APPLIED ECONOMICS
2021, VOL. 53, NO. 31, 3658–3678
https://doi.org/10.1080/00036846.2021.1884839

The impact of COVID-19 pandemic on abnormal returns of insurance firms: a cross-country evidence

Umar Farooq [a], Adeel Nasir [b], Bilal [c] and Muhammad Umer Quddoos [d]

[a]FAST School of Management, National University of Computer and Emerging Sciences, Faisalabad, Pakistan; [b]Department of Management Sciences, Lahore College of Woman University, Lahore 54000, Pakistan; [c]Accounting School, Hubei University of Economics, Wuhan, China; [d]Department of Commerce, Bahauddin Zakariya University, Multan, Pakistan

ABSTRACT

This research investigates the abnormal returns of 958 insurance companies from Australia, Canada, Germany, USA, UK, Brazil, India, and Indonesia under the COVID-19 scenario. This study deploys the event study methodology to analyse the effects of COVID-19 on stock returns both in the short and long terms. Results reveal that, overall, COVID-19 negatively affected the stock returns, particularly in the case of insurance firms operating in developing countries. This research also explores firm-specific determinants distinguishing the most affected insurance firms. It is found that firm size, systematic risk, price-earnings ratio, profitability, and dividend yield affect the intensity of abnormal returns in response to COVID-19 but in different event windows. The investors and policymakers should consider these factors in connection with the risk mitigating strategies.

KEYWORDS

COVID-19; pandemic; abnormal returns; stock returns; event study

I. Introduction

The novel coronavirus (COVID-19) ended the year 2020 with 83+ million confirmed cases and 1.8 + million deaths worldwide (WHO 2021). The COVID-19 and its spread have thrown a curveball for the global economy and society at large (Goodell 2020). Industries across the globe are facing challenges never seen before and the insurance industry is no exception. A healthy insurance sector empowers financial market stability, particularly under uncertainty and shock transmission resulting from economic integration (Nguyen and Vo 2020). However, COVID-19 carried new challenges for the insurance industry, such as operational limitations, regulatory issues, and financial problems that have vital implications for their ongoing as well as future performance (Baumann 2020; Vlaminckx 2020).

For instance, increasing numbers of COVID-19 cases and death morality could increase the claim expenses. Similarly, the expected decline in global GDP growth from 3.3% to 2.3% and a reduction of interest rate could negatively affect the return on investments of insurance companies (Leonard 2020). Such expense escalation and declining returns can affect the stock prices of insurance companies as described by pessimistic theory (Aiuppa, Carney, and Krueger 1993). Similarly, the pandemic disease creates uncertainty and pessimism about future cash flows that further adversely affect the investors' strategy. The spillover effect of the overall decline in the market could also form investors' herd behaviour to result in negative abnormal returns.

Conversely, one can also expect increasing demand for insurance contracts and premiums after COVID-19. According to threshold theory and hardening theory, such revenue escalation positively affects their stock returns (Aiuppa, Carney, and Krueger 1993). Shelor, Anderson, and Cross (1992) also proposed a "Gain from Loss" hypothesis to describe such positive effects. They studied the California (Loma Prieta) earthquake and found that insurance companies earned potential premiums from the enhanced future uncertainty. The aforementioned theoretical aspects show that both positive and negative abnormal returns can be expected in response to COVID-19.

Investigating such positive/negative abnormal returns is imperative to make prudent

CONTACT Bilal bilal@hbue.edu.cn Hubei University of Economics, Wuhan, China

investment decisions and explore the insurance sector's role as a financial market stabilizer during the catastrophic pandemic. Thus, the current study aims to analyse the abnormal returns of insurance companies in response to COVID-19 in a cross-country setting using a sample of 958 insurance companies from five developed countries (Australia, Canada, Germany, United States of America (USA), United Kingdom (UK)) and three developing countries (Brazil, India, and Indonesia). Although some of the studies have explored the impact of COVID-19 on different stock markets (Ashraf 2020; Baumann 2020; Chen et al. 2018; Liu et al., 2020; Sharif, Aloui, and Yarovaya 2020), the abnormal returns of insurance companies were not their area of interest. Therefore, up to the best of the authors' knowledge, no prior work analysed the abnormal returns of insurance companies in response to the COVID-19 pandemic.

This study employs the event study methodology to investigate the insurance stock returns' abnormality, incorporating the country effect, type of insurance effect, and firm-specific determinants. It is argued that due to behavioural differences, the impact of COVID-19 can differ for developed and developing countries. Similarly, the life-insurance sector is more likely to get benefits from the gain from loss hypothesis. Therefore, country effects and type of insurance effects were focused to explain variation in abnormal returns during COVID-19. Similarly, systematic risk, firm size, price-earnings ratio, return on assets, and dividend yield ratio are explored as firm-specific determinants of abnormal cross-sectional returns. It is argued that these determinants can help in distinguishing the insurance firms providing higher abnormal returns.

In short, the current study contributes to the literature in at least two crucial ways: First, we contribute by providing new evidence on the impact of the COVID-19 pandemic on abnormal returns of the two types of insurance companies from selected developed and developing countries. Second, we explore firm-specific determinants of abnormal returns to distinguish the most affected insurance firms to help stakeholders devise mitigating strategies accordingly.

II. Theoretical background

A plethora of research has examined the influence of catastrophes, such as earthquakes, typhoons, and epidemics, on insurance companies' stock returns since the 1990s. However, findings are inconclusive, and natural disasters have two opposing effects on insurance stock returns: a positive impact due to higher premium expectations and a negative impact due to payments on policyholders' claims. Both positive and negative implications of catastrophes can be explained by virtue of pessimistic theory, herding theory, or threshold theory (Aiuppa, Carney, and Krueger 1993). Under the pessimistic view, the insurance companies would experience abnormal returns after the catastrophe because of the substantial cash outflows due to claims' compensation (losses). Therefore, one can expect negative abnormal returns after the catastrophic event due to expectations of deteriorated performance during and post catastrophic period.

The efficient market hypothesis states that stock prices reflect all the available information, and investors cannot benefit from the opportunity of abnormal returns. However, such markets do not prevail in real practice, and the existence of the arbitrage opportunities to beat the market is an established fact. The behavioural theorists believe that such abnormal returns are the function of behavioural and psychological factors (Bollen 2007; Hoffmann, Post, and Pennings 2013). The panic and pessimistic states about economic expectations during health emergencies affect the investors' sentiments and result in abnormal returns (Baker and Wurgler 2006). Initially, such pessimism creates 'doubted individuals' and later converts into 'doubted groups' to negatively affect the stock market (Liu et al., 2020).

Similarly, Lee, Shleifer, and Thaler (1991) found that investors with pessimistic sentiments led to more volatility than optimistic sentiments. These behavioural aspects allude that COVID-19 would have a negative impact on stock returns. Another reason for negative abnormal behaviour can be the spillover effect of the overall decline in financial markets. Moreover, any catastrophe categorized as a part of systematic risk is more likely to affect the overall market, as well as the insurance sector, negatively. Hence, pessimistic theory, investor sentiments, and spillover effect explain the negative relationship between catastrophes and abnormal returns of the insurance sector.

In contrast, the threshold theory and hardening theory forecast the positive effects of catastrophes on abnormal stock returns (Aiuppa, Carney, and Krueger 1993). Threshold theory recommends that individuals recognize a probability value of infrequent events that possess a threshold value. These individuals will only be insured if their perceived value surpasses their threshold value. In catastrophes, individuals might recognize a higher perceived value of insurance than the threshold value, and this change boosts the insurance purchases and returns for insurance companies. Similarly, the hardening theory believes that insurance firms work in a soft-market pricing environment at the time of catastrophes. In a soft-market environment, buyers are less than the sellers, and firms compete with low prices. However, catastrophes' event discourages the management from following such pricing behaviour that ultimately increases their premiums. As a result, the events of catastrophe can have a positive impact on abnormal returns.

Shelor, Anderson, and Cross (1992) proposed the gain from loss hypothesis, which stated the positive impact of catastrophes on the insurance sector due to increased insurance demand. Aiuppa and Krueger (1995) advocate the gain from loss hypothesis and state that insurance companies benefitted from the Los Angeles earthquake of 1994. Yamori and Kobayashi (2002) rejected the hypothesis and provided the contrary impact of the 1995 Hanshin-Awaji earthquake on the Japanese stock market. Such contradictory results can be due to behavioural differences. For instance, attention theory explains that investors buy stocks that attract them (mostly through news) and do not evaluate the number of stocks based on their fundamental information (Andrei and Hasler 2015). Therefore, some positive thoughts about the insurance sector can increase demand while negative thoughts would conversely. Hence, catastrophic events can have positive and negative effects on the stock returns of insurance companies.

Previously, various studies have explored the abnormal returns of insurance companies in response to different catastrophic events. Table 1 presents the literature focusing on earthquakes, typhoons, and the terrorist attacks as an event of a catastrophe to estimate abnormal returns of insurance operators. However, the literature on infectious disease or epidemic outbreak concerning stock returns of insurance operators is limited. Most of the studies focus on exploring the general linkage between insurance coverage/products/claims and infectious disease outbreak (Chen, Goodwin, and Prestemon 2019; Cohen 2017; Hellander et al. 1995; Hoffmann and Icks 2012; Lefèvre and Picard 2015, 2018; Shemendyuk, Chernov, and Kelbert 2019). Very few studies have investigated pandemic diseases' impact on abnormal stock returns, particularly for the insurance industry.

Using a search query of '*TITLE-ABS-KEY (covid OR covid-19 OR corona OR coronavirus OR "corona virus" OR pandemic OR epidemic) AND TITLE-ABS-KEY ("abnormal returns" OR "Stock Returns" OR "Stock Prices" OR "Event Study")*' in Scopus, we found 35 results (till July, 2020). This search query was established to find the literature focusing on the impact of COVID-19 or previous pandemic diseases on abnormal stock returns. After analysing the title and abstract of each article, we screened 11 relevant studies. Among these 11 studies, 6 articles examined the impact of ongoing COVID-19 on stock market returns. Table 2 provides a summary of these articles. However, none of these studies explored the effects of COVID-19 on insurance companies' stock returns considering the cross-country environment.

The current study fulfils this gap by exploring the impact of the COVID-19 pandemic on abnormal returns of insurance operators from developed and developing economies. It is also explored whether such stock abnormality differs across countries and types of insurance providers. It is postulated that investors in developed countries are more rational and create negative abnormal returns due to pessimistic sentiments of COVID-19. However, in developing countries, investors' irrational behaviour can create more volatile abnormalities even against the theoretical expectations.

One can also expect an increase in insurance contracts in response to COVID-19 as described by

Table 1. Literature on the relation between catastrophes and abnormal returns.

Reference	Catastrophes	Insurance Type	Method	Results
Lamb (1995)	1992 Hurricane Andrew in South Florida and Louisiana	property-liability insurers	Event Study	Negative Abnormal Returns
Angbazo and Narayanan (1996)	1989 Hurricane Hugo in South Carolina	property-liability insurers	Event Study	Negative Abnormal Returns
Yamori and Kobayashi (2002)	1995 Great Hanshin Awaji Earthquake	property-liability insurers	Event Study	Negative Abnormal Returns
Takao et al. (2013)	Great East Japan Earthquake 2011	Life and Non-Life Insurance	Event Study	Negative Abnormal Returns
Valizadeh, Karali, and Ferreira (2017)	Japan's 2011 earthquake	The insurance industry and its trading partner	Event Study	Negative Abnormal Returns
Cummins and Lewis (2003)	The terrorist attack of 9/11 in the USA	property-causality insurers	Event Study	Negative Abnormal Returns
Shelor, Anderson, and Cross (1992)	Loma Prieta earthquake (struck California in 1989)	property-liability insurers	Event Study	Positive Abnormal Returns
Aiuppa, Carney, and Krueger (1993)	Loma Prieta earthquake (struck California in 1989)	property-liability insurers	Event Study	Positive Abnormal Returns
Lamb et al. (1997)	1994 Northridge earthquake in Los Angeles	property and casualty insurance	Event Study	Positive Abnormal Returns
Moridaira (2019)	Great East Japan Earthquake	Non-Life Insurance	Event Study	Positive Abnormal Returns
Yamasaki (2016)	series of typhoons that made landfall in Japan	Property-Liability Insurers	Event Study	Positive Abnormal Returns

threshold theory. However, ongoing COVID-19 enforced lockdown all over the world, and firms are operating online. This is one of the biggest challenges for insurance agents to sell insurance contracts online. Therefore, during ongoing COVID-19, insurance firms might not get benefits described by threshold theory and result in high cash outflow claims due to increased mortality. This argument is more relevant for life insurance (as death cases are increasing), and the impact of COVID-19 could be more for life insurance than non-life insurance. This research intends to identify such differential effects for countries and types of insurance operators.

Current research also studied firm systematic risk, size, price-earnings ratio, return on assets, and dividend payout ratio as determinants of abnormal returns. It is argued that these determinants can distinguish the most affected insurance firms that could provide policy implications. The Capital Asset Pricing Model (CAPM) argued that systematic risk is the primary determinant of cross-sectional returns due to its non-diversifiable nature (Black 1972; Lintner 1965; Sharpe 1964). However, Benz (1981) and Basu (1983) found that such positive risk–return relation depends on firm size and price-earnings ratio, respectively. Fama and French (2015) also contended that profitability is another critical determinant that should be used with the firm size and price-earnings ratio. Therefore, this research investigated these firm-specific factors to distinguish the most affected insurance firms. The outcome of these objectives will have substantial practical implications for investors, insurance managers, and policymakers.

III. Research methodology

This study selected a sample of 958 insurance firms from five developed (Australia, Canada, Germany, USA, UK) and three developing countries (Brazil, India, and Indonesia), as shown in Table 3. The segregation of these countries as developed and developing is based on the country's economic condition as followed by the United Nations in

Table 2. Literature on pandemic and stock market reactions.

Reference	Catastrophes	Sample	Method	Results
Chen, Jang, and Kim (2007)	SARS outbreak	Taiwan Hotel Industry	Event Study	Negative Abnormal Returns
Yang, Wang, and Chen (2010)	ENTEROVIRUS, Dengue Fever, SARS and H1N1	Biotechnology Industry in Taiwan	Event Study	Positive Abnormal Returns
Wang, Yang, and Chen (2013)	ENTEROVIRUS, Dengue Fever, SARS and H1N1	Biotechnology Industry in Taiwan	Event Study	Positive Abnormal Returns
Cho et al. (2016)	Middle East Respiratory Syndrome (MERS)	Korea Composite Stock Price Index		Negative Effect
Chen et al. (2018)	SARS	China and four Asian stock markets	The difference in Difference Approach	Found weak Long-run relation between China and four Asian markets
Al-awadhi et al. (2020)	Confirmed cases and death rate in COVID-19	China Stock Market	Panel Regression Analysis	A negative effect of confirmed cases and death on the stock market
Goodell and Huynh (2020)	COVID-19	49 Different industries from the USA	Event Study	Negative Abnormal Returns
Akhtaruzzaman, Boubaker, and Sensoy (2020)	COVID-19	China and G7 countries	VARMA (1,1) DCC-GARCH model	conditional correlations found between stock returns
Zaremba et al. (2020)	Govt Intervention in COVID-19	67 countries covered by Global Equity Indices in DataStream	Panel Regression Model	Non-pharmaceutical interventions increase equity market volatility
Liu et al. (2020)	COVID-19 Cases and Death	China and Asian Stock Markets	Event Study	Both the Chinese and Asian markets decline. Pharmaceutical and IT services had positive CAR
Haiyue Liu et al. (2020)	COVID-19	Major indices from Japan, Korea, Singapore, USA, Germany, Italy, and the UK	Event Study	Stock Market from major affected countries fell quickly after the virus outbreak

Table 3. Sample insurance operators across countries and the first COVID case.

Country	Life Insurance	Non-Life	Total	First COVID Case ($t = 0$)
Australia	2	12	14	25–01-2020
Canada	41	27	68	25–01-2020
Germany	134	453	587	27–01-2020
UK	7	16	23	31–01-2020
USA	54	169	223	21–01-2020
Brazil	0	10	10	25–02-2020
India	9	9	18	30–01-2020
Indonesia	2	13	15	02–03-2020
Total	**249**	**709**	**958**	

their 'World Economic Situation and Prospects' report (UN-DESA 2020). The daily stock market data are collected from Yahoo Finance. The selection of countries is made based on data availability (i.e. the data of at least ten insurance operators are available for that country on Yahoo Finance) and a high number of COVID-19 cases. The insurance operators are also divided into life insurance and non-life insurance using stock screeners in Yahoo Finance. To achieve our research objectives, we deployed the event study methodology to analyse insurance companies' abnormal returns in response to COVID-19 in eight selected countries.

We extracted daily stock price data of all selected firms from 1 January 2019 to 15 April 2020 using a 'batchgetsymbol' package in R studio (R programming language). This period provided data for 325 trading days on average. To calculate the expected returns, a GARCH model is used that employed the data from 1 January 2019to the fifteen days before the first corona case was reported in the respective country. We mainly used the event window starting from t-15 to t + 45 (i.e. −15, 45) where 't' is the event date when the first corona case is reported in the respective country. However, in Brazil and Indonesia, the first corona case was reported on 25–02-2020 and 02–03-2020, respectively, as shown in Table 3. Therefore, due to data restriction, we shortened their event window from −15 to +30. We used a single-factor market model to estimate the expected returns $E(R)_{it}$ with GARCH (1, 1) errors (Bollerslev 1986). This approach is applied using a package of 'EventStudy' in R Studio (Schimmer, Levchenko, and Müller 2014). The expected return $E(R)_{it}$and conditional variance $\sigma_t^2$of GARCH model may be stated as

$$E(R)_{it} = \alpha + \beta R_{mt} + \varepsilon_{it}$$

$$\sigma_t^2 = \omega + \gamma_1 * \varepsilon_{t-1}^2 + \delta_1 * \sigma_{t-1}^2$$

where σ_t^2 is the conditional variance of the above equation, ω is the intercept, ε_t^2 represents the residuals generated from the mean filtration process, γ_1 and δ_1 are the respective coefficients of ε_t^2 and σ_t^2. Chang et al. (2018) and Georgiou 2017) have previously studied abnormal stock returns based on such event methodology. After the derivation of expected returns E(R), abnormal returns can be calculated using the following equation.

$$AR_{it} = R_{it} - E(R)_{it}$$

AR_{it} is the abnormal returns equal to the difference of actual returns (R_{it}) and expected returns E(R). Abnormal returns AR_{it} are calculated for the event window starting from *t-15* to *t + 45*. We also computed the average abnormal returns for each country for the event window using the following formula:

$$AAR_t = \frac{1}{N \sum AR_{i,j}}$$

AAR is the average abnormal return, calculated as the sum of abnormal returns divided by the number (N) of firms in a specific country. We applied the cross-sectional t-test (CSect T) to check the hypothesis; H_o: AAR = 0 using the following formula.

$$t_{AAR} = \sqrt{N}\frac{AAT_t}{S_{AAR_t}}$$

Where S_{AARt}, represents the standard deviation of cross-sections at time t, and stated as;

$$S^2_{AAR_t} = \frac{1}{N-1}\sum_{i=1}^{N}\left(AR_{i,t} - AAT_t\right)^2$$

For a comprehensive analysis, this study also investigated cumulative abnormal returns for four combinations of days during the event window, i.e. *t-1 to t + 10, t-1 to t + 20, t-1 to t + 30, and t-1 to t + 45*. Cumulative abnormal returns (CAR) represent the sum of AR during *t1* and *t2*, as shown in the following formula. CAR enables this study to provide a holistic view of short-term and long-term accumulations of abnormal returns.

$$CAR(t_1, t_2) = \sum AR_{i,t}$$

The current study further extends its scope and investigates the firm-specific determinants of CAR. It is more important to understand the factors causing abnormal returns to provide policy implications in crisis, such as COVID-19, rather than just knowing the occurrence of abnormal returns. We proposed that cumulative abnormal returns (CAR) are the function of country, sector, market capitalization (MC), risk, P/E ratio, profitability, and dividend yield ratio.We applied the ordinary least square regression using the following equation.

$$\begin{aligned} CAR_{i(t_1,t_2)} = \alpha_i &+ \beta_i Country_i + \gamma_i Sector_i \\ &+ \emptyset_i Capitalization_i + \theta_I Beta_i \\ &+ \rho_i PEratio_i + \delta_i Profitability_i \\ &+ \vartheta_i DYR_i + \varepsilon_i \end{aligned}$$

Where CAR is calculated using four event windows of CAR (−1, 10), CAR (−1, 20), CAR (−1, 30) and CAR (−1, 45). *The country* is taken as a categorical variable, where the USA is used as a reference category. Similarly, $Sector_i$ is a dummy variable equal to 1 for non-life and 0 for life insurance. To calculate other firm-specific variables, we constructed different portfolios in Yahoo Finance and defined categorical variables. For instance, the variable $Capitalization_i$ is a categorical variable equal to 0 for Mega-Cap Stocks, 1 for Large-Cap, 2 for Mid-Cap, and 3 for Small-Cap firms. The variable $Beta_i$ is used as a proxy for systematic risk measured as the last three-year average beta. This variable is also defined as categorical that is equal to 0 for low-risk stocks (beta in between 0.2–0.8), 1 for risky stock (beta in 0.8 to 1.2), 2 for high-risk stock (beta greater than 1.2) and 3 for cyclical stocks (beta less than 0.2).

Similarly, *P/E ratio* is defined as a categorical variable equal to 0 for P/E ratio between 0 and 20, 1 for P/E ratio greater than 20, and 2 for negative P/E ratio, i.e. less than 0. Variable of $Profitability_i$ is also defined as a categorical variable that is 0 for return on assets (ROA) between 0% and 2%, 1 for ROA between 2% and 5%, 2 for ROA greater than 5% and 3 for ROA less than 0%, i.e. loss. At last, *DYRi* represents the categorical variable for dividend yield ratio where 0 is denoted as DYR less than 2%, 1 represents DYR between 2% and 5%, 2 shows the DYR between 5% and 8% and 3 symbolises DYR greater than 8%. We used these categorical variables because we could not find any free API or R package to extract actual ratios from Yahoo finance.

Therefore, we constructed portfolios based on the above categories and extracted their tickers. These tickers are then matched with all the symbols using the excel function of index-match to construct each categorical variable. Constructing such categorical variables becomes advantageous when comparing the different levels of degree and intensity of each variable. For instance, the categorical construction of firm size makes it easier to compare mega, large, medium and small stocks. With the continuous variable of market capitalization, such comparison becomes very difficult in regression analysis. Similarly, in the continuous variable of beta, one cannot analyse the role of negative beta stocks or medium beta, or very high beta stocks (speculative). The ability of these categorical variables makes it an advantageous option for operationalization.

IV. Results and discussion

Daily average abnormal returns (AARs) for the event window of (−15, 45) are presented in Figure 1. In the figure, the grey line is the event date (t_0) representing the first reported corona case in the respective country. Green upward bars represent the significant positive AARs, while red downward bars represent the significant negative AARs. Black bars are the insignificant AARs. Results show that insurance firms from the United States, Canada, Australia, and the UK documented more abnormal returns, particularly after the event's 20th day. Germany reported significant AARs right after the event date (in short window *t-1 to t + 10*) and later. Canada's insurance sector reacted negatively after 25 days of the disease outbreak. Australia also had a few significant negative AARs after 25 days from the event. Its insurance sector may have felt the pressure of claims instead of gaining from loss due to anticipated premiums. The overall insurance sector of these countries felt the impact of COVID-19 but in the later period. Therefore, it can be inferred that developed countries' stock markets did not respond to the early news of COVID-19, but retorted aggressively in the later period when the disease became more severe.

There were different patterns in developing nations, as India initially reacted negatively, but after 35 days, it had reacted positively to the event. The same pattern was reported in Brazil as its insurance sector reacted negatively at first but became positively significant after 18 days of the event. Indonesia's insurance sector had not reacted significantly to the event. The Indonesian market confronted the spillover effect from other markets as the first COVID-19 case was reported late in March 2020. Brazil also observed the immediate effect of the infectious disease on its insurance sector. However, the adverse impact of COVID-19 on India's insurance sector wass found after two days of the event date. Thus, it is concluded that the insurance sector in developing countries (particularly India and Brazil) documented more abnormal returns in the early days of COVID-19 outbreak than in developed countries.

From these results, one can extract three useful inferences. First, overall, COVID-19 outbreak affected abnormal returns of the insurance sector. Investors might view the future negative performances of the insurance sector in response to pandemic disease. An increasing number of expected health insurance and life insurance claims would affect the insurance sector's profitability by the end of the year 2020 as described by pessimistic theory and go against the gain from loss hypothesis. Consequently, investors respond to COVID-19, and negative abnormal returns are found in most of the cases, which are supported by Lamb (1995); Angbazo and Narayanan (1996); Cagle (1996) Yamori and Kobayashi (2002); Cummins and Lewis (2003); Chen et al. (2008); Takao et al. (2013) and Valizadeh, Karali, and Ferreira (2017). Another reason can be the negative sentiments rooted from the COVID-19 to affect the overall market and insurance sector.

Second, COVID-19 affected the insurance sector's abnormal returns from developed countries, which are considered less volatile. However, such an effect is observed in a later stage of the Pandemic when COVID-19 becomes more severe. Third, the insurance sector from developing countries documented more abnormal returns right after the announcement of COVID-19 as compared to developed countries. This early effect could be due to the high volatile stock markets of developing countries

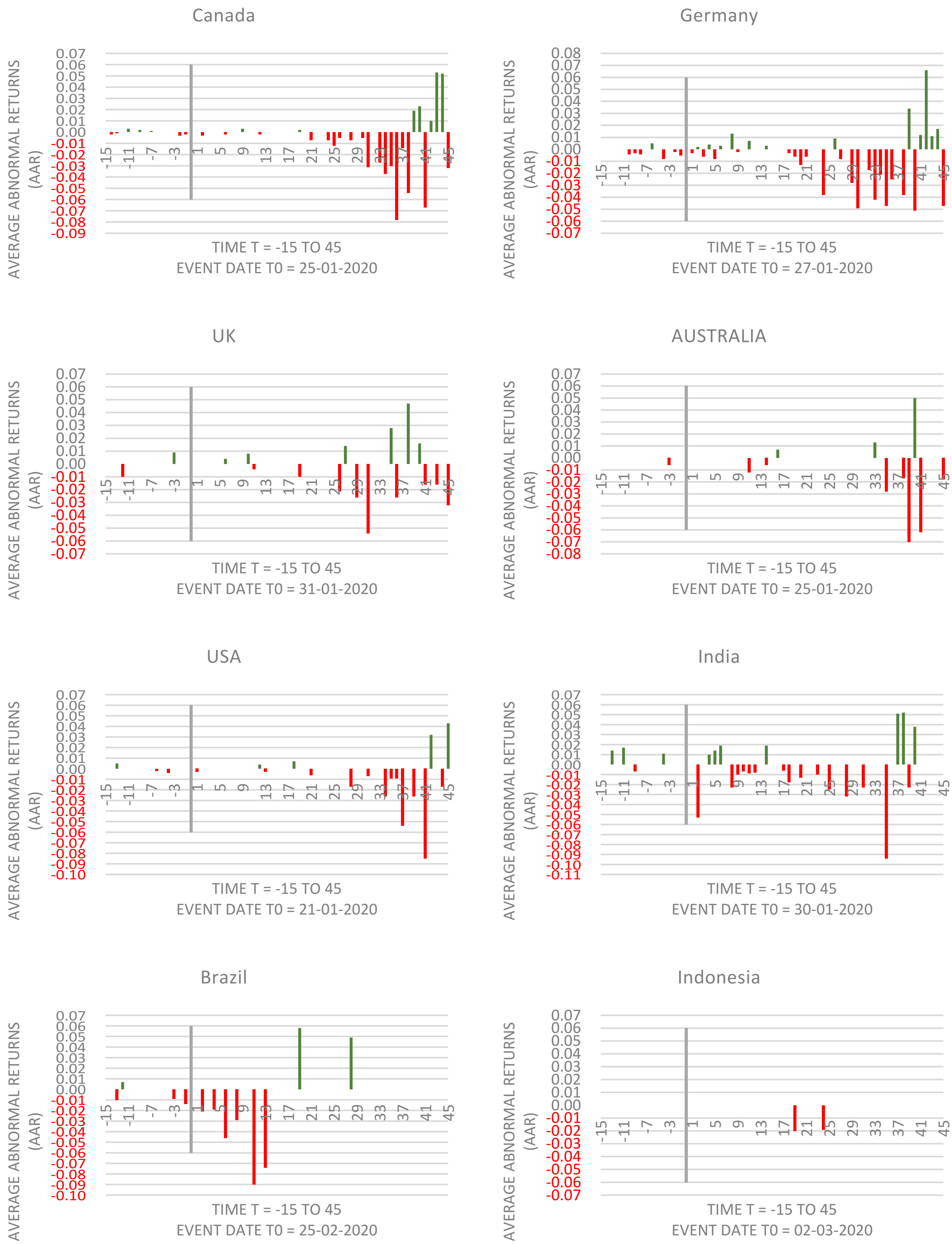

Figure 1. Average abnormal returns (AARs) of insurance companies across countries.

or the spillover effect as the first case of COVID-19 was reported late in selected developing countries.

Cross-sectional analysis

The previous section explored the number of times the insurance firms document abnormal returns and did not examine the factors of abnormal returns. This section will provide a cross-sectional analysis of the magnitude of abnormal returns using cumulative abnormal returns (CAR). Table 4 presents the regression analysis of Equation 9 using CAR as the dependent variables with four event windows, i.e. *t-1 to t + 10, t-1 to t + 20, t-1 to t + 30 and t-1 to t + 45.* This analysis covers all insurance firms. All models are significant, as shown by their significant F-statistics and reasonable Adjusted R^2. However, it is notable that the minimum Adjusted R^2 is of the *CAR t-1 to t + 45* (18%) while model CAR *t-1 to t + 10* accounted highest Adjusted R^2 (39%). Unexplained Adjusted R^2 can be due to other anomalies such as day effect, reverse momentum, Govt. stimulus package announcement, lockdown announcement or travel restrictions. However, these anomalies and events are not the focus of the study.

Since all the independent variables are categorical, regression results in Table 4 are contrast effects concerning a reference category. For instance, in the variable of country, the USA is taken as a reference category. Results showed that in a shorter period, i.e. *t-1 to t + 10*, CARs of the UK and Brazil are significantly different from the CAR of the USA. However, in the case of the more extended period, i.e. *t-1 to t + 30*, CAR of Germany, UK, Brazil, and India are significantly different from the USA. Here, it is notable that Table 4 is only providing contrast effects concerning a base category. For instance, Brazil's negative

Table 4. Regression analysis.

	CAR *t-1 to t + 10*		CAR *t-1 to t + 20*		CAR *t-1 to t + 30*		CAR *t-1 to t + 45*	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Country ('USA' as reference category)								
Australia	0.0003	0.20	0.00023	0.20	0.00115	0.90	0.00018	0.12
Canada	−0.00006	−0.06	−0.00014	−0.19	−0.00042	−0.55	−0.00034	−0.37
Germany	0.0005	0.96	−0.00036	−0.86	−0.004**	−9.03	−0.0016**	−2.92
UK	0.0056**	4.13	0.00016	0.15	−0.0026*	−2.28	−0.00062	−0.45
Indonesia	0.0014	0.48	0.00142	0.64	−0.00137	−0.58		
India	−0.0035	−1.42	−0.0045*	−2.32	−0.0099**	−4.78	−0.0078**	−3.12
Brazil	−0.0274**	−13.92	−0.0217**	−13.98	−0.0146**	−8.81		
Sector ('Life Insurance' as reference category)								
Non-Life	0.0012*	2.05	0.0001	0.25	0.0000	0.04	0.0005	0.82
Capitalization ('Mega Cap' as reference category)								
Large Cap	0.0041**	3.06	0.00117	1.11	−0.0037**	−3.30	−0.0046**	−3.44
Mid Cap	0.0027*	1.99	0.00037	0.35	−0.0043**	−3.80	−0.0058**	−4.28
Small Cap	0.00219	1.55	0.00080	0.72	−0.0045**	−3.82	−0.0046**	−3.24
Beta ('0.2 to 0.8' as reference category)								
0.8 to 1.2	−0.00014	−0.23	0.00008	0.17	−0.00036	−0.72	−0.0014*	−2.29
Greater than 1.2	−0.00081	−1.13	−0.0013*	−2.33	−0.0022**	−3.59	−0.0026**	−3.51
Less than 0.2	−0.00282	−1.68	−0.0032*	−2.42	−0.00140	−0.99	−0.00020	−0.11
P/E Ratio ('0 to 20' as reference category)								
greater than 20	−0.00058	−0.71	−0.00031	−0.49	−0.00103	−1.51	0.00099	1.20
Less than 0	0.00158	1.07	0.0025*	2.19	0.00119	0.96	0.00099	0.67
Return on Assets (ROA) ('0 to 2%' as reference category)								
2% to 5%	−0.00054	−0.85	−0.00055	−1.11	−0.00087	−1.63	−0.00030	−0.46
Greater than 5%	0.00049	0.59	−0.00006	−0.09	0.00109	1.55	0.00020	0.23
Less than 0	−0.00055	−0.36	−0.00183	−1.53	0.0039**	3.04	0.00161	1.06
Dividend Yield Ratio (DYR) ('Less than 2%' as reference category)								
2% to 5%	−0.00135	−1.60	−0.00126	−1.90	−0.0015*	−2.05	−0.0022**	−2.54
5% to 8%	−0.0034**	−3.59	−0.00229**	−3.07	−0.0027**	−3.39	−0.0026**	−2.65
Greater than 8%	−0.00202*	−2.06	−0.00158*	−2.04	−0.0025**	−3.03	−0.0043**	−4.21
constant	−0.00227	−1.45	0.00075	0.60	0.0049**	3.73	0.00276	1.74
Number of obs.	407		407		407		395	
F-Value	12.94		12.06		11.18		5.36	
Prob > F	0.00		0.00		0.00		0.00	
R-squared	0.43		0.41		0.39		0.22	
Adj R-squared	0.39		0.37		0.36		0.18	
Root MSE	0.00		0.00		0.00		0.00	

coefficient (−0.0146**) in the case of t-1 to t + 30 indicates that the average CAR of Brazil is less than the USA's average CAR −0.0146. Table 4 does not report the average CAR for the USA and other categories, along with their significance. Williams (2012) argued that interpreting only contrast effects for categorical variables does not provide insight information about the relationships. He further argued that in regression analysis, predictive margins should be used to explain the relations between categorical variables and interaction terms.

To compare the predictive means between all the categories, we also used margins effects using the STATA command of *margins*, as presented in Table 5. The margin effects adjust the average score of all the categories along with their significance. Combining the results of Tables 4 and Tables 5 can provide useful interpretations. Table 5 shows that the average CAR of all countries is negative and significant for a more extended period except Australia and Indonesia. However, only Brazil, India, the UK, and the USA demonstrated significant CAR in the short-term window, as shown in Table 5. These results reveal that COVID-19 negatively affected the CAR in later stages, particularly in developed countries.

Table 5 can also be used to compare the predictive margins of CAR for each country, as shown in Figure 2. Figure 2 plots the predictive means of CARs of both shorter (*t-1 to t + 10)* and larger event windows (*t-1 to t + 45)* for each country with a confidence interval of 95%. Results are clearly showing that the average CAR in India is less than the CAR of other developed countries in both shorter and larger event window. Conversely, average CARs of developed countries are similar in terms of intensity. The country effect has its significance in predicting the return variations (Brooks and Del Negro 2005). However, Figure 2 does not show Brazil and Indonesia's results because of the limited event window of two countries from *t-1 to t + 30.*

Table 5. Margin effects of means.

	CAR *t-1 to t + 10*		CAR *t-1 to t + 20*		CAR *t-1 to t + 30*		CAR *t-1 to t + 45*	
	Margin	t	Margin	t	Margin	t	Margin	t
Country								
Indonesia	0.0006	0.21	0.0010	0.47	−0.0027	−1.18		
Brazil	−0.028**	−14.59	−0.0221**	−14.51	−0.0159**	−9.81		
India	−0.0043	−1.77	−0.0049**	−2.58	−0.0112**	−5.53	−0.0127**	−5.19
Australia	−0.0005	−0.33	−0.0002	−0.14	−0.0002	−0.16	−0.0047**	−3.25
Canada	−0.0008	−1.01	−0.0005	−0.82	−0.0018**	−2.55	−0.0053**	−6.34
Germany	−0.0003	−0.70	−0.0008*	−2.53	−0.0054**	−16.78	−0.0065**	−17.09
UK	0.0049**	3.81	−0.0002	−0.23	−0.0040**	−3.69	−0.0055**	−4.28
USA	−0.0008*	−2.05	−0.0004	−1.34	−0.0013**	−4.24	−0.0049**	−12.99
Sector								
Insurance	−0.0017**	−3.43	−0.0011**	−2.65	−0.0035**	−8.32	−0.0061**	−12.11
Non-Life	−0.0005	−1.72	−0.0009**	−4.23	−0.0035**	−14.89	−0.0056**	−19.51
Capitalization								
Mega Cap	−0.0036**	−2.99	−0.0017	−1.76	0.0003	0.28	−0.0011	−0.86
Large Cap	0.0004	1.01	−0.0005	−1.54	−0.0034**	−9.42	−0.0057**	−12.94
Mid Cap	−0.0010*	−2.33	−0.0013**	−3.94	−0.0040**	−11.20	−0.0068**	−16.01
Small Cap	−0.0015**	−2.66	−0.0009*	−2.07	−0.0042**	−9.24	−0.0057**	−10.29
Beta								
Less than 0.2	−0.0033*	−2.03	−0.0038**	−2.96	−0.0042**	−3.09	−0.0048**	−2.77
0.2 to 0.8	−0.0005	−1.15	−0.0006	−1.80	−0.0028**	−7.96	−0.0046**	−10.66
0.8 to 1.2	−0.0006	−1.62	−0.0005	−1.71	−0.0032**	−9.83	−0.0060**	−15.38
Greater than 1.2	−0.0013*	−2.45	−0.0019**	−4.60	−0.0050**	−11.21	−0.0072**	−13.34
P/E Ratio								
Less than 0	0.0008	0.54	0.0015	1.35	−0.0022	−1.89	−0.0049**	−3.46
0 to 20	−0.0008**	−3.06	−0.0010**	−4.98	−0.0034**	−15.54	−0.0059**	−22.03
Greater than 20	−0.0014	−1.86	−0.0013*	−2.31	−0.0045**	−7.17	−0.0049**	−6.58
Return on Assets (ROA)								
Less than 0%	−0.0013	−0.88	−0.0026*	−2.26	0.0003	0.22	−0.0041**	−2.86
0% to 2%	−0.0007*	−2.14	−0.0007**	−2.81	−0.0036**	−12.83	−0.0058**	−17.21
2% to 5%	−0.0013*	−2.50	−0.0013**	−3.27	−0.0045**	−10.59	−0.0061**	−11.88
Greater than 5%	−0.0002	−0.31	−0.0008	−1.39	−0.0025**	−4.07	−0.0056**	−7.45
Dividend Yield Ratio (DYR)								
Less than 2%	0.0010	1.36	0.0005	0.78	−0.0017**	−2.71	−0.0033**	−4.26
2% to 5%	−0.0003	−0.85	−0.0008**	−2.70	−0.0032**	−10.07	−0.0055**	−14.56
5% to 8%	−0.0024**	−4.86	−0.0018**	−4.76	−0.0044**	−10.82	−0.0059**	−12.02
Greater than 8%	−0.0010	−1.80	−0.0011*	−2.56	−0.0042**	−9.09	−0.0076**	−13.37

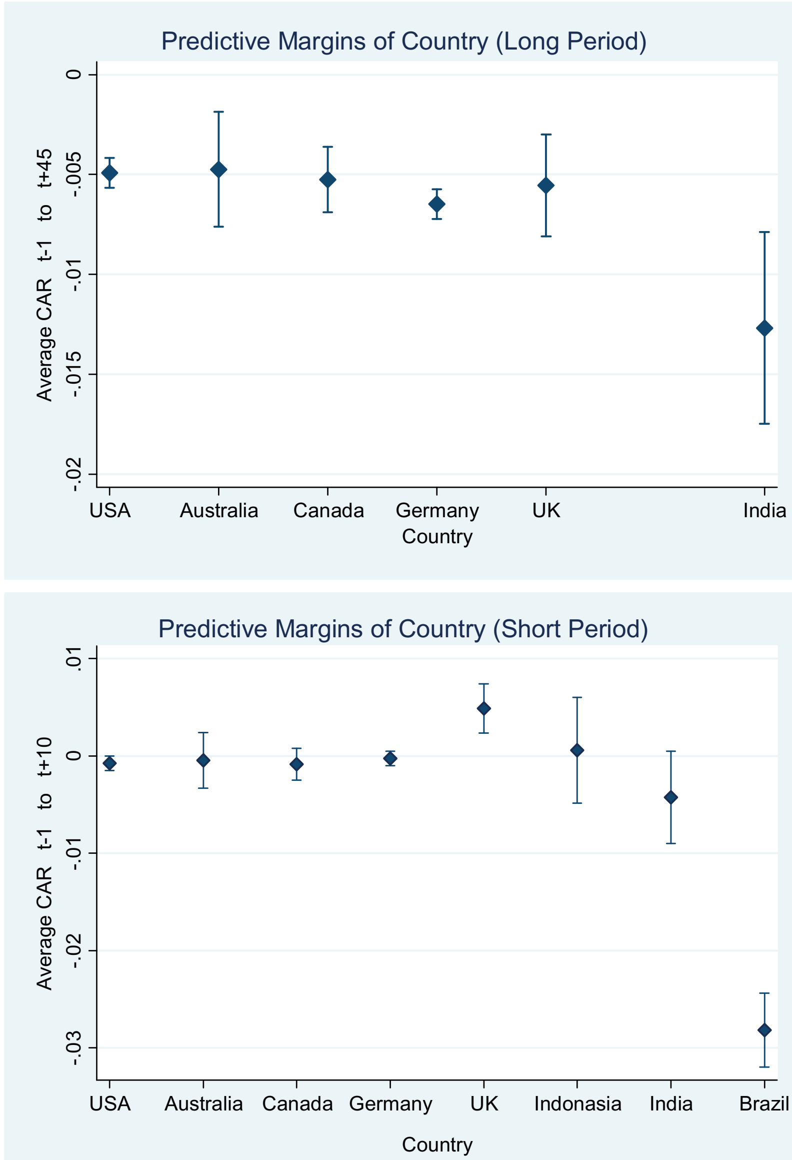

Figure 2. Predictive means of each country.

Figure 3 plots the average CAR for the event window of *t-1 to t + 30* for all the selected countries. Figure 3 shows that the average CARs in India and Brazil are much less than the average CAR of other developed countries. These results show that, on average, the insurance sector from two developing countries created more negative CAR than the insurance sector of developed countries. Similarly, the average CARs in Germany and the UK are more than the USA, Australia, and Canada. Hence, it is concluded that the effects of COVID-19 vary across countries, particularly in developing countries. The findings are in line with Brooks and Del Negro (2005), who supported the significant country effect on stock returns. To assess the overall significant differences in categories of each variable, we also calculated contrast effects using the STATA command of *contrast*. Table 6 shows the conflicting results and confirms the conclusions.

This research also aims to study the differences in CAR of life insurance and non-life insurance due to COVID-19. Table 4 shows that the average CAR of non-life insurance significantly differs for a short window of *t-1 to t + 10* only. These findings

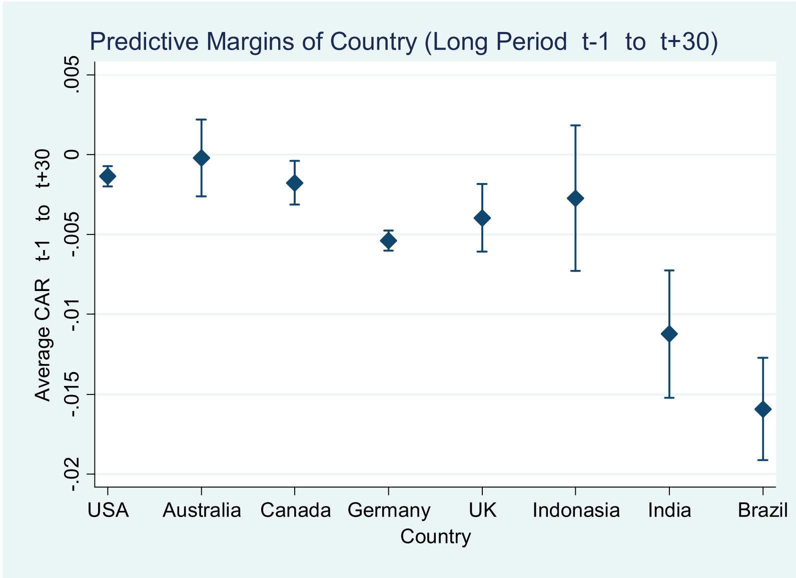

Figure 3. Predictive means of CAR t-1 to t + 30 for each country.

Table 6. ANOVA contrast test.

	CAR *t-1 to t + 10*		CAR *t-1 to t + 20*		CAR *t-1 to t + 30*		CAR *t-1 to t + 45*	
	F-stat	P-val	F-stat	P-val	F-stat	P-val	F-stat	P-val
Country	**33.310**	**0.000**	**29.380**	**0.000**	**25.010**	**0.000**	**3.800**	**0.002**
Sector	**4.180**	**0.042**	0.060	0.803	0.000	0.969	0.670	0.414
Capitalization	**4.780**	**0.003**	1.120	0.343	**5.280**	**0.001**	**6.530**	**0.000**
Beta	1.320	0.267	**4.400**	**0.005**	**5.000**	**0.002**	**4.250**	**0.006**
P/E ratio	0.930	0.394	2.700	0.069	1.800	0.166	0.860	0.423
ROA	0.540	0.658	1.100	0.348	**5.600**	**0.001**	0.530	0.659
Dividend yield	**5.270**	**0.001**	**3.290**	**0.021**	**4.610**	**0.004**	**6.140**	**0.000**

indicate that life insurance stocks produced more negative CAR than non-life insurance just after the news of the first COVID-19 case. However, for the larger window, this difference becomes insignificant.

Conversely, Table 5 reports that the predictive means are insignificant for non-life insurance in a shorter window (*t-1 to t + 10)*. The differences in predictive means of both shorter and larger windows are presented in Figure 4. The results show more differences between life insurance's predictive margins and non-life insurance in a shorter period than a more extended period. Life insurance is creating more negative abnormal returns than non-life insurance. The reason can be increasing mortality claims and negative sentiments. Table 6 of the contrast effect is also endorsing the same results.

The current study also proposed that the size of the insurance operator by its market capitalization also affected the abnormal returns in response to COVID-19. Table 4 shows that CARs of Large and Mid-cap stocks are higher than the CARs of Mega-cap stocks in a shorter window. Conversely, in a larger window of CARs, mid- and small-cap stocks are less than the Mega-cap stocks. Furthermore, Table 5 shows that Mega-cap stocks demonstrate significant CAR only in a shorter window. The predictive means from Table 5 are also portrayed in Figure 5. It can be viewed that Mega-cap stocks responded early to COVID-19 with negative CAR. However, large-, mid-, and small-cap stocks responded negatively at a later stage.

Theoretically, larger firms are more expected to absorb adverse macroeconomic shocks. Our analysis shows that this theoretical argument is valid for large-cap stocks (in a short window) and not for mega-cap stocks. Mega-cap stocks responded initially; after that, they showed a small amount of CAR. Thus, it can be concluded that the insurance firm's size significantly

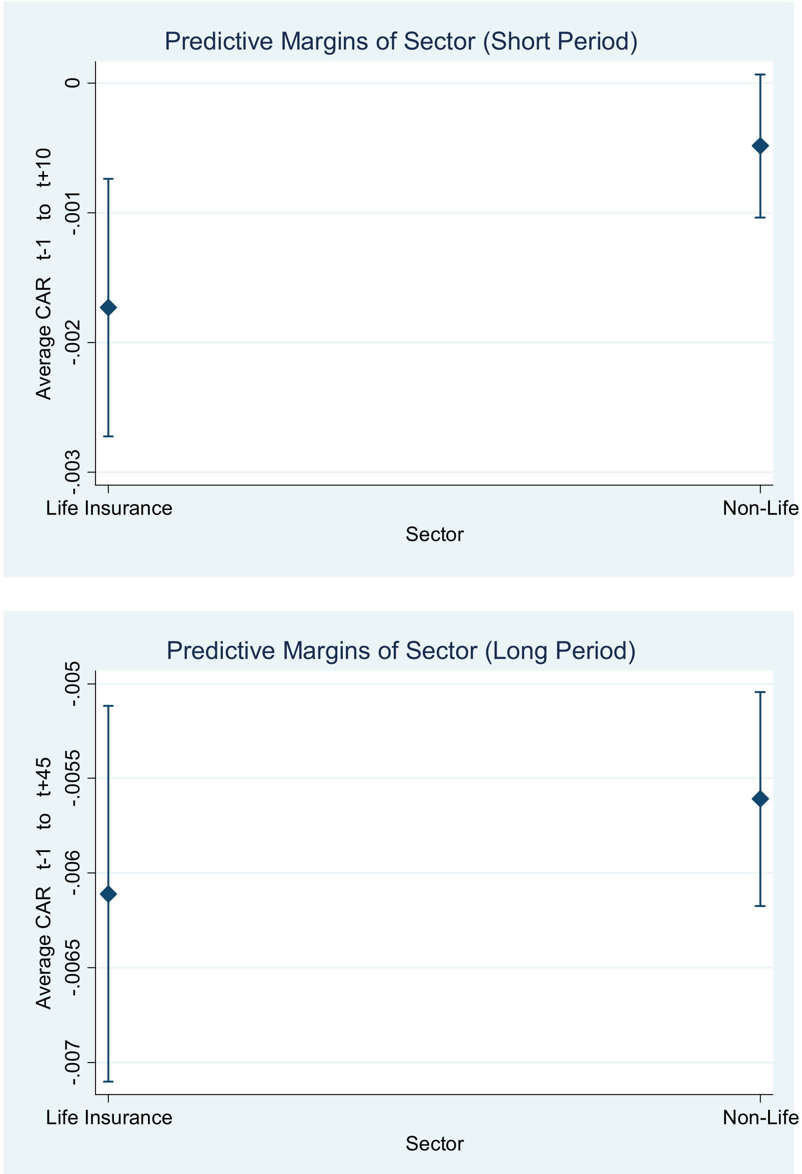

Figure 4 .:Predictive means of life and non-life insurance.

affects the CAR in both shorter and longer windows. Table 6 of the contrast effect also confirms that overall significant differences are present in abnormal returns of categories of variable *capitalization*. Size factor has significant literature support for predicting stock returns (Amanda and Husodo 2014; Fama and French 1992, 1993; Haque and Nasir 2016; Javid and Ahmad 2011; Khan, Hassan, and Ali 2012; Wang and Ma 2014).

The current study further explores the impact of systematic risk measured by beta on abnormal returns. We have divided beta into four categories, i.e. beta <0.2 (cyclic stocks), 0.2< beta<0.8 (low risky stocks), 0.8< beta<1.2 (medium risky stocks) and beta >1.2 (high risky stocks). Theoretically, risky stocks are more expected to generate abnormal returns as compared to low risky stocks. Table 5 is showing that medium and low risky stocks are providing insignificant CAR in a shorter window. Furthermore, Table 6 of contrast effects confirms that the differences in CAR based on four categories of beta are insignificant in a shorter window. Such differences can also be viewed in Figure 6 that plots the predictive margins from Table 5. It is also notable that in a larger window, medium and low risky stocks present significant negative CAR but

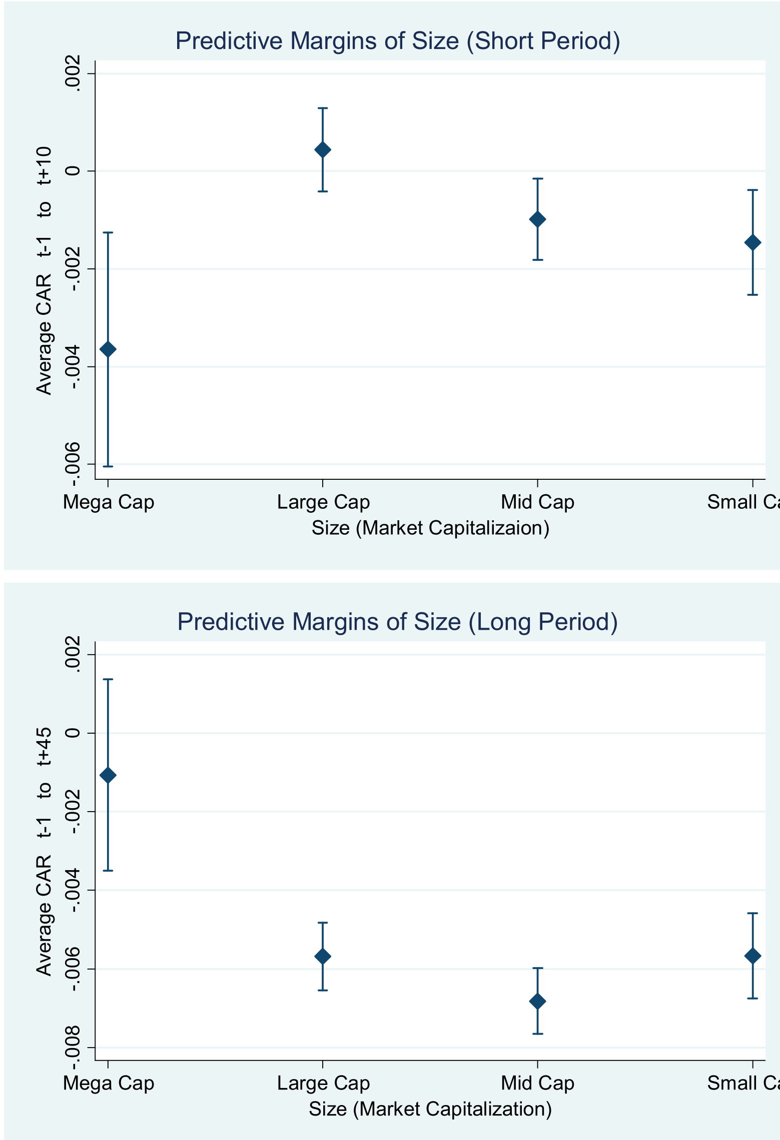

Figure 5. Predictive margins of market capitalization.

greater than the negative CAR of high risky stocks, as shown in Tables 4 and Tables 5.

It is also proposed that the P/E ratio affects the abnormal returns of insurance firms in response to COVID-19. It is argued that a high P/E ratio represents growth stocks, and any negative shock can affect such stocks more hostilely as compared to low P/E ratio stocks. However, Tables 4 and Tables 6 show that insurance firms are providing similar CAR regardless of their P/E ratio in both shorter and larger windows – Figure 7 portrays the predictive means extracted from Table 5. Figure 7 shows that CAR is marginally different for the three categories of the P/E ratio.

However, significant differences can be observed in the variations of the three categories. Insurance firms having a P/E ratio between 0 and 20 show the least variations, while the P/E ratio less than 0 has the highest variations, as shown in Figure 7. Hence, the P/E ratio is not a significant determinant of abnormal returns but an essential factor of variations. An insignificant effect of the P/E ratio on stock returns is supported by (Akwe and Garba 2019; Tseng 1988).

This research also studied profitability and dividends as determinants of abnormal returns. Tables 4 and Tables 6 show that highly profitable and low profitable insurance firms generate similar CAR except in the event window of *t-1 to t + 30*.

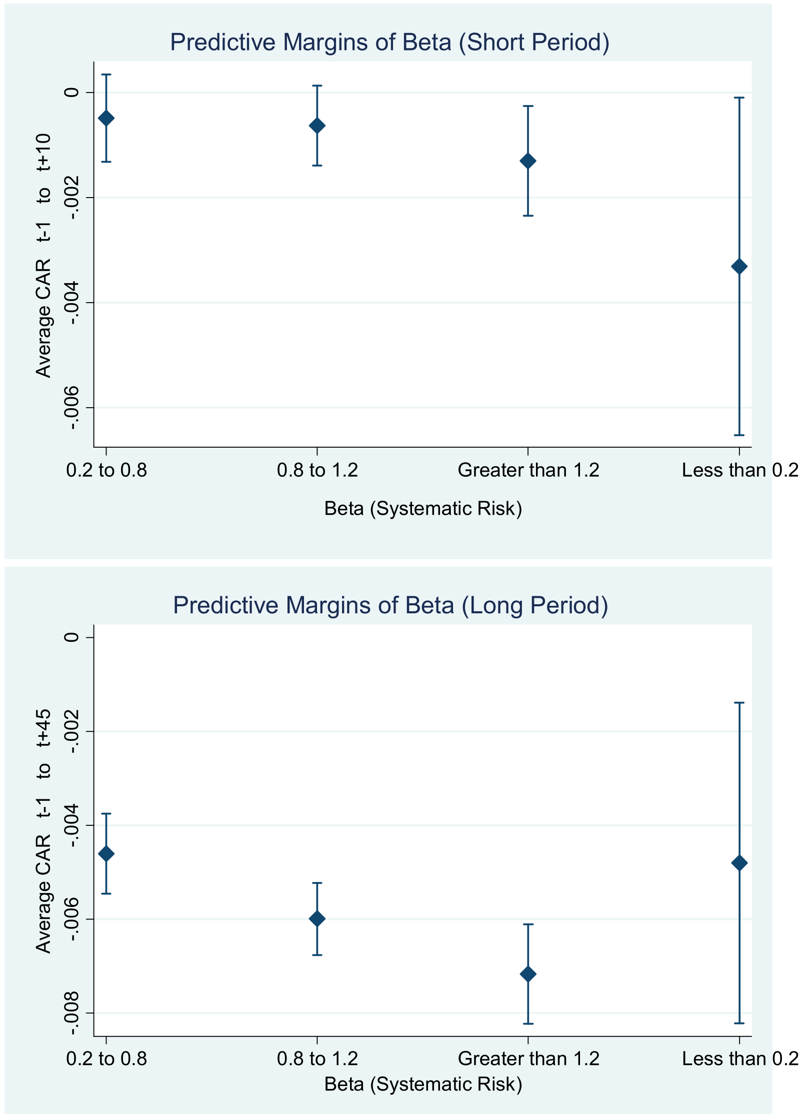

Figure 6. Predictive means of beta.

Figure 8 presents the predictive margins of ROA in both short and large windows. Figure 8 is not showing a specific pattern to depict some relationship between profitability and CAR. Therefore, it is concluded that ROA is not an essential determinant of CAR in both short and large windows. The irrelevancy of profitability factor with stock returns is reported by (Ball et al. 2016). However, the Dividend Yield Ratio (DYR) shows a negative relation with CAR, as shown in Figure 9 of predictive margins. Table 6 is showing that CAR is significantly different across different categories of DYR in all the windows. Firms with high DYR documented high CAR as compared to low DYR in both shorter and larger windows. It is possible that investors predicted low profits due to increasing health insurance and life insurance claims and low dividend yields by the end of the year 2020.

Consequently, investors focusing on dividend income responded negatively, and high dividend yield stocks generated high negative CAR. Thus, it is concluded that the dividend yield ratio is an essential determinant of abnormal returns in response to COVID-19. A significant impact of dividend yield on stock returns is reported by (Gwilym, Morgan, and Thomas 2000; Liang 2019; McManus, Ap Gwilym, and Thomas 2004; McMillan and McMillan 2018).

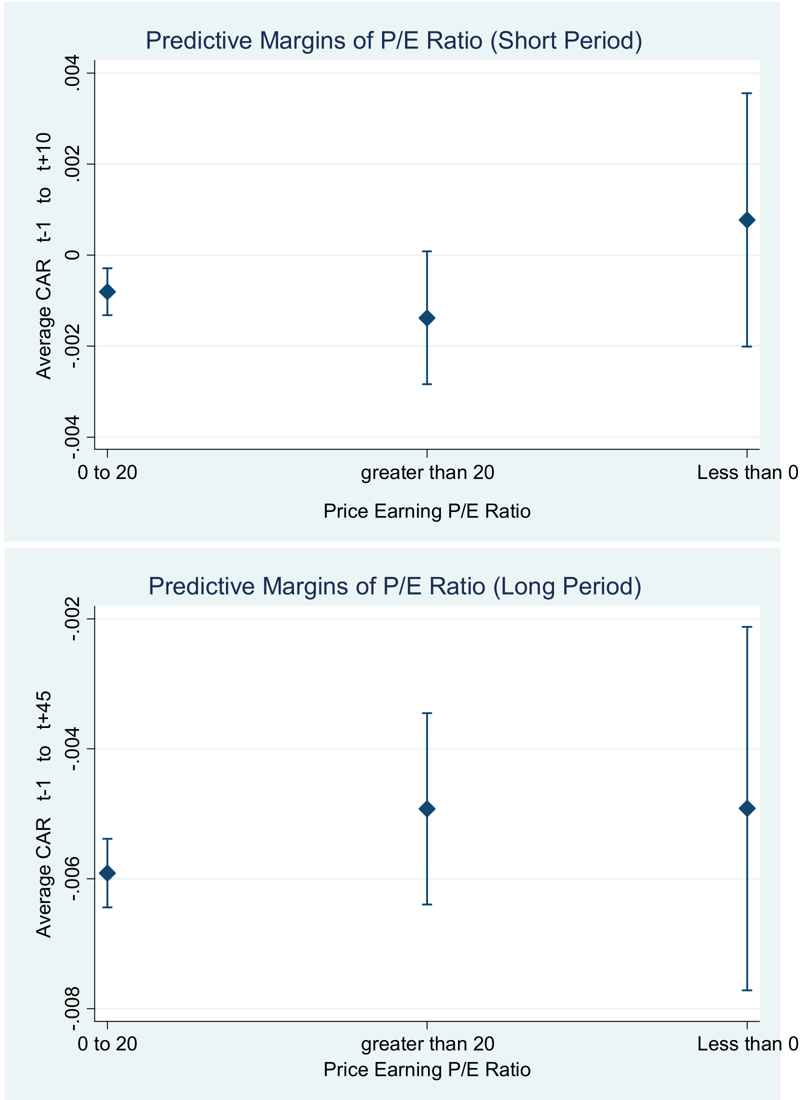

Figure 7. Predictive means of P/E ratio.

V. Conclusions

The current study analyses the insurance sector's stock abnormality in response to COVID-19 in five developed and three developing economies. Overall, insurance firms documented negative abnormal returns after the reporting of the first case of COVID-19. Notably, Germany's insurance sector has been significantly affected by the COVID-19 as it reported thirty-three significant average abnormal returns. Such adverse effects are explained by the pessimistic theory that proposed that one can expect negative abnormal returns for the insurance sector because of the expected cash outflow from insurance claims during catastrophes. The study also reports that the stock returns of insurance companies from developed countries showed negative abnormalities 20 days after the announcement of the first corona-virus case. Conversely, developing countries felt the impact of infectious disease in a short window compared to developed nations due to their volatile nature and spillover effects. The study notably identified the expected spillover effect for Indonesia and Brazil, where the first COVID-19 case came after the third month of 2020.

This study further explored the firm-specific factors distinguishing more affected insurance firms. The effect of COVID-19 is found to be more negative for life insurance in a shorter window than non-life. Investors may expect more life insurance claims due to COVID-19 that ultimately decrease their share prices. It is also found that size, CAPM beta, price-

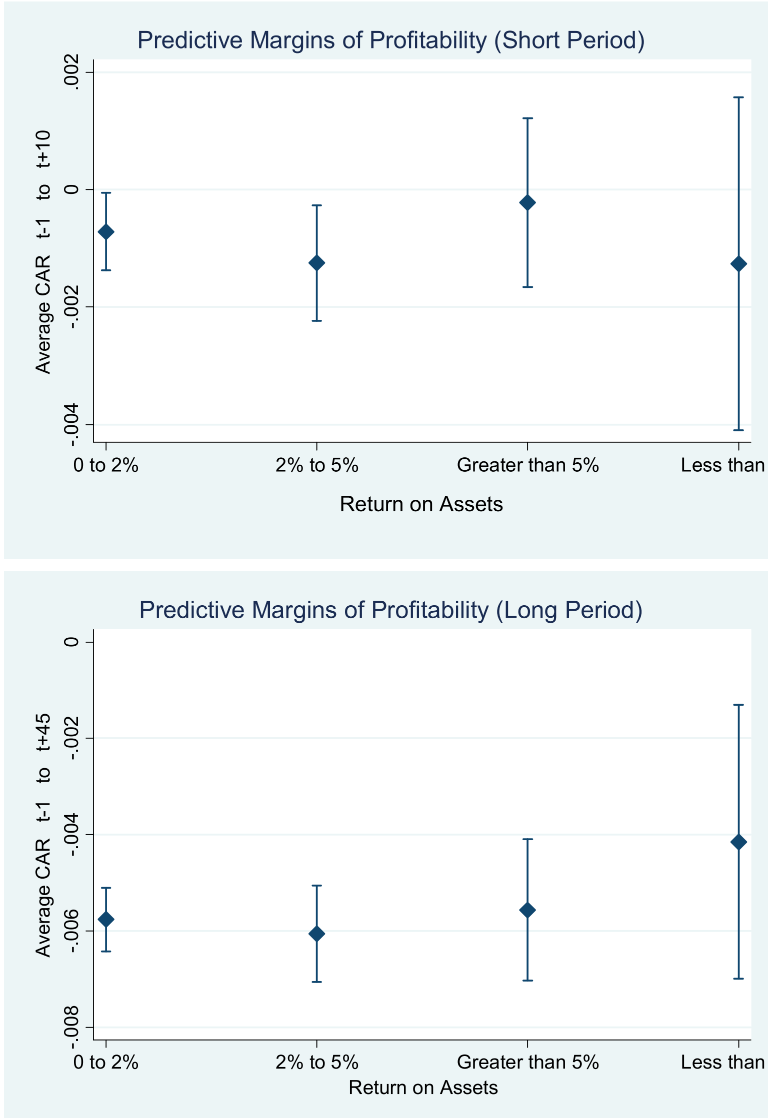

Figure 8. Predictive margins of ROA.

earnings ratio, profitability, and dividend yield are essential determinants of abnormal returns in different event windows. Using these determinants, one can distinguish insurance firms documenting more abnormal returns in the shorter and longer window.

Implications of the study

Overall, there is an adverse effect of the pandemic on stock returns of the insurance sector of both developed and developing countries. Based on these results, we can list down the following implications for stakeholders.

1.First, the findings show that abnormality has been observed after twenty days in developed countries. The negative sentiments affected stock returns and also provided arbitrage opportunity for investors in pandemic situations.

2.Second, the early effect of COVID-19 in developing countries may be due to the volatile stock market or spillover effect from the developed financial markets. In future pandemic situations, Investors, policymakers and economists can predict and prepare while looking at other financial markets.

3.Third, significantly different marginal effects of market capitalization, beta, dividend yield, and profitability on average abnormal returns give investors diversification opportunities during the pandemic.

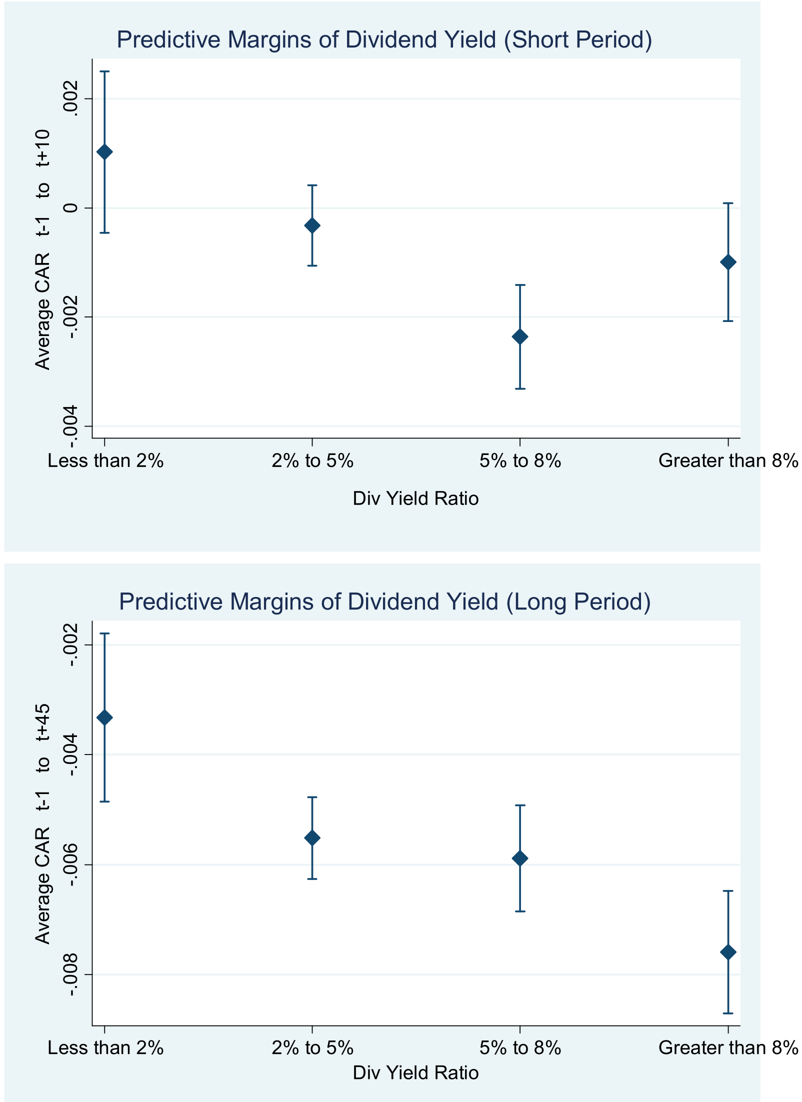

Figure 9. Predictive means of div yield ratio.

Limitation of study

1.This research explored abnormal returns during post 45 days of the first COVID case announcement in the respective countries. However, this research did not consider events such as lockdown, the stimulus package, travel restrictions, and oil crisis. Future studies can gain more insight after considering such significant events.

2.The scope of this study was limited to the firm-specific factors. Investigating other determinants of CAR such as macroeconomics and corporate governance factors can also increase the in-depth understanding of the topic.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

We acknowledge the financial support of Hubei University of Economics of this article through its excellent Ph.D. program-wide grant number XJ18BS06.

ORCID

Umar Farooq http://orcid.org/0000-0002-8725-7399
Adeel Nasir http://orcid.org/0000-0002-4065-3159
Bilal http://orcid.org/0000-0001-6599-6687

Muhammad Umer Quddoos http://orcid.org/0000-0002-1498-6822

References

Aiuppa, T. A., R. J. Carney, and T. M. Krueger. 1993. "An Examination of Insurance Stock Prices following the 1989 Loma Prieta Earthquake." *Journal of Insurance Issues* 16 (1): 1–15.

Aiuppa, T. A., and T. M. Krueger. 1995. "Insurance Stock Prices following the 1994 Los Angeles Earthquake." *Journal of Insurance Issues* 18 (1): 23–36.

Akhtaruzzaman, M., S. Boubaker, and A. Sensoy. 2020. "Financial Contagion during COVID–19 Crisis." *Finance Research Letters*. doi:10.1016/j.frl.2020.101604.

Akwe, J. A., and S. B. Garba. 2019. "Effects of Internal and External Factors on Stock Returns of Large Size Firms in Nigeria." *Global Journal of Accounting* 5 (1): 44–56.

Al-awadhi, A. M., K. Alsaifi, A. Al-awadhi, and S. Alhammadi. 2020. "Death and Contagious Infectious Diseases: Impact of the COVID-19 Virus on Stock Market Returns." *Journal of Behavioral and Experimental Finance* 27: 1–5. doi:10.1016/j.jbef.2020.100326.

Amanda, C., and Z. A. Husodo. 2014. "Empirical Test of Fama French Three Factor Model and Illiquidity Premium in Indonesia." *SSRN Electronic Journal*. doi:10.2139/ssrn.2396509.

Andrei, D., and M. Hasler. 2015. "Investor Attention and Stock Market Volatility." *Review of Financial Studies* 28 (1): 33–72. doi:10.1093/rfs/hhu059.

Angbazo, L. A., and R. Narayanan. 1996. "Catastrophic Shocks in the Property-Liability Insurance Industry: Evidence on Regulatory and Contagion Effects." *The Journal of Risk and Insurance* 63 (4): 619. doi:10.2307/253474.

Ashraf, B. N. 2020. "Stock Markets' Reaction to COVID-19: Cases or Fatalities?" *Research in International Business and Finance* 54: 1–6. doi:10.1016/j.ribaf.2020.101249.

Baker, M., and J. Wurgler. 2006. "Investor Sentiment and the Cross-section of Stock Returns." *Journal of Finance* 61 (4): 1645–1680. doi:10.1111/j.1540-6261.2006.00885.x.

Ball, R., J. Gerakos, J. T. Linnainmaa, and V. Nikolaev. 2016. "Accruals, Cash Flows, and Operating Profitability in the Cross Section of Stock Returns." *Journal of Financial Economics* 121 (1): 28–45. doi:10.1016/j.jfineco.2016.03.002.

Basu, S. 1983. "The Relationship between Earning Yields, Market Value and Return for NYSE Common Stock: Further Evidence?" *Journal of Financial Economics* 12 (1): 129–156. doi:10.1016/0304-405X(83)90031-4.

Baumann, N. 2020. "Understanding COVID-19's impact on the insurance sector." https://www2.deloitte.com/global/en/pages/about-deloitte/articles/covid-19/understanding-covid-19-s-impact-on-the-insurance-sector-.html

Benz, R. 1981. "The Relationship between Returns and Market Value Common Stocks." *Journal of Financial Economics* 9 (1): 3–18. doi:10.1016/0304-405X(81)90018-0.

Black, F. 1972. "Capital Market Equilibrium with Restricted Borrowing." *Journal of Business* 45 (3): 444–455. doi:10.1086/295472.

Bollen, N. P. B. 2007. "Mutual Fund Attributes and Investor Behavior." *Journal of Financial and Quantitative Analysis* 42 (3): 683–708. doi:10.1017/s0022109000004142.

Bollerslev, T. 1986. "Generalized Autoregressive Conditional Heteroskedasticity." *Journal of Econometrics* 31 (3): 307–327. doi:10.1016/0304-4076(86)90063-1.

Brooks, R., and M. Del Negro. 2005. "Country versus Region Effects in International Stock Returns." *Journal of Portfolio Management* 31 (4): 67–72. doi:10.3905/jpm.2005.570152.

Cagle, J. A. B. 1996. "Natural Disasters, Insurer Stock Prices, and Market Discrimination: The Case of Hurricane Hugo." *Journal of Insurance Issues* 19 (1): 53–68.

Chang, C.-L., S.-H. Hsu, and M. McAleer. 2018. „An Event Study Analysis of Political Events, Disasters, and Accidents for Chinese Tourists to Taiwan.„ *Sustainability* 10 (11), 1–77. https://doi.org/10.3390/su10114307

Chen, M. M.-H. M., S. Jang, and W. G. Kim. 2007. "The Impact of the SARS Outbreak on Taiwanese Hotel Stock Performance: An Event-study Approach." *International Journal of Hospitality Management* 26 (1): 200–212. doi:10.1016/j.ijhm.2005.11.004.

Chen, X., B. K. Goodwin, and J. P. Prestemon. 2019. "How to Fight against Southern Pine Beetle Epidemics: An Insurance Approach." *Canadian Journal of Agricultural Economics* 67 (2): 193–213. doi:10.1111/cjag.12186.

Chen, X., B. X. Lin, H. Doerpinghaus, B. X. Lin, and T. Yu. 2008. "Catastrophic Losses and Insurer Profitability: Evidence from 9/11." *Journal of Risk and Insurance* 75 (1): 39–62. doi:10.1111/j.1539-6975.2007.00247.x.

Chen, M.-P., C.-C. Lee, Y.-H. Lin, and W.-Y. Chen. 2018. „Did the SARS Epidemic Weaken the Integration of Asian Stock Markets? Evidence from Smooth Time-Varying Cointegration Analysis„. *Economic Research-Ekonomska Istrazivanja* 31 (1): 908–926. https://doi.org/10.1080/1331677x.2018.1456354

Cho, M., H. Yun, J. Kwon, and J. Lee 2016. "A Study on Infectious Disease Control System in Korea." In D. Sigrist and S. Wahlen. (edited by), Proceedings of the 6th International Disaster and Risk Conference: Integrative Risk Management - Towards Resilient Cities, IDRC Davos 2016. (pp. 124–127): Davos Switzerland, Global Risk Forum (GRF). https://www.scopus.com/inward/record.uri?eid=2-s2.0-85055835413&partnerID=40&md5=c34e99c1ed549510b3684c2850bf1709

Cohen, J. 2017. "Epidemic Insurance." *Science* 356 (6334): 125–127. doi:10.1126/science.356.6334.125.

Cummins, J. D., and C. M. Lewis. 2003. "Catastrophic Events, Parameter Uncertainty and the Breakdown of Implicit Long-Term Contracting: The Case of Terrorism Insurance." *Journal of Risk and Uncertainty* 26 (2–3): 153–178. doi:10.1023/A:1024115107245.

Fama, E. F., and K. R. French. 1992. "Cross-section of Expected Returns." *Journal of Finance* 47 (2): 427–465. doi:10.1111/j.1540-6261.1992.tb04398.x.

Fama, E. F., and K. R. French. 1993. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics* 33 (1): 3–56. doi:10.1016/0304-405X(93)90023-5.

Fama, E. F., and K. R. French. 2015. "A Five-factor Asset Pricing Model." *Journal of Financial Economics* 116 (1): 1–22. doi:10.1016/j.jfineco.2014.10.010.

Georgiou, M. N. 2017. „Using GARCH in Event Studies.„ *SSRN Electronic Journal*.https://doi.org/10.2139/ssrn.2976047

Goodell, J. W. 2020. "COVID-19 and Finance: Agendas for Future Research." *Finance Research Letters* 35: 101512. doi:10.1016/j.frl.2020.101512.

Goodell, J. W., and T. L. D. Huynh. 2020. "Did Congress Trade Ahead? Considering the Reaction of US Industries to COVID-19." *Finance Research Letters* 36: 101578. doi:10.1016/j.frl.2020.101578.

Gwilym, O. A. P., G. Morgan, and S. Thomas. 2000. "Dividend Stability, Dividend Yield and Stock Returns: UK Evidence." *Journal of Business Finance and Accounting* 27 (3–4): 261–281. doi:10.1111/1468-5957.00313.

Haque, A., and A. Nasir. 2016. "Systematic and Idiosyncratic Risk Analysis of Banking and Insurance Sector of Pakistan." *Abasyn University Journal of Social Sciences* 9 (2): 442–453. http://0-search.ebscohost.com.wam.city.ac.uk/login.aspx?direct=true&db=a9h&AN=120954892&site=ehost-live

Hellander, I., J. Moloo, D. U. Himmelstein, S. Woolhandler, and S. M. Wolfe. 1995. "The Growing Epidemic of Uninsurance: New Data on the Health Insurance Coverage of Americans." *International Journal of Health Services* 25 (3): 377–392. doi:10.2190/AQTP-FLAQ-PWXN-DYMR.

Hoffmann, A. O. I., T. Post, and J. M. E. Pennings. 2013. "Individual Investor Perceptions and Behavior during the Financial Crisis." *Journal of Banking and Finance* 37 (1): 60–74. doi:10.1016/j.jbankfin.2012.08.007.

Hoffmann, F., and A. Icks. 2012. "Diabetes Epidemic' in Germany? A Critical Look at Health Insurance Data Sources." *Experimental and Clinical Endocrinology and Diabetes* 120 (7): 410–415. doi:10.1055/s-0032-1306331.

Javid, A. Y., and E. Ahmad. 2011. "Asset Pricing Behaviour with Dual-Beta in case of Pakistani Stock Market." *The Pakistan Development Review* 50 (2): 95–118. doi:10.30541/v50i2pp.95-118.

Khan, F., A. Hassan, and S. Ali. 2012. "Size, Leverage and Stocks Returns : Evidence from Pakistan." *INTERNATIONAL JOURNAL of ACADEMIC RESEARCH* 4 (1): 24–32.

Lamb, R. P. 1995. "An Exposure-Based Analysis of Property-Liability Insurer Stock Values around Hurricane Andrew." *The Journal of Risk and Insurance* 62 (1): 111. doi:10.2307/253695.

Lamb, R. P., W. F. Kennedy, R. P. Lamb, and W. F. Kennedy. 1997. "Insurer Stock Prices and Market Efficiency around the Los Angeles Earthquake." *Journal of Insurance Issues* 20 (1): 10–24.

Lee, C. M. C., A. Shleifer, and R. H. Thaler. 1991. "Investor Sentiment and the Closed-End Fund Puzzle." *The Journal of Finance* 46 (1): 75. doi:10.2307/2328690.

Lefèvre, C., and P. Picard. 2015. "Risk Models in Insurance and Epidemics: A Bridge through Randomized Polynomials." *Probability in the Engineering and Informational Sciences* 29 (3): 399–420. doi:10.1017/S0269964815000066.

Lefèvre, C., and P. Picard. 2018. "Final Outcomes and Disease Insurance for a Controlled Epidemic Model." *Applied Stochastic Models in Business and Industry* 34 (6): 803–815. doi:10.1002/asmb.2341.

Leonard, M. 2020. *Global Macro And Insurance Outlook*. Insurance Information Institute.

Liang, S. X. 2019. "What Drives Stock Returns in Japan?" *Financial Markets and Portfolio Management* 33 (1): 39–69. doi:10.1007/s11408-018-0322-7.

Lintner, J. 1965. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *Review of Economics and Statistics* 47 (1): 13–37. doi:10.2307/1924119.

Liu, H., A. Manzoor, C. Wang, L. Zhang and Z. Manzoor. 2020. „The COVID-19 Outbreak and Affected Countries Stock Markets Response.„ *International Journal of Environmental Research and Public Health* 17 (8): 2800. https://doi.org/10.3390/ijerph17082800

Liu. H, Y. Wang, D. He and C. Wang. 2020. „Short Term Response of Chinese Stock Markets to the Outbreak of COVID-19.„ *Applied Economics*. https://doi.org/10.1080/00036846.2020.1776837

McManus, I., O. Ap Gwilym, and S. Thomas. 2004. "The Role of Payout Ratio in the Relationship between Stock Returns and Dividend Yield." *Journal of Business Finance and Accounting* 31 (9–10): 1355–1387. doi:10.1111/j.0306-686X.2004.00577.x.

McMillan, D. G., and D. G. McMillan. 2018. "Forecasting Stock Returns—Historical Mean Vs. Dividend Yield: Rolling Regressions and Time-Variation." In *Predicting Stock Returns*, 27–56. Palgrave Pivot, Cham. doi:10.1007/978-3-319-69008-7_3.

Moridaira, S. 2019. "How the Capital Market Reacted to the Great East Japan Earthquake: A Risk Perspective." In *Governance, Risk and Financial Impact of Mega Disasters: Lessons from Japan*, 97–114. Springer, Singapore. doi:10.1007/978-981-13-9005-0.

Nguyen, D. K., and D. T. Vo. 2020. "Enterprise Risk Management and Solvency: The Case of the Listed EU Insurers." *Journal of Business Research* 113: 360–369. doi:10.1016/j.jbusres.2019.09.034.

Schimmer, M., A. Levchenko, and S. Müller 2014. "Eventstudytools (Research apps)." http://www.eventstudytools.com

Sharif, A., C. Aloui, and L. Yarovaya. 2020. "COVID-19 Pandemic, Oil Prices, Stock Market, Geopolitical Risk and Policy Uncertainty Nexus in the US Economy: Fresh

Evidence from the Wavelet-based Approach." *International Review of Financial Analysis* 70: 1–9. doi:10.1016/j.irfa.2020.101496.

Sharpe, W. F. 1964. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance* 19: 425–442.

Shelor, R. M., D. C. Anderson, and M. L. Cross. 1992. "Gaining from Loss: Property-Liability Insurer Stock Values in the Aftermath of the 1989 California Earthquake." *The Journal of Risk and Insurance* 59 (3): 476. doi:10.2307/253059.

Shemendyuk, A. A., A. A. Chernov, and M. Y. Kelbert 2019. "Fair insurance premium level in connected sir model under epidemic outbreak." *ArXiv*. http://arxiv.org/abs/1910.04839

Takao, A., T. Yoshizawa, S. Hsu, and T. Yamasaki. 2013. "The Effect of the Great East Japan Earthquake on the Stock Prices of Non-life Insurance Companies." *Geneva Papers on Risk and Insurance: Issues and Practice* 38 (3): 449–468. doi:10.1057/gpp.2012.34.

Tseng, K. C. 1988. "Low Price, Price-Earnings Ratio, Market Value, and Abnormal Stock Returns." *Financial Review* 23 (3): 333–343. doi:10.1111/j.1540-6288.1988.tb01271.x.

UN-DESA. 2020. *World Economic Situation and Prospects as of Mid-2020*. New York, USA. doi:10.18356/ef50b25a-en.

Valizadeh, P., B. Karali, and S. Ferreira. 2017. "Ripple Effects of the 2011 Japan Earthquake on International Stock Markets." *Research in International Business and Finance* 41: 556–576. doi:10.1016/j.ribaf.2017.05.002.

Vlaminckx, D. 2020. *Potential Implications of COVID-19 for the Insurance Sector, How the Coronavirus Outbreak May Impact Insurers Operationally and Economically*. Deloitte.

Wang, Y., and J. Ma. 2014. "Excess Volatility and the Cross-section of Stock Returns." *North American Journal of Economics and Finance* 27: 1–16. doi:10.1016/j.najef.2013.10.003.

Wang, Y.-H., F.-J. Yang, and L.-J. Chen. 2013. "An Investor's Perspective on Infectious Diseases and Their Influence on Market Behavior." *Journal of Business Economics and Management* 14 (SUPPL1): S112–S127. doi:10.3846/16111699.2012.711360.

WHO. 2021. *COVID-19 Weekly Epidemiological Update*. World Health Organization.

Williams, R. 2012. "Using the Margins Command to Estimate and Interpret Adjusted Predictions and Marginal Effects." *The Stata Journal* 12(2): 308–331. doi:10.1177/1536867X1201200209.

Yamasaki, T. 2016. "Do Typhoons Cause Turbulence in Property-liability Insurers' Stock Prices?" *Geneva Papers on Risk and Insurance: Issues and Practice* 41 (3): 432–454. doi:10.1057/gpp.2015.29.

Yamori, N., and T. Kobayashi. 2002. "Do Japanese Insurers Benefit from A Catastrophic Event? Market Reactions to the 1995 Hanshin-Awaji Earthquake." *Journal of the Japanese and International Economies* 16 (1): 92–108. doi:10.1006/jjie.2001.0477.

Yang, F.-J., Y.-H. Wang, and L.-J. Chen. 2010. "Information Value of the Infectious Diseases Outbreak on Biotechnology." *Journal of Medicinal Plants Research* 4(20): 2103–2107. Retrieved from https://www.scopus.com/inward/record.uri?eid=2-s2.0-78650038596&partnerID=40&md5=e02dce5919c63b60304c4e0f690e552e

Zaremba, A., R. Kizys, D. Y. Aharon, and E. Demir. 2020. "Infected Markets: Novel Coronavirus, Government Interventions, and Stock Return Volatility around the Globe." *Finance Research Letters* 35: 101597. doi:10.1016/j.frl.2020.101597.