that the investors care more about the change in the daily rate of injections than the total number of injections. Apergis (2022) also documents a positive impact of the COVID-19 vaccination program on house prices in the

[17] Unlike our main regression, this analysis starts from February 2021 to June 2021 to match the vaccination start date in February 2021.

US. He measured vaccination rate as the change in number of vaccinated people. Note that none of the lockdown coefficients (MCO 3.0 and FMCO) are negative and significantly related to abnormal returns. This result could be attributed to the increased familiarity of investors with the lockdown policies as explained earlier. It could also be driven by expectations of improvement in the economy following the vaccination program.

Table 7 Effects of Vaccination on Firm Stock Returns

	Vaccination			Change in Vaccination		
	(1)	(2)	(3)	(4)	(5)	(6)
	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)
GeoCOVID	0.057	0.069	-0.249	-0.018	0.090	-0.373
	(0.256)	(0.157)	(0.418)	(0.295)	(0.107)	(0.388)
Vaccination	-0.001	-0.001	-0.001			
	(0.001)	(0.002)	(0.004)			
Change in Vaccination				-0.140	0.404	2.560**
				(0.142)	(0.262)	(1.115)
MCO 3.0	-0.144	-0.064	0.521	-0.101	0.071	0.940
	(0.276)	(0.498)	(0.875)	(0.178)	(0.469)	(0.750)
FMCO	0.132	0.919**	0.795	0.191	0.993**	0.941
	(0.351)	(0.412)	(1.469)	(0.276)	(0.378)	(0.674)
Constant	-5.535	-12.800	-20.967*	-4.240	-12.636	-21.725*
	(3.505)	(7.914)	(11.209)	(3.165)	(7.760)	(11.583)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm type	Firm type	Firm type	Firm type	Firm type	Firm type
Time effects	Month	Month	Month	Month	Month	Month
Observations	2,901	2,184	1,522	2,862	2,146	1,487
R-squared	0.069	0.181	0.272	0.069	0.180	0.274

Notes*:** Significant at the 0.1*, 0.05** and 0.01 levels. P-values are reported in parentheses.

6.3.5 Robustness Tests

This section provides several robustness checks for the basic results in Table 4. First, we conduct a subsample analysis on our base model by firm and REIT types. Second, we re-estimate the base model by using alternative measures of COVID-19. For the first robustness test, we split the analysis by firm type. Our aim is to identify which type of firm is most affected by COVID-19. Table 8 tabulates the regression results of Equation (3) with three separate subsamples. Among all three types of firms in our sample, only hotels are negatively affected by GeoCOVID. This is a sensible finding given that hotels are sensitive to the

increase in COVID-19 cases due to their nature of offering direct contact services. As expected, the negative effects of MCO 1.0 from our full sample remain negative and highly significant in the sub-sample analysis. This indicates that MCO 1.0 had a strong impact on all firm types. In contrast to the baseline results, MCO 2.0 had a negative impact on hotels. This is consistent with the fact that hotels heavily depend on tourists, who were not able to travel inter-district and inter-state during the lockdowns. For FMCO, the returns of both REITs and hotels are positively affected by this lockdown phase.

Next, we split the 16 REITs in our sample into four different asset portfolios: diversified (5), industrial (2), office (4), and retail (5). We expect that these different types of assets would be impacted differently during the pandemic due to different exposure to the COVID-19 cases and lockdown policies. The results are presented in Table 9. MCO 1.0 negatively impacted all REITs except for REITs that focus their assets on industrial properties. This is a plausible finding given that essential services and industry were still allowed to operate during MCO 1.0. This finding is consistent with Cai and Xu (2022) who find COVID-19 to exert a positive impact on the industrial REIT returns in the US. For the moratoriums, only the blanket moratorium exerts a positive impact on the stock price of diversified and retail REITs. This is perhaps due to the negative impact of the full closure of retail buildings which resulted in the difficulty of tenants in paying the rent. Hence, the moratoriums help the tenants to divert the cash to pay for rent instead of loans.

Our results using GeoCOVID so far show that the geographically weighted measure of COVID-19 cases at the firm-level does not have any significant impact on firm stock returns. To confirm this, we use two other measurements that could replace GeoCOVID as a proxy for the COVID-19 infection rate. First, we use reported cases of COVID-19 at the national-level. This variable does not account for the geographical exposure of firms to COVID-19 cases, as this variable is the sum of the reported cases nationwide. Second, we replace GeoCOVID with the nationwide number of deaths. The results of these tests are reported in Tables 10 and 11. Consistent with our main results, we do not find that the nationwide COVID-19 cases and deaths have an impact on firm stock returns. MCO 1.0 and Blanket dummies remain strongly significant as in the base model. Therefore, we can conclude that the daily reported cases of COVID-19 do not change the expectations of investors of the firm prospects.

Table 8 Effects of COVID-19 Pandemic on Firm Stock Returns by Firm Type

	REIT			Property			Hotels		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)
GeoCOVID	0.037	-0.009	0.190**	0.105	0.055	-0.300	-0.419**	-0.061	0.283
	(0.036)	(0.078)	(0.074)	(0.081)	(0.109)	(0.427)	(0.155)	(0.143)	(0.170)
MCO 1.0	-1.694***	-2.824***	-4.265***	-0.627	-2.648**	-4.066**	-2.554*	-7.028***	-6.980***
	(0.251)	(0.519)	(0.753)	(0.503)	(1.063)	(1.716)	(1.149)	(2.000)	(1.947)
MCO 2.0	-0.234	-0.167	-0.191	0.622	1.201	0.436	-0.690**	-1.517**	-2.227**
	(0.139)	(0.214)	(0.277)	(0.522)	(0.788)	(0.718)	(0.279)	(0.626)	(0.892)
MCO 3.0	-0.071	-0.081	0.441	-0.624	-1.589	-1.161	-0.069	-0.356	0.755
	(0.074)	(0.162)	(0.389)	(0.575)	(0.996)	(1.723)	(0.313)	(0.967)	(1.403)
FMCO	0.220**	0.580**	0.876*	-0.241	0.593	-1.390	0.788	1.869*	1.925
	(0.089)	(0.200)	(0.478)	(0.788)	(0.947)	(1.942)	(0.546)	(0.912)	(1.878)
Blanket	1.984***	3.468***	3.897***	0.722	1.054	0.409	2.528**	4.949***	3.767
	(0.297)	(0.550)	(0.655)	(0.867)	(1.685)	(1.958)	(0.780)	(1.486)	(2.066)
Targeted	-0.480**	-0.664**	-1.139**	-0.175	-0.748	-1.247	2.231	3.480	4.574
	(0.179)	(0.302)	(0.418)	(0.579)	(1.184)	(1.663)	(1.708)	(2.393)	(3.824)
Enhanced	-0.107	0.472	0.807	-0.083	-1.205	-0.444	-0.204	2.288*	3.610**
	(0.139)	(0.352)	(0.513)	(0.530)	(1.215)	(1.377)	(0.494)	(1.165)	(1.585)
Constant	2.398***	3.888***	3.285	1.588	6.079	5.478	8.447**	9.830	10.530
	(0.583)	(1.288)	(2.006)	(2.802)	(8.017)	(8.897)	(2.839)	(6.200)	(8.459)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Month	Month	Month	Month	Month	Month	Month	Month	Month
Observations	5,949	4,515	3,183	3,788	2,804	1,949	3,214	2,379	1,642
R-squared	0.045	0.079	0.094	0.033	0.099	0.174	0.026	0.061	0.076

Notes: Significant at the 0.1*, 0.05**and 0.01*** levels. P-values are reported in parentheses.

Table 9 Effects of COVID-19 Pandemic on Stock Returns of REITS by Asset Portfolio

	Diversified			Industrial			Office			Retail		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)
GeoCOVID	0.022	0.125	0.261	0.036	-0.204*	-0.006	0.024	-0.209	0.276	0.016	0.057	0.139
	(0.039)	(0.133)	(0.139)	(0.057)	(0.031)	(0.129)	(0.075)	(0.185)	(0.208)	(0.095)	(0.101)	(0.117)
MCO 1.0	-1.293**	-1.581	-2.547*	-1.588	-1.886	-2.445	-1.681**	-3.580**	-6.112*	-2.001**	-3.376**	-4.513**
	(0.435)	(0.877)	(1.101)	(0.512)	(0.542)	(1.228)	(0.478)	(1.096)	(2.053)	(0.592)	(1.009)	(1.160)
MCO 2.0	0.100	0.251	-0.068	-1.213	-1.428	-1.630	0.023	-0.039	-0.195	-0.417*	-0.165	0.063
	(0.203)	(0.341)	(0.293)	(0.207)	(0.686)	(1.609)	(0.229)	(0.668)	(0.881)	(0.195)	(0.190)	(0.263)
MCO 3.0	0.094	0.177	0.493	0.009	0.676	1.637	-0.409	-0.643	-0.314	-0.086	-0.208	0.142
	(0.086)	(0.286)	(1.004)	(0.251)	(0.347)	(0.839)	(0.213)	(0.309)	(0.823)	(0.152)	(0.295)	(0.707)
FMCO	0.069	0.226	-0.273	0.697	1.615	3.198	-0.123	-0.132	-0.330	0.338*	0.936*	1.575*
	(0.154)	(0.343)	(1.043)	(0.178)	(0.339)	(1.096)	(0.187)	(0.340)	(0.200)	(0.141)	(0.347)	(0.712)
Blanket	1.831***	3.307***	3.623**	1.281	2.324	2.685	1.499	3.082	3.182	2.655***	4.232**	4.919***
	(0.382)	(0.599)	(0.921)	(0.254)	(0.846)	(1.111)	(0.964)	(2.217)	(2.609)	(0.556)	(0.949)	(1.048)
Targeted	-0.309	-0.765	-1.019	0.033	0.504	0.216	-0.454	-0.501	-1.320	-0.357	-0.537	-1.047
	(0.157)	(0.443)	(0.574)	(0.072)	(0.272)	(0.164)	(0.217)	(0.408)	(0.607)	(0.212)	(0.487)	(0.694)
Enhanced	-0.262	0.006	0.378	-0.076	0.757	1.243	0.080	0.765	1.433	-0.211	0.307	0.137
	(0.407)	(0.822)	(1.087)	(0.033)	(0.726)	(0.262)	(0.298)	(0.965)	(1.566)	(0.220)	(0.599)	(0.963)
Constant	-0.243	0.088	0.247	-1.909	-7.234	-12.991**	-0.618	-23.504	-64.590	2.473**	5.289**	7.141**
	(0.923)	(1.958)	(1.678)	(0.420)	(2.253)	(0.641)	(9.523)	(16.016)	(41.048)	(0.620)	(1.639)	(2.376)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Month	Month	Month	Month	Month	Month	Month	Month	Month	Month	Month	Month
Observations	1,684	1,280	903	679	519	368	1,205	893	617	1,704	1,309	934
R-squared	0.043	0.070	0.072	0.072	0.136	0.205	0.032	0.080	0.117	0.080	0.131	0.153

Notes*:** Significant at the 0.1*, 0.05** and 0.01 levels. P-values are reported in parentheses.

Table 10 Alternative Measurement of COVID-19: MYCOVID

	MYCOVID			MYCOVID growth		
	(1)	(2)	(3)	(4)	(5)	(6)
	Ret (1-day)	Ret (2-day)	Ret (3-day)	Ret (1-day)	Ret (2-day)	Ret (3-day)
MYCOVID	0.000	0.000	0.000			
	(0.000)	(0.000)	(0.000)			
MYCOVID Growth				0.048	0.049	0.095
				(0.068)	(0.145)	(0.181)
MCO 1.0	-1.645***	-3.921***	-5.132***	-1.643***	-3.911***	-5.101***
	(0.349)	(0.679)	(0.807)	(0.350)	(0.684)	(0.789)
MCO 2.0	-0.055	-0.169	-0.527	-0.055	-0.133	-0.487
	(0.191)	(0.333)	(0.366)	(0.192)	(0.347)	(0.359)
MCO 3.0	-0.150	-0.108	0.625	-0.150	-0.303	0.331
	(0.181)	(0.375)	(0.657)	(0.176)	(0.360)	(0.628)
FMCO	0.215	0.790*	0.515	0.216	0.938**	0.793
	(0.296)	(0.456)	(0.912)	(0.282)	(0.386)	(0.776)
Blanket	1.674***	2.944***	2.653***	1.683***	2.944***	2.668***
	(0.352)	(0.705)	(0.856)	(0.347)	(0.697)	(0.849)
Targeted	0.233	0.254	0.031	0.236	0.247	-0.017
	(0.478)	(0.725)	(1.087)	(0.476)	(0.734)	(1.108)
Enhanced	-0.026	0.772	1.621**	-0.031	0.749	1.590**
	(0.225)	(0.512)	(0.716)	(0.224)	(0.522)	(0.711)
Constant	0.827	-0.487	-3.014	0.807	-0.516	-3.117
	(1.386)	(2.722)	(4.015)	(1.395)	(2.692)	(3.951)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm type	Firm type	Firm type	Firm type	Firm type	Firm type
Time effects	Month	Month	Month	Month	Month	Month
Observations	12,951	9,698	6,774	12,951	9,698	6,774
R-squared	0.024	0.065	0.107	0.024	0.065	0.107

Notes*:** Significant at the 0.1*, 0.05**and 0.01 levels. P-values are reported in parentheses.

Table 11 Alternative Measurement of COVID-19: MYDeath

	(1) Ret (1-day)	(2) Ret (2-day)	(3) Ret (3-day)	(4) Ret (1-day)	(5) Ret (2-day)	(6) Ret (3-day)
MYDeath	2.184	2.705	3.741			
	(1.913)	(2.459)	(3.448)			
MYDeath Growth				0.128**	0.129	0.054
				(0.059)	(0.090)	(0.112)
MCO 1.0	-1.640***	-3.914***	-5.120***	-1.659***	-3.918***	-5.130***
	(0.351)	(0.679)	(0.808)	(0.348)	(0.681)	(0.808)
MCO 2.0	-0.033	-0.102	-0.441	-0.048	-0.129	-0.483
	(0.197)	(0.347)	(0.350)	(0.195)	(0.342)	(0.359)
MCO 3.0	-0.008	-0.051	0.668	-0.158	-0.304	0.320
	(0.232)	(0.449)	(0.647)	(0.177)	(0.360)	(0.629)
FMCO	0.118	0.813*	0.565	0.218	0.933**	0.785
	(0.299)	(0.452)	(0.748)	(0.282)	(0.386)	(0.782)
Blanket	1.662***	2.930***	2.642***	1.695***	2.967***	2.685***
	(0.351)	(0.706)	(0.849)	(0.352)	(0.707)	(0.859)
Targeted	0.234	0.252	0.029	0.235	0.233	0.024
	(0.478)	(0.725)	(1.087)	(0.478)	(0.727)	(1.089)
Enhanced	-0.025	0.748	1.602**	0.009	0.764	1.600**
	(0.226)	(0.519)	(0.712)	(0.230)	(0.525)	(0.706)
Constant	0.837	-0.518	-3.013	0.927	-0.547	-2.951
	(1.391)	(2.714)	(4.012)	(1.381)	(2.818)	(4.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm type	Firm type	Firm type	Firm type	Firm type	Firm type
Time effects	Month	Month	Month	Month	Month	Month
Observations	12,951	9,698	6,774	12,911	9,660	6,774
R-squared	0.024	0.065	0.107	0.025	0.069	0.107

Notes*:** Significant at the 0.1*, 0.05** and 0.01 levels. P-values are reported in parentheses.

7. Conclusion and Implications

This paper provides a comprehensive analysis on the impact of the COVID-19 infection rate and various government responses on stock returns in Malaysia. Our extended study period covers the resurgence in COVID-19 cases beyond the first wave in March 2020. This period saw the re-implementation of three nationwide lockdowns in Malaysia. More importantly, we consider stock market reactions to government fiscal policy during 2020 and the impact of the vaccination rate on stock returns. We find investors reacted negatively to the implementation of MCO 1.0. Daily returns that surround the MCO 1.0 implementation are 1.65% lower than other non-MCO daily returns. This drop is economically significant, as it is equivalent to 121.8% of the mean abnormal returns in the sample. We do not find that subsequent nationwide MCOs exert a negative impact on abnormal returns. Meanwhile, the blanket moratorium

implemented 11 days after the announcement of MCO 1.0 is found to be positively and significantly related to abnormal returns. Similar to MCO 1.0, the results are robust to three different measures of abnormal returns and expanded regression models.

Further tests reveal that the negative impact of MCO 1.0 on abnormal returns can be altered by the COVID-19 infection rate, as shown in the significance of the GeoCOVID–MCO interaction terms. The sign of the interaction term is positive during MCO 1.0 and MCO 3.0 but negative during MCO 2.0. A positive (negative) interaction terms implies that the lockdown policy (MCOs) reduces (increase) the negative impact of COVID-19 on stock returns. These reversals in sign suggest that there is a shift in the confidence of investors on the efficacy of lockdown policies in curbing the spread of the COVID-19 virus. We also find that leverage and firm size affect the impact of COVID-19 on firm value as captured by the interaction terms of GeoCOVID–firm characteristics. The sign of these variables, however, does not support our expectation that larger firms and firms with larger debt capacity (low leverage) were financially more prepared for the COVID-19 crisis.

We can infer the following implications based on the evidence presented in this paper. First, while there is no doubt that COVID-19 has exerted a negative impact on the real and financial economies, the channels that drive this negative impact could differ between countries. Our Malaysian evidence suggests that lockdowns are a first order determining factor of abnormal returns, not the COVID-19 infection rate as documented in prior studies that use non-Malaysian data. Thus, the findings in Ling et al. (2020) on the GeoCOVID variable are not generalizable to the Malaysian market. This finding underscores the importance of country-specific research.

Second, we find that the loan moratorium policy significantly increased the abnormal returns of firms. The coefficient value of Blanket is about the same as MCO 1.0 for the 1-day event window, thus implying that the loss in market capitalization due to MCO 1.0 is almost fully recovered by the announcement of the blanket loan moratorium. We note that the blanket loan moratorium was only announced 11 days after the announcement of MCO 1.0. It is logical to assume that the negative impact of MCO 1.0 would be significantly milder if it was announced jointly with the fiscal responses of the government (including loan moratorium).

Third, as shown in Figure 1, our sample of listed companies with significant commercial properties suffered more reduction in stock returns than other listed companies, as proxied by FBM KLCI. This is consistent with Salami et al. (2022) who find Turkish REITs to underperform the general market during COVID-19. The change in stock price return reflects the expectation of investors that future cash flows of these companies should be derived mainly from rental income. This suggests that commercial property owners, hotels, and

retail properties in particular may warrant targeted financial assistance from the Malaysian government.[19]

References

Acharya, V. V., and Steffen, S. (2020). The risk of being a fallen angel and the corporate dash for cash in the midst of COVID. *The Review of Corporate Finance Studies*, 9(3), 430-471.

Akinsomi, O. (2021). How resilient are REITs to a pandemic? The COVID-19 effect. *Journal of Property Investment & Finance*, 39(1), 19-24.

Alam, M. M., Wei, H., and Wahid, A. N. (2021). COVID-19 outbreak and sectoral performance of the Australian stock market: An event study analysis. *Australian Economic Papers*, 60(3), 482-495.

Alfaro, L., Chari, A., Greenland, A. N., and Schott, P. K. (2020). Aggregate and firm-level stock returns during pandemics, in real time (No. w26950). National Bureau of Economic Research.

Allan, R., Liusman, E., Lu, T., and Tsang, D. (2021). The COVID-19 Pandemic and Commercial Property Rent Dynamics. *Journal of Risk and Financial Management*, 14(8), 360.

Alzyadat, J. A., and Asfoura, E. (2021). The Effect of COVID-19 Pandemic on Stock Market: An Empirical Study in Saudi Arabia. *The Journal of Asian Finance, Economics and Business*, 8(5), 913-921.

Anguera-Torrell, O., Aznar-Alarcón, J. P., & Vives-Perez, J. (2021). COVID-19: Hotel industry response to the pandemic evolution and to the public sector economic measures. *Tourism Recreation Research*, 46(2), 148-157.

Apergis, N. (2022). Residential Housing Prices, COVID-19 and the Role of the Vaccination Program: Evidence from US State Panel Data. *International Real Estate Review*, 25(4), 461-478.

Baker, S. R., Bloom, N., Davis, S. J., Kost, K., Sammon, M., and Viratyosin, T. (2020). The unprecedented stock market reaction to COVID-19. *The Review of Asset Pricing Studies*, 10(4), 742-758.

[19] The Malaysian government did offer a special tax reduction for landlords equal to the rental reduction to their SME tenants for the period of April 2020 to June 2021. However, this special tax may not result in incremental cash flow to the landlords who were in a financial loss situation (tax credit situation).

Cai, Y., & Xu, K. (2022). Net Impact of COVID-19 on REIT Returns. *Journal of Risk and Financial Management*, 15(8), 359.

Chatjuthamard, P., Jindahra, P., Sarajoti, P., and Treepongkaruna, S. (2021). The effect of COVID‐19 on the global stock market. *Accounting & Finance*, 61(3), 4923-4953.

Chen, H., Qian, W., and Wen, Q. (2021). The Impact of the COVID-19 Pandemic on Consumption: Learning from High Frequency Transaction Data. *AEA Papers and Proceedings*, 111, 307-311.

Chiu, L. R., Rubio, A. P., Argüelles, V. J., and Poó, V. L. (2020). The Impact of COVID-19 on Real Estate Transaction in Lagos, Nigeria. *International Journal of Real Estate Studies*, 14(S1), 107-112.

Chu, X., Lu, C., and Tsang, D. (2021). Geographic Scope and Real Estate Firm Performance during the COVID-19 Pandemic. *Journal of Risk and Financial Management*, 14(7), 309.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber. (2020). Labor Markets During the COVID-19 Crisis: A Preliminary View. BFI Working Paper, Becker Friedman Institute for Economics, University of Chicago, April 13.

Corbet, S., Hou, Y. G., Hu, Y., Oxley, L., and Xu, D. (2021). Pandemic-related financial market volatility spillovers: Evidence from the Chinese COVID-19 epicentre. *International Review of Economics & Finance*, 71, 55-81.

D'Lima, W., Lopez, L. A., and Pradhan, A. (2022). COVID‐19 and Housing market effects: Evidence from us shutdown orders. *Real Estate Economics*, 50(2), 303-339.

Gormsen, N. J., and Koijen, R. S. (2020). Coronavirus: Impact on stock prices and growth expectations. *The Review of Asset Pricing Studies*, 10(4), 574-597.

Harrison, D. M., Panasian, C. A., and Seiler, M. J. (2011). Further evidence on the capital structure of REITs. *Real Estate Economics*, 39(1), 133-166.

Halling, M., J. Yu, and J. Zechner (2020): Bond and equity issuance activity during COVID-19. Available at SSRN 3596114.

He, Z., Nagel, S., and Song, Z. (2022). Treasury inconvenience yields during the COVID-19 crisis. *Journal of Financial Economics*, 143(1), 57-79.

Hoesli, M., and Malle, R. (2022). Commercial real estate prices and COVID-19. *Journal of European Real Estate Research*, 15(2), 295-306.

Hung, D. V., Hue, N. T. M., and Duong, V. T. (2021). The impact of COVID-19 on stock market returns in Vietnam. *Journal of Risk and Financial Management*, 14(9), 441.

Kaynak, S., Ekinci, A., and Kaya, H.F. (2021). The effect of COVID-19 pandemic on residential real estate prices: Turkish case. *Quantitative Finance and Economics*, 5(4), 623-639.

Kothari, S. P., and Warner, J. B. (2007). Econometrics of event studies. In *Handbook of Empirical Corporate Finance* (pp. 3-36). Elsevier.

Lee, K. Y. M., Jais, M., and Chan, C. W. (2020). Impact of COVID-19: Evidence from Malaysian stock market. *International Journal of Business and Society*, 21(2), 607-628.

Ling, D. C., Wang, C., and Zhou, T. (2020). A first look at the impact of COVID-19 on commercial real estate prices: Asset-level evidence. *The Review of Asset Pricing Studies*, 10(4), 669-704.

Milcheva, S. (2022). Volatility and the cross-section of real estate equity returns during COVID-19. *The Journal of Real Estate Finance and Economics*, 65, 293-320.

Ozdemir, O., Dogru, T., Kizildag, M., Mody, M., & Suess, C. (2021). Quantifying the economic impact of COVID-19 on the U.S. hotel industry: Examination of hotel segments and operational structures. *Tourism Management Perspectives*, 39, 100864.

Pastor, L. and B. Vorsatz. 2020. Mutual fund performance and flows during the COVID-19 crisis. *Review of Asset Pricing Studies*, 10, 791–833.

Salami, M. A., Tanrivermiş, H., & Tanrivermiş, Y. (2022). Performance evaluation and volatility of Turkey REITs during COVID-19 pandemic. *Journal of Property Investment & Finance*, 41(5), 473-505.

Shaheen Ali, Z., and Song, J. (2022). Digital platforms and real estate industry during COVID-19. *International Real Estate Review*, 25(4), 499-523.

Sinagl, P. (2020). When does Cash-flow Risk Matter to Investors? Evidence from the COVID-19 Pandemic. Evidence from the COVID-19 Pandemic (June 6, 2020). Available at SSRN: https://ssrn.com/abstract=3566511 or http://dx.doi.org/10.2139/ssrn.3566511.

Ramelli, S., and Wagner, A. F. (2020). Feverish stock price reactions to COVID-19. *The Review of Corporate Finance Studies*, 9(3), 622-655.