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Measuring COVID-19 Effects on Stock Returns of Online Travel Agencies: Does International Diversification Matter?

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Abstract

The article examines the effects of COVID-19 on stock performance of 14 largest Online Travel Agencies (OTA). Using Panel Auto Regression Distribution Lag (ARDL), I firstly observe both short term and long-term adverse effects of COVID-19 cases and deaths on OTAs' stock performance. On the contrary, the results indicate positive effects of containment measures stringency on OTAs' stock performance during the first wave alone. Secondly, I reveal that OTAs with a higher magnitude of international diversification exhibited better stock performance amid strict countermeasures. I ultimately show the fact that the effects of COVID-19 on OTAs' stock performance were more pronounced during the first wave of the pandemic alone. I conclude by providing implications and recommendations from our findings.

Keywords: *Covid-19; Online Travel Agencies; Stock Performance; Panel ARDL; International*

1.0 Introduction

Early 2020, the world experienced the outbreak of the novel Covid-19 which crippled the global economy. This has been attributed to the stringency of the governments` containment measures such as lockdowns, travel bans, and suspension of social events and gatherings (Barbosa and Paramo, 2021). These effects have been felt in different economic sectors including travel and tourism which are inherently dependent on international travel. During the first outbreak of Covid-19 in 2020, international tourist arrivals dropped by a staggering 22% due to uncertainties surrounding the pandemic (World Trade Organization, 2021). Online travel agency (OTA) is a fast growing business model within the tourism and travel sectors that offers customers with the opportunity to cheaply and conveniently make travel arrangement, book hotels, cars and tours online. Companies such as AirBnb, Booking.com, and Expedia have grown so fast to become household names within the tourism and travel sector due to rising customer base around the globe. However, despite the sub-sector success, OTAs have also been on the receiving end of economic adversity caused by Covid-19. The OTA market declined sharply by 20% during the first half of 2020 following imposition of travel restrictions and other social distancing measures around the world (Keneth Research, 2021). However, despite such disruptions, the OTA market is anticipated to revamp back to about USD 820.18 billion equivalent to 11.24% annual growth rate by 2023 (Keneth Research, 2021). Thus, we aim in this current study, to investigate market reactions to pandemic shocks for the largest OTAs from different regions across the globe. This can provide key market players, particularly investors, policy makers and practitioners with information on potential risks and opportunities available in this (OTA) fast growing market.

Our article adds to existing literature on four (4) folds. Firstly, we contribute to the debate on COVID-19 and tourism & travel stock performance as existing literature is sparse and inconclusive (Deng et al., 2021; Wu et al., 2021; Chen et al., 2020). We secondly evaluate the moderation role of OTAs' international exposure (Yong and Laing, 2020) on the relationship between COVID-19 containment measures stringency on OTAS' stock performance. Thirdly, we extend the time frame from January 2020 to December 2021 to evaluate the phenomenon during the first and second wave of COVID-19 as previous studies have done so during the first wave alone despite the fact that the pandemic is still ongoing (Yiwei et al., 2021; Wu et al., 2021; Carter et al., 2020; Lee et al., 2020; Chen et al., 2020). Fourthly, we focus on OTAs from different countries around the globe as previous studies have focused on tourism stocks in specific countries or regions thus failing to account for cross country heterogeneity of tourism and travel companies from different regions (Carter et al., 2022; Wu et al., 2021; Yiwei et al., 2021; Lee et al., 2020; Chen et al., 2020).

The rest of the article proceeds as follows. Section 2 provides for the in-depth review of extant literature regarding the potentials of online travel agency as an emerging business model and fast-growing market. It also discusses the Covid-19 pandemic effects on the OTA market investment. Section 3 highlights the methods employed while section 4 provides the results and discussions. Section 5 documents conclusions and implications.

2.0 Literature review

2.1 Tourism and Travel Stocks During COVID-19

Several studies have evaluated how the prevailing COVID-19 pandemic has affected tourism and travel stocks in different countries especially USA, China and EU countries. Wu et al. (2020) assessed the COVID-19 and tourism stocks in Chinese listed firms and observed significant negative stock performance. Their findings also suggested both negative and positive effects of government counter measures on tourism stock returns in different time periods. In another study that covered Chinese listed travel and tourism firms, evidence showed negative stock returns were exacerbated by news of growth in cases and deaths (Lee et al., 2020). However, (Carter et al., 2022) argue that larger tourism and travel firms with greater cash reserves and higher market-to-book ratios exhibited lesser negative returns in US. These results support those of the earlier study in a similar context that show deteriorating stock returns of travel and leisure firms due to growing strictness of government countermeasures (Chen et al., 2020). On a comparative study, Yiwei et al. (2021) argued that travel and tourism stocks in China and US experienced similar rising volatilities during the first wave of COVID-19 in 2020. Chancharat & Supawat Meeprom, 2021; Lin & Falk, 2021) also provide evidence to show negative effects of the pandemic on travel and tourism stocks in Thailand and Nordic countries respectively.

2.2 The Role of International Exposure

Despite growing number of literature on how international diversification impacts firm performance, the issue remains mixed and unresolved (Yong and Laing, 2021). Tongli et al. (2005) studied Singaporean multinationals that are more exposed into international markets outperformed others during the Asian financial crisis. Their arguments appear to be strongly supported by those of Yildiz et al.

(2022) whose review of 200 S&P 500 manufacturing firms showed that higher degree of international diversification has the potential to optimize firm performance. However, Qian et al. (2008) argue that the relationship between international markets diversification is not as straightforward as it is purported to be. They depict that international exposure boosts performance only if a firm operate across a moderate number of developed regions and a limited number of developing regions. Espinosa-Méndez et al. (2020) provided a different view from Chilean firms by showing that international exposure can both improve or deteriorate firms' performance depending with international market conditions. Thus an internationally exposed firm is not always guaranteed to perform better than less exposed ones. By studying Mexican firms, Thomas (2006) also supports the curvilinear linkage between international diversification and firm performance. This is due to the fact that the liability of foreignness causes firms to perform poorly but as they gain experience they eventually improve and enjoy the fruits of international expansion. In the light of these issues, we intend to moderate the role of international exposure on the relationship between COVID-19 and performance of OTAs stocks.

3.0 Data and Methods

3.1 Data

I employ a panel dataset of 14 listed OTAs from around the world with a combined market capitalization of at least 90 percent of the entire OTA sector (see appendix 1). The list was compiled after an extensive search for all OTAs listed in major stock markets in USA, Europe, Asia, Oceania and Latin America. I employ daily stock returns data from each of these companies as well as daily COVID-19 statistics for each company's country of operations (*Table 1*). The study timeframe ranges from 1st January 2020 to 31st December 2021 and it is split into two sub-periods. The first sub-period ranged from 1st January 2020 to 30th November 2020 signifying the first wave and the second ranged from 1st December 2020 to 31st December 2021 to represent the second wave. The sub-period analysis allows more plausible conclusions to be reached due to varying magnitude of the pandemic's effects during different periods.

Table 1: Description of variables

Variable	Description	Source
Stock Performance (Returns)	$= \frac{\text{Closing Price}_1 - \text{Closing Price}_0}{\text{Closing Price}_0} * 100\%$	https://www.investing.com
Return on Equity (ROE)	$= \frac{\text{Profit after Tax}}{\text{Total Equity}} * 100\%$	https://www.investing.com
Liquidity (LQD)	= Acid Test Ratio	https://www.investing.com
Leverage (LVG)	= Total Debt to Equity Ratio	https://www.investing.com
Firm Growth (F. Growth)	= Quarterly Sales Growth Rate	https://www.investing.com
Firm Size (F. Size)	= Log(Market Capitalization)	https://www.investing.com
Capital Expenditure Growth (CEG)	= Quarterly Capital Expenditure Growth	https://www.investing.com
International Exposure (IE)	= Ratio of International Firm's Revenues to Total Revenues	Individual Companies' annual reports
Cases	= New daily COVID-19 cases per million people	https://ourworldindata.org/covid-cases
Deaths	= New daily COVID-19 deaths per million people	https://ourworldindata.org/covid-deaths
Containment Measures Stringency (CoMS)	= A composite measure nine (9) metrics namely; school closures; workplace closures; cancellation of public events; restrictions on	https://ourworldindata.org/covid-stringency-index

	public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls. The index is computed on daily basis as an average score of the nine (9) metrics with each ranked between 0 and 100. The highest score of 100 indicates a strictest policy on a particular day.	

3.2 Methods

3.2.1 Panel Auto Regression Distributed Lag (ARDL)

I used the panel ARDL to estimate the short- and long-run coefficients of our COVID-19 variables due to its reliability in short sample periods (Pesaran et al., 1997). The panel ARDL model is specified as follows;

$$Y_{it} = a_i + \gamma_1 Y_{i,t-1} + \beta_i X_{it} + \mu_{it} \quad \ldots\ldots\ldots\ldots (i)$$

For firm i, where i = 1,2,….N,

The long-run parameter θ_t for firm i is presented as follows;

$$\theta_t = \beta_i / 1 - \gamma_1 \ldots\ldots\ldots\ldots (ii)$$

However due to heterogeneity bias as a result of heterogeneous slopes in dynamic panels, we estimate Panel ARDL using two (2) estimation methods namely; Mean group (MG) and Pooled mean group (PMG) estimator. The MG estimator computes the long-run coefficients for Panel ARDL for individual firms separately by allowing for heterogeneous nature of firms/countries. This allows MG estimator to generate long-run coefficients estimates that are consistent (Pesaran et al., 1997). The MG estimator in relation to equations (i) and (ii) is therefore presented as follows;

$$\theta_t = 1/N\, \Sigma^N_{i=1}\, \theta i \;\; ; \;\; \hat{a} = 1/N\, \Sigma^N_{i=1}\, a_i \ldots\ldots\ldots\ldots (iii)$$

On the other hand, PMG estimator computes the long run coefficients for Panel ARDL by averaging and pooling together coefficients of individual firms. It permits the intercepts, short-run coefficients and error variances to vary freely and constrains the long-run coefficients to be homogeneous across firms (Pesaran et al., 1998). Both MG and PMG estimators require the selection of appropriate length for individual firm models, to this end the Akaike Information Criterion (AIC) as well as Shwarz Bayesian Criterion (SBC) are used.

$$\Delta y_{it} = \theta i\, (y_{i,t-1} - \beta x_{i,t-1}) + \Sigma^{p-1}_{j=1} \lambda_{ij}\, \Delta y_{i,t-j} + \Sigma^{q-1}_{j=1} \Upsilon_{ij}\, \Delta x_{i,t-j}\;\; \Delta xi,t\text{-}j + \mu_i + \mathcal{E}it \ldots\ldots\ldots\ldots (iv)$$

Whereby;

β = Long-term parameters; θi = the equilibrium (or error)-correction parameters; $X_{i,\,t-j}$ = the vector of explanatory variables for firm i; μ_i = fixed effect.

Both MG and PMG estimate the error correction (EC) term which calculates the speed at which a dependent variable converges/diverges to equilibrium following a sudden shock in independent variables. Lastly, the Hausman test is carried out to select the best estimator between MG and PMG given the heterogeneous/homogeneous of firms.

3.2.2 Random Effects (RE) Regression Model

I specify the following random effects regression model for empirical analyses related to the moderation role of international exposure;

$$Returns_{f,d} = \alpha_f + \beta_1(CoMS_{f,d} \times International\ Exposure_f) + \beta 2(CoMS_{f,d}) + \beta 3(International\ Exposure_f) + \Sigma^k_{k=0}\beta_k X^k_c + \acute{\varepsilon}_{f,d} \ldots\ldots (v)$$

Whereby;

$Returns_{f,d}$ = The dependent variable; f = Firm; d =Time in days; α_f = A constant term; β = Coefficient of independent/moderating variables; $CoMS_{f,d}$ = COVID-19 measures stringency for a country in which a particular OTA originates in a given day; $CoMS_{f,d} \times International\ Exposure_f$ = the first interaction term indicating the effects of individual country's CoMS on Returns of OTAs that originate from that country are influenced by OTAs' degree of international exposure; $X^k{}_c$.= a set of firm level control variables namely; Leverage, Liquidity, Firm Size, Firm Growth, Capital Expenditure Growth; $\acute{\varepsilon}_{f,d}$ = Error term.

3.2.2 Pre-Estimation Diagnostics

Cross Sectional Dependence (CSD)

I conducted a series of robustness tests prior to embarking on carrying out the pre-described panel analyses. First and foremost, we tested for CSD in the panel data by initially regressing our independent variables namely; cases, deaths and CoMS on returns in both sub-periods. We then conducted three (3) separate CSD tests namely Pesaran's CD test, Frees' test and Friedman's test (*Table 2*) and the results reveal the presence of CSD.

Table 2: Cross sectional dependence test results

	First Wave			***Second Wave***		
	Pesaran's CSD	Frees CSD	Friedman's CSD	Pesaran's CSD	Frees CSD	Friedman's CSD
Coefficient	55.966*	0.912*	503.795*	62.781*	0.972*	53.925*

*Significant @ 0.05

Panel Unit Root Test

Since the presence of CSD is evident, we then conducted second generation panel unit analysis for each variable using the Covariate Augmented Dickey-Fuller (CADF) test introduced by (Pesaran, 2007). CADF test is well suited to accurately test for unit root when panel members contain CSD unlike conventional first-generation methods such as Levin-Chu (Chen et al., 2021). *Table 3* presents the CADF unit root test results and the first round of testing revealed unit root in three (3) variables namely; Leverage, Firm Growth and Capital Expenditure Growth. However, after first differencing the aforementioned variables became stationary.

Table 3: CADF

	Returns	ROE	LQD	ΔLVG	ΔFG	FS	ΔCEG	IE	Cases	Deaths	CoMS
Coefficient (First Wave)	-4.00*	-1.78*	-2.59*	-2.99*	-3.27*	-2.69*	-3.17*	-2.41*	-1.32*	-1.05*	-8.54*
Coefficient (First Wave)	-3.78*	-2.25*	-3.21*	-2.58*	-3.75*	-2.81*	-3.52*	-2.92*	-1.46*	-1.78*	-9.15

*Significant @ 0.05

Panel Co-Integration Test

After establishing the stationarity of the panel variables, we tested for long run co-integration between COVID-19 variables and OTAs' returns using (Kao, 1999) and Pedoni (2004). Kao (1999) works on the assumption that co-integrating vectors are homogeneous across all firms. On the other hand (Pedroni, 2004) assumes panel-specific or heterogeneous co-integrating vectors. The results are presented in *Table 4* and they present evidence of strong long run co-integration between the aforementioned variables thus supporting further short-run and long-term analytics using ARDL.

Table 4: Long run co-integration test results

	First Wave		**Second wave**	
	CoMS and Returns			
a) Pedroni Co-integration Test	Without trend	With trend	Without trend	With trend
▪ Modified Phillips-Peron	0.92	1.87*	0.74	1.42*
▪ Phillips-Peron	-10.74*	-11.48	-8.92*	-9.58*
▪ Augmented Dickey Fuller	-12.23*	-14.71*	11.17*	-8.13*
b) Kao Co-integration Test				
▪ Modified Dickey Fuller	-9.12		-11.57	
▪ Dickey Fuller	-11.10		-9.25	
▪ Augmented Dickey Fuller	-7.12		-7.26	
▪ Unadjusted Modified Dickey Fuller	-13.57		-8.57	
▪ Unadjusted Dickey Fuller	-15-23		-12.14	
Deaths and Returns				
a) Pedroni Co-integration Test	Without trend	With trend	Without trend	With trend
▪ Modified Phillips-Peron	0.84	1.87*	0.91	0.93*
▪ Phillips-Peron	-11.93*	-11.48	-8.01*	-8.26*
▪ Augmented Dickey Fuller	-13.74*	-14.71*	10.38*	-9.71*
b) Kao Co-integration Test				
▪ Modified Dickey Fuller	-8.42*		-13.49*	
▪ Dickey Fuller	-13.48*		-10.74*	
▪ Augmented Dickey Fuller	-6.42*		-9.46*	
▪ Unadjusted Modified Dickey Fuller	-14.49*		-10.24*	
▪ Unadjusted Dickey Fuller	-16.73*		-13.72*	
Cases and Returns				
a) Pedroni Co-integration Test	Without trend	With trend	Without trend	With trend
▪ Modified Phillips-Peron	1.23	1.45*	1.91	2.73*
▪ Phillips-Peron	-12.63*	-12.37	-8.17*	-10.15*
▪ Augmented Dickey Fuller	-14.43*	-15.63*	12.37*	-9.27*
b) Kao Co-integration Test				
▪ Modified Dickey Fuller	-11.22*		-12.74*	
▪ Dickey Fuller	-14.31*		-10.37*	
▪ Augmented Dickey Fuller	-8.23*		-8.38*	
▪ Unadjusted Modified Dickey Fuller	-14.75*		-9.89*	
▪ Unadjusted Dickey Fuller	-16.92*		-11.53*	

*Significant @ 0.05

Regression Model Goodness-of-Fit and Estimation

I conducted both fixed effects and random effects regression analysis to evaluate the moderation role of international exposure on the relationship between COVID-19 CoMS on Returns. Then the Hausman test was carried out and RE estimation was found to be more robust than FE. I also carried out further goodness-of-fit diagnostics to test crucial regression assumptions (appendix 2). The Breusch-Pagan test for heteroskedasticity revealed a p-value of 0.621 which exceeds the threshold of 0.05 thus signifying absence of the problem (Hausman and Taylor, 1981). The Variance Inflation Factors (VIFs) for all independent variables also had the values below the threshold of 5 which indicates the absence of multicollinearity problem. Moreover, the link test or regression model specification results indicate the p-value of 0.594 which exceeds the 0.05 level of significance thus signifying correct model specification.

4.0 Empirical Results

4.1 Preliminary Results

4.1.1 Descriptive Statistics and Pairwise Correlations

The descriptive statistics for all the variables during both sub-periods firstly reveal very small positive mean stock returns for both periods (*Table 5*). The mean for the second sub period appears to be slightly higher which may indicate the varying magnitudes of pandemic's economic repercussions on OTAs with the first wave being more severe. What's more, the deviations of returns in the first wave were higher than those from the second wave depicting more volatile returns during the first wave. The other crucial variable of interest is CoMS and the results show slightly higher magnitude of countermeasures stringency during the first wave as highlighted by the initial panic caused by the declaration of the virus as a pandemic by the World Health Organization (WHO) in March 2020. The average international exposure of OTAs during both sub-periods is between 44 and 48 which signify the fact that firms in the sector are increasingly going international in an attempt to increase their customer base and diversify their revenues internationally.

Table 5: Descriptive statistics

	First Wave					***Second Wave***				
Variable	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max
Returns	2,544	0.08	5.55	-51.14	58.77	3,663	0.10	3.77	-38.32	86.59
ROE	2,544	-9.61	24.55	-70.59	21.23	3,663	-11.28	24.75	-70.59	21.23
LQD	2,544	124.63	116.03	1.10	431.00	3,663	124.80	111.34	1.10	431.00
LVG	2,544	132.61	123.02	0.00	411.00	3,663	122.44	118.74	0.00	411.00
F. Growth	2,544	-10.07	10.02	-31.36	2.00	3,663	-7.99	14.53	-31.36	29.34
F. Size	2,544	8.63	1.48	5.08	10.46	3,663	8.68	1.48	5.08	10.46
CEG	2,544	-6.99	15.71	-49.79	11.02	3,663	-6.27	15.19	-49.79	11.02
IE	2,544	44.81	28.23	2.00	90.00	3,663	48.09	29.17	2.00	90.00
Cases	2,544	92.36	208.26	0.00	3098.55	3,663	247.12	308.90	0.00	4152.72
Deaths	2,544	1.71	3.21	0.00	73.48	3,663	2.95	3.86	0.00	45.68
CoMS	2,544	61.74	23.74	0.00	100.00	3,663	61.33	12.60	34.26	87.96

The Pairwise correlations between variables were also analyzed during both sub-periods (*Table 6a and 6b*). The results firstly indicate significant negative correlations between Returns and Cases and Deaths during the first wave of COVID-19. On the other hand, CoMS was observed to be positively and significantly correlated with Returns. However, during the second wave, only Deaths variable appeared to be significantly correlated with Returns while Cases and CoMS revealing an insignificant correlation with Returns.

Table 6a: First wave Pairwise correlation results

	1	2	3	4	5	6	7	8	9	10	11
Returns (1)	1.00										
ROE (2)	-0.01	1.00									
LQD (3)	0.00	0.39*	1.00								
LVG (4)	0.00	-0.14*	-0.49*	1.00							
F. Growth (5)	-0.01	0.67*	0.07*	0.23*	1.00						
F. Size (6)	0.00	0.05*	0.11*	0.14*	0.40*	1.00					
CEG (7)	-0.01	-0.05*	0.08*	-0.08*	0.35*	0.48*	1.00				
IE (8)	-0.01	0.23*	0.32*	0.22*	0.19*	0.31*	-0.08*	1.00			
Cases (9)	-0.08*	-0.06*	-0.16*	0.23*	-0.09*	-0.11*	-0.05*	0.07*	1.00		
Deaths (10)	-0.16*	0.02	-0.13*	0.24*	0.01	-0.08*	0.00	0.01	0.54*	1.00	
CoMS (11)	0.13*	-0.14*	-0.04*	-0.10*	-0.03	0.15*	0.02	-0.19*	0.06*	0.22*	1.00

*Significant @ 0.05

Table 6b: Second wave Pairwise correlation results

	1	2	3	4	5	6	7	8	9	10	11
Returns (1)	1.00										
ROE (2)	-0.01	1.00									
LQD (3)	0.00	0.39*	1.00								
LVG (4)	0.01	-0.09*	-0.48*	1.00							
F. Growth (5)	-0.01	0.51*	0.10*	0.03	1.00						
F. Size (6)	0.00	0.08*	0.11*	0.09*	0.45*	1.00					
CEG (7)	-0.01	-0.02	0.12*	-0.12*	0.35*	0.47*	1.00				
IE (8)	0.01	0.19*	0.32*	0.13*	0.35*	0.35*	0.03	1.00			
Cases (9)	-0.01	0.06*	-0.12*	0.23*	0.04*	-0.16*	0.01	0.08*	1.00		
Deaths (10)	-0.03*	0.10*	-0.03	0.29*	0.15*	0.01	-0.02	0.18*	0.52*	1.00	
CoMS (11)	0.03	0.02	0.21*	-0.19*	0.04*	0.16*	0.05*	-0.09*	-0.13*	0.27*	1.00

*Significant @ 0.05

4.1.2 Structural Breaks

I proceeded to conduct structural breaks test to examine the dates at which each OTA's returns trend significantly changed in the entire study timeframe (Bai and Perron, 2003). These results are vital to supplement the descriptive comparisons of returns between the first and second wave. The results indicate that all OTAs returns except for Yatra had single structural breaks during the entire timeframe (*Table 7*). The structural breaks for all OTAs occurred between 9th and 24th March 2020 which is the time period at which COVID-19 cases during the first wave were exponentially surging in major economies across the globe. Furthermore, this was the month when the World Health Organization (WHO) declared the virus as a global pandemic resulting into a global panic.

Table 7: Structural break test results

Company	Sup. F	p value	No of Breaks	Break (1)	Break(2)
AirBnB	8.978	0.045	1	24-Mar-20	Nil
Booking	9.768	0.063	1	23-Mar-20	Nil
Despegar	8.738	0.101	1	23-Mar-20	Nil
eDreams	38.674	0.000	1	19-Mar-20	Nil
Expedia	15.638	0.004	1	18-Mar-20	Nil
HostelWorld	24.915	0.000	1	16-Mar-20	Nil
Lastminute	28.711	0.000	1	19-Mar-20	Nil
MMYT	9.448	0.073	1	18-Mar-20	Nil
OTB	14.362	0.007	1	19-Mar-20	Nil
Travelzoo	13.032	0.013	1	18-Mar-20	Nil
Trip.com	6.86	0.227	1	18-Mar-20	Nil
Trivago	4.64	0.526	1	9-Mar-20	Nil
WebJet	28.371	0.000	1	11-Mar-20	Nil
Yatra	3.04	0.831	2	17-Mar-20	8-Feb-21

4.2 Main Results

4.2.1 Panel Granger Causality Test Results

I recommenced our main analyses by conducting the panel Granger Causality test to probe into the extent at which CoMS, Cases and Deaths cause Returns during both waves of COVID-19 (Dumitrescu & Hurlin, 2012). The results portrayed in *Table 8* indicate the fact that all three (3) COVID-19 variables namely; CoMS, Deaths and Cases Granger caused Returns but during the first wave alone. These results are in contrast to those of the second wave which show that all three (3) variables do not Granger cause Returns. These results can be explicated by the fact that during the first wave of Covid-19 most people were at home due to lockdowns thus they had ample time to read, analyze and digest the information thoroughly. Our results support Salisu and Vo (2020) who explicate how news pertaining to aspects like cases and deaths improve the predictability of stock returns.

Table 8: Panel Granger causality test results

	Statistic	***First Wave***	***Second Wave***
CoMS on Returns			
Coefficients	Z-bar	14.56*	-0.12
	Z-bar tile	14.39*	-0.13
Deaths on Returns			
Coefficients	Z-bar	15.64*	-1.13
	Z-bar tile	15.46*	-1.13
Cases on Returns			
Coefficients	Z-bar	11.07*	1.69
	Z-bar tile	10.94*	1.83

*Significant @ 0.05

4.2.2 Autoregression Distributed Lag (ARDL) Estimation Results

To account for heterogeneity of dynamic panels we employed both MG and PMG estimations to diagnose whether there are short run or long run effects of CoMS as well as Deaths and Cases on Returns (*Table 9*). I used the lag length of 1 as indicated by the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (BIC) for these particular estimations. The MG and PMG estimation results for both waves are presented in *Table 9*. Based on the Hausman test results, the dynamic panel model appears to have heterogeneity effects thus pointing to the appropriateness of MG to capture these effects during both waves. During the first wave, CoMS appeared to have significant positive long run effects on Returns while Deaths and Cases had significant negative effects on Returns. The results support Aggarwal et al., 2021; Haroon and Rizvi, 2020) who show the importance of containment measures in building investors confidence towards virus containment and economic restoration during the first wave. We partly corroborate findings by (Wu et al. (2020) that also find evidence of positive effects of containment measures on tourism stocks. The MG error correction term during the same period appears to be positive and significant which signifies the fact that the long term effects of COVID-19 variables on Returns are unstable. This also means that Returns for OTAs may significantly diverge and not quickly recover to equilibrium following a disturbance or shock in any of three (3) COVID-19 measures.

The results also reveal significant short run effects of CoMS, Deaths and Cases on Returns with the latter two (2) revealing negative effects. The negative effects of case and deaths on returns during the first wave support investors' overreaction to unexpected bad news in line with the rational expectations equilibrium (Veronesi, 1999). The MG estimation results are however different in the second sub-period/wave whereby the three (3) COVID-19 variables had insignificant short run and long run effects on Returns which may signify diminishing shock among investors.

Table 9: PMG and MG estimation results for short run & long run relationship between COVID-19 and OTAs' returns

	First Wave		***Second Wave***	
Returns	MG (Standard Error)	PMG (Standard Error)	MG (Standard Error)	PMG (Standard Error)
Long run coefficients				
CoMS	0.0194*	0.0062*	0.0167	0.0145*
	(0.0073)	(5.3200)	(0.0104)	(0.0070)
Cases	-0.0015*	-0.0040*	-0.3050	-0.0000
	(0.0004)	(0.0010)	(0.3027)	(0.0003)
Deaths	-0.5935*	-0.2889*	-120.8696	-0.0008
	(0.0283)	(0.1038)	(121.0783)	(0.0253)
Short run coefficients				
EC	0.5283*	-0.5184*	1.0197*	-1.0507*
	(0.0073)	(0.0064)	(0.0323)	(0.0679)
CoMS. D1	0.1292*	0.0133*	0.1490	0.1974
	(0.0110)	(0.0069)	(0.13205)	(0.1069)
Cases. D1	-0.0059*	-0.0001*	-0.1253	-0.0003
	(0.0002)	(0.0000)	(0.1237)	(0.0014)
Deaths. D1	-0.1774*	0.0326*	-44.8173	0.0405
	(0.0116)	(0.0074)	(45.0524)	(0.0696)
_Cons	1.1960*	-1.4394*	1.0876*	-0.7415
	(0.2979)	(0.0294)	(0.5234)	(0.4173)
Hausman Test	Chi-square	p value	Chi-square	p value
	-0.27	0.0045	-1.05	0.0021

*Significant @ 0.05

4.2.3 Random Effects Regression Results

In the RE results, Model 1 represents the base line model made up of the main independent variable (CoMS), Deaths, cases as well as the control variables which are regressed against Returns which is the dependent variable (*Table 10*). Model 2 adds the moderating variable i.e. International Exposure on top of Model 1. Lastly, Model 3 adds the interaction variable "CoMS x IE" on top of Model 2 for final analysis. The results (Model 1) initially reveal significant positive and negative effects of CoMS and Deaths respectively on Returns but during the first sub-period/wave alone. The results however suggest insignificant relationship between CoMS, Deaths and Cases in the second sub-period/wave. We then looked into the moderation effects of International Exposure in Models 2 and 3. The results indicated significant positive moderation effects of International Exposure on the linkage between CoMS and Returns during in the first wave of COVID-19 alone. I therefore support findings from earlier researches that advocate for the important role of international exposure in improving firms' performance especially during economic adversity (Yildiz et al. 2022; Tongli et al. 2005; Thomas. 2006).

Table 10: Random effects regression results

Returns	***First Wave***			***Second Wave***		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Lag. Returns	0.02	0.02	0.02	-0.09*	-0.09*	-0.09*
CoMS	0.02*	0.02*	0.02*	0.01	0.01	0.00
International Exposure	-	0.00*	0.01*	-	0.00	-0.01
CoMS*IE	-	-	0.00*	-		0.00
Cases	0.00	0.00	0.00	0.00	0.00	0.00
Deaths	-0.24*	-0.24*	-0.24*	0.03	0.03	0.03
ROE	0.00	0.00	0.00	0.00	0.00	0.00
Liquidity	0.00	0.00	0.00	0.00	0.00	0.00
Leverage	0.00	0.00	0.00	0.00	0.00	0.00
Firm Growth	0.00	0.00	0.00	0.00	0.00	0.00
Firm Size	0.05	0.03	0.06	-0.01	-0.03	-0.01
Cap. Exp Growth	-0.01	-0.01	-0.01	0.00	0.00	0.00
Constant	-2.11*	-2.01*	-1.59*	-0.43	-0.44	-0.01
R-Squared	0.60	0.69	0.75	0.02	0.04	0.02
No of Obs.	2,544	2,544	2,544	3,663	3,663	3,633

*Significant @ 0.05 level

5.0 Conclusions and implications

This article investigates the impact of COVID-19 on stock performance of 14 leading OTAs during the first and second wave. Our results firstly provide evidence of causal effects from COVID-19 cases, deaths and containment measures stringency on OTAs' stock performance during the first wave alone. Secondly, I find significant short term and long-term unstable effects of cases and deaths on stock performance of OTAs. In addition, evidence points towards short term and long term significant positive effects of containment measures stringency on OTAs' stock performance. However, it is worth noting that significant effects for all three (3) COVID-19 variables were observed during the first wave alone. I finally reveal the fact that OTAs' international exposure amplifies the positive effects of containment measures stringency on OTAs' stock performance during the first wave of COVID-19. Our study makes two (2) theoretical contributions. Firstly, we show that investors' panic tends to diminish in the long run following earlier shocks to stocks from occurrence of major events. I secondly make the argument that some bad news i.e. containment measures stringency can actually have positive effects on stock prices/returns if they have the potential to improve future market conditions. So we urge OTA investors to avoid panic selling during the early days of health crises as adverse effects of containment measures to the sector's operations can last only for short periods of time.

Furthermore, the sector has always been able to bounce back from crises such as 9/11 attacks and the Global Financial Crisis (2009). I secondly stress the need for governments to take early actions by implementing strict containment measures upon the outbreak of highly contagious diseases to build confidence among investors. Evidence shows that initial lockdowns have helped to raise investors' confidence in overall stock markets in countries such as New Zealand (Bouri et al., 2021). Thirdly, OTAs should implement short term measures like budget cuts on discretionary costs and promote discounted travel packages to least infected tourists destinations to boost cash flows during the pandemic.

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Appendix 1 Selected OTAs

No.	Company	Country	Stock Exchange
1	AirBnB	USA	NASDAQ
2	Booking Holdings In	USA	NASDAQ
3	Expedia Inc (EXPE)	USA	NASDAQ
4	MakeMyTrip Limited	India	NASDAQ
5	WEBJET	Australia	Sydney Stock Exchange
6	Despegar	Argentina	Buenos Aires Stock Exchange
7	Trivago NV	Germany	Frankfurt Stock Exchange
8	On The Beach Group PLC	UK	London Stock Exchange
9	eDreamsOdigeo SA	Luxembourg	London Stock Exchange
10	Lastminute.com Group	Switzerland	Switzerland Stock Exchange
11	HostelWorld Check Group AG	Ireland	Ireland Stock Exchange
12	Trip.com	China	Hong Kong Stock Exchange
13	Yatra	India	NASDAQ
14	Travel zoo	USA	NASDAQ

Source: https://www.statista.com/statistics/1039616/leading-online-travel-companies-by-market-cap/

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Appendix 2: Regression model assumptions

S/N	Regression Assumptions	Test(s)	We seek values
1	No heteroskedasticity problem	*Breusch-Pagan hettest* Chi2(1): 88.33 p-value: 0.621	> 0.05
2	No multicollinearity problem	*VIF*	< 5.00
3	No specification problem	*Linktest* t: 0.826 p-value: 0.517	> 0.05
4	No influential observations	*Cook's distance* no distance is above the cut-off	< 1.00