Tourism Firm Performance on Economic Risk and Return in Malaysia under Climate Change Context

Chuiehong Tan*, Seenie Lee, and Shufen Chuah

***Abstract*—Tourism demand leads to economic growth, but empirical studies of tourism sector performance on economic risk nexus have been quite scant, especially under climate change context. This paper studies the influence of tourism firm financial performance on volatility and growth in Malaysia. Three types of firm volatility are measured by standard deviation, GARCH(1,1) and EGARCH models. The effect of tourism firm performance on volatility of firms' stock return and economic growth under climate change and environmental hazards condition is further examined. This study focuses panel data in Malaysia from years 2010 until 2021. Data were content-analyzed and coded into weather types, firm performance and stock return volatility. Climate change data consist of temperature extremes, the intensity of rain events, rain days, floods and extreme events. Environmental hazards data include carbon dioxide emissions (CO2), greenhouse gas emissions (GHG) and air quality index (AQI). The results statistically reveal that (i) financial performance is a significant factor in explaining the volatility of tourism firms and economic growth (ii) better financial performance contributes to economic growth under climate change context (iii) tourism firm financial performance induces environmental hazards, especially CO2 and thus affects the tourism firms' financial risk in Malaysia. Results from this study are important to policymakers who should spare no effort to mitigate the effect of climate change in the context of tourism performance and economic risk. This study provides detailed insights into the sensitivity of tourism firm performance on economic risk, and their current ability to deal with climate change issue.**

***Index Terms*—Tourism firm financial performance, climate change, environmental hazards, stock return volatility, economic development**

I. Introduction

Tourism in Malaysia is one of the major contributors to Malaysian economy. Climatic change poses serious effects on climate-sensitive tourism which ultimately influence the tourism sector. Climate change in Malaysia is usually associated with extreme weather (temperature, rainfall, wind) and seasonality (dry and wet/monsoon season). The tourism trend is affected by these two factors and to some extent influences the perception of tourists to visit Malaysia. A change in climate would have given impact on Malaysia's tourism industry, which is one of national economic key resource areas. The indicators of climate change such as geographical location, temperature and rainfall are perceived as the potential threats to the tourism activities and resources. The number of tourists would be affected in which scenic areas such as highlands, beaches and diving resorts that are banked in to its natural beauty have been reduced and changed for the worse. Pristine environment and favourable weather conditions are the fundamental of the tourism industry sustainability.

Since 13th century, Malaysia has a rich history and consists of mainland and islands of diverse fauna and flora which are main factors in attracting millions of tourists from other countries. Various activities have been promoted for tourists to visit Malaysia such as diving, golf gaming, world class F1 car racing track, cave exploring as well as bird viewing [1]. Additionally, "Homestay Malaysia" and 'Malaysia My Second Home' are some Malaysia's travel programmes. Besides that, health tourism and eco-temporary arts are popular in Malaysia.

Geographically, Malaysia has a sum land area of 329733km square and majority coastal lands are low lying regions that may cause tourist spots vulnerable to sea level increases. MOSTE [2] claims that temperatures in Malaysia have risen by 0.18 ℃ since 1951, and that the sea level on the southern coast of Peninsular Malaysia has risen by an average of about 1.25mm per year since 1986 [3]. Consequently, climate change conditions are forecasted to sustain on upward tendency [4]. The dominant influences of climate change in Malaysia are damaging native scenic spots and tourism infrastructure as well as losing archaeological assets and a lot of native resources. Furthermore, climate change also increases coral bleaching and coastal erosion, and thus raises waterfronts maintenance costs.

The climate change in Malaysia is a primary factor causing common communicable diseases that are sensitive to endemic such as dengue, Japanese encephalitis, cholera, malaria, meningococcal meningitis, leptospirosis and rickettsial infections [5]. This issue not only causes the problem for the country but also creates anxiety for risk avoidance tourists.

Malaysia is a weather-dependent industry, and tourism industry will be influenced by climate change. This study provides evidence on how climate change affects the tourism firm financial performance, as well as economic growth in Malaysia and stock return volatility (economic risk). This research analyses two-phase model in which the first phase involves an analysis of the effect of climate change on tourism firm financial performance, risk evaluation and economic development opportunity in Malaysia. The second phase focuses on the impact of tourism firm performance on Malaysian economic growth and stock return volatility (economic risk) under climate change condition.

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Chuiehong Tan and SeeNie Lee are with the Faculty of Management, Multimedia University, Cyberjaya, Selangor, Malaysia.

Shufen Chuah is with the Faculty of Business. Economics and Social Development, Universiti Malaysia Terengganu, Terengganu, Malaysia.

*Correspondence: chtan@mmu.edu.my (C.T.)

II. Literature Review

A. The Logic between Tourism vs Economic Growth

The overall long-run economic growth is definitely contributed through tourism sector. Tourism could bring in foreign exchange that can be used to import capital goods to produce goods and services heading to economic development [6]. The rapidly growth of tourism industry would also directly and indirectly increase household incomes through a multiplier effects, thereby further boosting economic growth.

Moreover, tourism revenue could positively contribute to economic growth in terms of increasing imports, resources utilization that is parallel with nation's factors endowment. Besides that tourism industries could create more job opportunities, provide infrastructure improvements, construct latest useful technologies and decision-making skills into the economy as well as promote greatest connections with other industry [7]. Thus, rapid tourism industry growth is predicted to contribute to the economy in the host country.

B. Tourism-Economic Growth Nexus

Tourism has been regarded as a high potential sector in increasing employment opportunities, foreign exchange income, tax revenue, and stimulating consumption [8]. The validity of tourism led economic growth hypothesis (TLEG) in Malaysia was further validated by employing a multivariate model derived from the Solow growth theory. Tang *et al.,* [9] discovered that tourism has positively influenced on short and long-term economic growth in Malaysia.

The neutrality hypothesis proves insignificant nexus between tourism and the growth of the overall economy, which means that tourism sector does not significantly stimulate economic growth or vice versa. Since tourism insignificantly impacts the whole economic system such that tourism development polices or incentives have almost no impact on the economy growth. Dogru *et al.,* [8] and Tang *et al.,* [10], showed support for the hypothesis of neutrality.

Researchers found that tourism development negatively impacts the economic growth [11]. Corden *et al.*, [12] initially discovered that the Dutch disease symptoms, are generally used to show the poor economic impact of tourism growth. It draws labour and resources from different sectors to tourism-dominant sectors, increases housing and land prices in the locality, and diminishes social welfare [13]. Continuation from that, tourism industry will hinder long period of economic development.

For the tourism-oriented destinations, the economic structure that is fully dependent on tourism may generate adverse effects, since the tourism industry is exposed to an increasing number of external shocks [14]. Javier *et al.*, [15] argue that an excessive tourism-oriented economy may result in less dynamic and low efficient growth. Drawing resources and labor from other industries to tourism-oriented sectors, increasing local land and house prices, and reducing social welfare [13], and thus hampering long-term economic growth.

In Malaysia, empirical studies on co-movement nexus of tourism development and economic growth are limited. Lau *et al.*, [16] found evidence support TLEG hypothesis in the state of Sarawak. Nanthakumar *et al.*, [17] showed the hypothesis of economic-driven tourism growth in Malaysia via trivariate model involving real GDP, international tourist arrivals and CPI, between 1980 and 2007. They concluded that bi-directional relationship between CPI and international tourist arrivals and between CPI and GDP, suggesting that economic aspects leads to Malaysia's tourism industry. Kadir *et al.*, [18] investigated the co-integration and causality relationship using quarterly data of total trade, international tourism receipts, total exports and imports. The results revealed that total trade drives tourism growth.

By employing ARDL method, Othman *et al.*, [19] concluded TLEG hypothesis is significant in both Malaysia and Singapore with annual data of GDP and international tourist arrivals between 1976 and 2005. Othman *et al.*, [20] further supported on long run nexus between tourism development, economic growth and foreign direct investment in 18 major tourism countries including Malaysia and Singapore. Besides that Sarmidi *et al.*, [21] also employed ARDL method to analyze the dynamic interrelationships between economic development, trade volume and international tourist arrival in Malaysia and ASEAN tourism countries. The results reveal short run unidirectional and bidirectional nexus between trade volume, economic growth and tourism. The results also showed strong long-run inter-correlation between tourism, trade volume and economic growth in the selected countries.

Since the effect of tourism firm on economic growth may change under different conditions, this study analyses the correlation between tourism firm performance and economic growth (GDP) under climate change condition.

C. Effect of Firm Financial Performance on Economic Growth

Neely *et al.*, [22] denotes that performance measurement is the process of analyzing both the actions of efficiency and effectiveness taken. Performance measurement refers to a great significance to the effective organization management and the processes enhancement, because only measurable things are manageable. Corporate performance matters have aroused the researchers' interest from different disciplines and perspectives [23, 24]. Saad *et al.*, [25] found that corporate financial performance indicators such as profit, productivity, turnover and return on investment, are worth noting in the literature. Firms with greater performance contribute more to economic development, since these firms are stable, sustainable and have the ability to offer shareholders with fixed profit and employees with fixed income, thereby enhance investors' confidence in the capital market.

Since 1990s, some considerable studies discovered the direct implications between institutions and economic growth [26, 27]. Recent studies show most of the cases positively and significantly impact corporates' financial performance and countries' economic growth. Marinko *et al.*, [28] showed corporate governance positively and significantly impacts the firms' performance on countries' economic growth in majority of the research cases.

Hence, the hypothesized tourism firm's financial performance has positive affect on the economic growth.

D. Climate Change Nexus with Tourism Firm Performance

Climate has been recognized as vital to tourists' decision-making and it will also affect the achievement management of travel and tour firms. Nevertheless, scholars have predicted that the rise of air temperature and sea level, changing rainfall patterns, and increase in extreme weather events. Therefore, islands that rely on tourism need to be alert of the climate change as this phenomenon would influence their business [29].

According to past literature, climate change and its impact on travel and tour is rarely being analyzed. Climate change is now receiving concern gradually, especially from the tourism industry [30, 31]. It is important to investigate such indicators because tourism industry is a crucial resource for the industry. The widely known climate proxies which have greater influence on tourism are sunshine, heat, humidity, radiation, wind, precipitation and fog.

Wilkins *et al.*, [32] studied different type of tourists' perceptions and behaviour, mostly about their weather sensitiveness, climate change worries as well as behavioural intentions. They found that tourism satisfaction varies with changing weather, e.g. temperature, precipitation as well as storms. The existing literatures confirm that researches investigating the influence of climate change on tourism is scant, especially in Malaysia. Thus, subject to methodological limitations, this study will look into the climate change impact on the corporate's financial performance and subsequently on Malaysian economic growth.

Previous studies tend to concentrate on tourism firm as a climate change victim, even though it is observed that the impacts may be nonsymmetrical in which some destinations may possibly benefited from the climate change. In Malaysia, most Kapas Island's inn operations perceived that climate change is irrelevant with their inns' management [33]. The climate change impacts on tourism firms have implications for new governmental policies, tax regimes, new planning and environmental management in Malaysia. The Bernama news institution constructed two major projects that geared to boost the Malaysia's tourism and culture. National Cultural Policy (DKN) and National Tourism Policy (DPN2030) played a crucial role in tackling climate change problem. The strength of tourism sector in Malaysia shows its ability to acclimatise to climate change. Thus, the effect of climate change on Malaysia's travel and tourist firm performance will be investigated. Based on the scenario, climate change may contribute to lower/higher tourism firm financial performance in Malaysia.

E. Tourism Firm Performance-Country'S Stock Return Volatility Nexus

The significance of travel and tour growth in a nation relies on the international tourist arrivals, tourism revenues and foreign exchange revenues. Similarly, Malaysian tourism sector accumulated US$ 94.53 billion which accounts to 67.52 percent of GDP and 3.47 million employments opportunities for Malaysia economy in 2018 [34].

Firm performance may influence country's stock price volatility. Tourist firms with better performance may have better operating efficiency, sufficient cash flow, high return on equity (ROE) and return on investment (ROI) that contribute better firm value to confront climate change shock more steadily and suffer lesser performance volatility. Thus, they contribute to country's economy stabilization.

Financial statement reported by firm illustrates a firm's performance. Thus, a better archiving corporate probably reinforce management for quality disclosure [35]. Better corporate performance is likely to reinforce investors' confidence and reliance, particularly during uncertainty circumstances the sentiment behaviour such as panic, herding or contagion is less possible to influence corporate stock prices and, therefore, lesser stock returns volatility. Moreover, better firm performance attracts foreign investments and tourism arrivals that lead to increase tourism receipts, foreign exchange earnings, capital inflow, and employment opportunities, hence contributes to country's stock return.

III. Hypothesis Development

A. The Impact of Tourism Firm Performance on Stock Price Volatility (Economic Risk) and Economic Growth (GDP).

Tourism industry positively and significantly leads to the growth of economy in Malaysia [36, 37]. Tourism sector is one of the world's rapid-growth sectors and brings huge benefits of economic gains by creating job opportunities, multiplying personal wealth, raising infrastructure investments, increasing government tax revenue, as well as decreasing deficit budget [38].

Since 1960s, Malaysian tourism sector has begun promoting Malaysian tourist destinations in an infancy stage [39]. Tourism Malaysia (2021) reported Malaysia tourism industry is the second biggest foreign revenue earners after manufacturing in 2020. There are about 26.1 million international tourists who arrive in Malaysia in year 2019, and the number increases years after years.

Tourism sector contributes to around 5.9 percent of Malaysian economic growth in year 2018. Tourism performance also achieved growth of 2.9 percent to RM3257 per capital expenditure in year 2019. ASEAN tourist arrivals dominate continuing tourist arrivals to Malaysia which is 70.1 percent (Tourism Malaysia, 2020).

It is widely agreed that tourism firm and economic growth have a close relationship, in which tourism sector contributes to foreign exchange revenues in Malaysia. In year 1974, Malaysia achieved only 12 million foreign tourists. However, in 2019, the sum of international tourist arrivals increased to 26.1 million (Tourism 2020). Earnings accounted by international tourist arrivals increased dramatically from RM0.35 billion to 86.1 billion [40]. The overall long-run economic growth is dominated by tourism industry. Generally speaking, tourism generates foreign exchange earnings and leads to more import capital goods. Subsequently this process yields goods and services that gives to growth of economic [6].

The dramatically growth of tourism would also directly and indirectly increases household incomes for several reasons like multiplier effects, which eventually leads to economic growth. Furthermore, foreign tourist can increase income by enhancing market competition efficiency among local and foreign tourist destinations, easing the scale

economies[41].

Qiushi *et al.*, [42] revealed that tourism industry can contribute to overall economic development. However, if tourism is at a comparative disadvantage, growth in tourism cannot stimulate economic growth. They also found the increasing tourist arrivals did not certainly translate into higher economic growth in which tourism faces a trade deficit and comparative disadvantage. Thus, the development of tourism industry may lead to increase country's stock return volatility.

Furthermore, tourism industry has negative impact on economic growth in the aspects of inflation, increase foreign labour and leakage (increase purchase of foreign capital and investment for domestic tourism use, capital outflow increase). It is considered undesirable as it is often the result of economic instability since tourism firm performance and economic in Malaysia have a close relationship. Poor tourism firm performance can increase uncertainty and volatility in country. Meanwhile, the firm performance dimension does impact the stock return volatility, especially under climate change issue. Climate change has destroyed facilities, economies and ecological natures in the tourism areas. Poor firm performance may have lower cash flow and inefficiency operating management that will reduce profit, as well as increase country's stock return volatility. Thus, for climate-change-hit destinations, policymakers who are concerned on tourism development need to have a strategic engine to stimulate and recover economy.

We argue that tourism firms with better firm financial performance such as increasing on profit, return on investment, productivity and lower turnover lead to better economic growth. Hence, the firm performance hypothesis is formed as follow:

H1: Better tourism firm performance leads to increase Malaysia's economic growth and lower stock returns volatile.

B. The Impact of Tourism Corporate Performance on Economic Growth under climate Change and Environmental Hazards in Malaysia

Damage to the tourism products would influence tourism firm performance. Climate change hazard is beyond the control of a business and can be hostile. Malaysia has been blessed with many islands both in West (Peninsular) and East (Sabah and Sarawak) as tourism destinations in Malaysia which are believed to be affected by the climate change. The harsh climatic condition could decrease tourists from visiting Malaysia.

Climate deterioration can negatively affect the output of agriculture and damage coral reefs because of sea surface temperatures become hotter as well as other potential threats such as loss of water resources [43]. Furthermore, the pressure of wind would possible cause damage to property and incur maintenance cost, thus lower tourism firm performance.

In addition, climate change categorizes into direct impact, indirect impact and secondary effects that impact economic growth. The climate change directly damages physical or capital stocks as well as environmental goods and services. Indirect damage includes interruptions to flows of services from capital and natural goods and services, whereas, secondary effects include impacts on country's economic growth.

Both "tourism" and the "climate change" are playing main roles in the growth of Malaysian economy. Tourism firm performance may lead to negatively impact on economic growth under climate change issue. So, the formed hypothesis is coined as below:

H2: Climate change and environmental hazards moderate the relationship between Malaysia's tourism firm performance and economic growth (GDP), such that strong (less) climate change contributes to lower (higher) economy growth.

C. The Impact of Tourism Firm Performance on Malaysia's Stock Return Volatility under Climate Change and Environmental Hazards

Tourism firms with better performance may have better operating efficiency and sufficient cash flow that contribute better firm value to tackle climate change shock. Thus, they contribute to country's economy stabilization. However, the firms' performance may influence the stock prices volatility, especially from a climate change perspective. Therefore, our firm performance hypothesis is formed as follow:

H3: Climate change and environmental hazards will moderate the link between tourism firm performance and Malaysia's stock return volatility, such that strong (less) climate change contributes to higher (lower) volatility in stock return.

IV. Methodology

A. Models to Measure Volatility Risk

The Generalized Autoregressive Conditional Heteroscedastic (GARCH) model Originally from Autoregressive Conditional Heteroscedastic (ARCH), example GARCH (1,1):

$$\text{Mean equation} \quad rp_t = \mu + \phi_1 rp_{t-1} + \varepsilon_t \tag{1}$$

$$\text{Variance equation} \quad \sigma^2_t = \omega + \alpha_1 \varepsilon^2_{t-1} + \beta_1 \sigma^2_{t-1} \tag{2}$$

where $\omega > 0$, $\alpha_1 \geq 0$, *and* $\beta_1 \geq 0$, and:

μ= average return, rp_t = return of the asset at time t, ε_t = residual return = $v_t \sqrt{h_t}$, σ^2_v =1 and

$$h_t = \theta_0 + \sum^q_{i=1} \theta_i \varepsilon^2_{t-i} + \sum^p_{i=1} \delta_i \, h_{t-I} \tag{3}$$

where σ^2_t stand for conditional variance.The return is represented as a linear function of its own lag which is lag 1for mean equation. Variance equation is relying on previous news and previous volatility (own lag of conditional variance). The previous news known as the ARCH term is used to measure the clustering effect. On the other hand, the past conditional variance known as GARCH term is used to determine the persistency of the volatility.

The Exponential Generalized Autoregressive Conditional Heteroscedastic (EGARCH) Model

The leverage effect can be measured using an asymmetric GARCH model where bad news increases volatility rather than good news at the same magnitude. Basic EGARCH(1,1) model is written as below:

$$\text{Mean equation:} \quad rp_t = \mu + \phi_1 rp_{t-1} + \varepsilon_t \tag{4}$$

Variance equation:

$$ln\sigma^2{}_t = \omega + \beta_1 ln\sigma^2{}_{t-1} + \alpha_1 \frac{\epsilon_{t-1}}{|\sigma_{t-1}|} + \gamma \frac{\epsilon_{t-1}}{\sigma_{t-1}} \quad (5)$$

where leverage parameter, *r* is expected to be negative and significant where negative shock will have greater impact on volatility rather than positive shock.

B. Standard Deviation

The standard deviation (Greek letter sigma σ or the Latin letter s) is use to quantify the amount of variation or dispersion of a set of data values. The formula for the sample standard deviation is

$$s = \sqrt{\frac{\sum_{i=1}^{N}\left(x_i - \bar{x}\right)^2}{N-1}} \quad (6)$$

where { *x*1 , *x*2 , … , *xN* } are the observed values of the sample items, $\bar{x}$ is the mean value of these observations, and *N* is the number of observations in the sample.

C. Models to Measure Firm Financial Performance

The Formula of the Q Ratio

$$Q_{i,t} = \frac{MV(Equity)_{i,t} + BV(Assets)_{i,t} - BV(Equity)_{i,t}}{BV(Assets)_{i,t}} \quad (7)$$

where $Q_{i,t}$, $MV(Equity)_{i,t}$ $BV(Assets)_{i,t}$ and $BV(Equity)_{i,t}$ represent Tobin's Q, the market value of equity, the book value of assets, and the book value of equity for each firm *i* at year *t*, respectively.

Note: $BV(Assets)_{i,t} - BV(Equity)_{i,t} = BV(Liabilities)_{i,t}$

$BV(Assets)_{i,t} = BV(Equity)_{i,t} + BV(Liabilities)_{i,t}$

The Formula of the ROE

$$\text{ROE} = \frac{Net\ Income\ (annual)}{Shareholders' Equity} \quad (8)$$

Return on Equity (ROE) refers to a corporate's return yearly (net income) divided by sum of shareholders' equity, in percentage. The figure shows the sum of equity capital return as well as represents as corporate's capability of spin equity investments into revenues.

Formula of the Net Profit Margin (NPM)

$$\text{NPM} = \frac{R - COGS - E - I - T}{R} \times 100 \quad (9)$$

where *R* is revenue, *COGS* is the cost of goods sold, *E* is operating and other expenses, *I* is interest and *T* is taxes. Net profit margin refers to *R* minus *COGS* minus operating and other expenses minus interest and divide by revenue, in percentage.

D. The Baseline Model

H1(i): Better tourism firm performance leads to lower stock return volatility.

$$\ln(VOL)_{i,t} = \alpha + \beta_1 \ln(Tobin'sQ)_{i,t} + \beta_2 \ln(NPM)_{i,t} + \beta_3 \ln(ROE)_{i,t} + \varepsilon_{i,t} \quad (10)$$

The dependent variable is *VOL*, the volatility of stock price of Malaysia tourism listed firms in the year 2010-2021. The explanatory variables are defined as follows: Tobin's Q is tobin's Q of Malaysia tourism listed firms; *ROE* is return on Equity of Malaysia tourism listed firms; *NPM* is net profit margin of Malaysia tourism listed firms; β is parameter to be estimated, *t* is the period of time from year 2010 until 2021; *ln* is the natural logarithmic.

H1(ii): Better tourism firm financial performance leads to increase Malaysian economic growth.

$$\ln(GDP)_{i,t} = \alpha + \beta_1 \ln(Tobin'sQ)_{i,t} + \beta_2 \ln(NPM)_{i,t} + \beta_3 \ln(ROE)_{i,t} + \varepsilon_{i,t} \quad (11)$$

The endogenous indicator is economic growth (GDP) in Malaysia between year 2010–2021. The independent variables are defined as follows: Tobin's Q; *ROE* is return on equity; *ROI* is return on investment.

H2: Climate change and environmental hazards moderate the relationship between Malaysian tourism firm performance and GDP such that strong (less) climate change leads to lower (higher) economic growth.

$$LnGDP_{it} = \beta_0 + \beta_1 Ln(FP*T_{it}) + \beta_2 Ln(FP*RainFall_{it}) + \beta_3 Ln(FP*RainDays_{it}) + \beta_4 Ln(FP*FEE_{it}) + \beta_5 Ln(FP*AQI_{it}) + \beta_6 Ln(FP*CO2_{it}) + \beta_7 Ln(FP*GHG_{it}) + \varepsilon_{it} \quad (12)$$

The dependent indicator is economic growth in Malaysia (GDP) for year 2010–2021. The explanation indicators are determined as follows: *FP* is the tourist firm financial performance in Malaysia; *RainFall* is total rainfall in mm; RainDay is total rain day; *T* is the temperature in ℃. All the climate data are collected in state of Malaysia such as Kuala Lumpur/Subang, Malacca, Kuantan, Kuching and Kota Kinabalu. *FEE* is the total day of floods and extreme events. *AQI* is air quality indices; *CO2* is carbon dioxide emissions; *GHG* is greenhouse gas emissions. All these data are average quarterly data.

H3: Climate change and environmental hazards moderate the co-relationship among tourism firm performance and the volatility of stock return in Malaysia, such that strong (less) climate change leads to higher (lower) stock return volatility.

$$LnVOL_{it} = \beta_0 + \beta_1 Ln(FP*T_{it}) + \beta_2 Ln(FP*RainFall_{it}) + \beta_3 Ln(FP*RainDays_{it}) + \beta_4 Ln(FP*FEE_{it}) + \beta_5 Ln(FP*AQI_{it}) + \beta_6 Ln(FP*CO2_{it}) + \beta_7 Ln(FP*GHG_{it}) + \varepsilon_{it} \quad (13)$$

E. Sampling and Descriptive Statistics

This study employs a simple regression to investigate the empirical nexus between climate change, environmental hazards and tourist firm's financial performance. The sample size of 33 listed tourist firms in Malaysia have been chosen based on the availability of data. In this research the secondary data is obtained from the year 2010 to year 2021. The variables included in this study are environmental hazards, climate change, tourism firm's financial performance and stock return volatility. The GDP and Tobin's Q data is obtained from ipcapital data-stream. The ROE is obtained from KLSESCREENER, whereas the net profit margin data is obtained from I3investor. The CO2 and AQI data are retrieved from OECD data whereas the climate change data is retrieved from Tutiempo Network. The stock prices data is gathered from yahoo finance.com.

Table I describes the descriptive statistics for the selected indicators. Panel A shows the mean percent of corporate risk, standard deviation, G and EG variances, are 1.552%, -4.072% and -5.135% respectively. The mean percent of GDP is 12.353% with minimum of 12.051% and maximum of 12.585%. The mean value of firms' financial performance,

Tobin's Q, ROE and NPM are 0.939%, 0% and 3.497% respectively. The mean value of climate change, Temperature (T), rain fall, rain day, flood and extreme events are 3.316%, 5.470%, 16.764 and 0.272% respectively. Lastly, the mean value of environmental hazards, AQI, GHG and CO2 are 3.876%, 12.508% and 5.494% respectively.

TABLE I: DESCRIPTIVE STATISTIC

Variables	Mean	SD	Min.	Max.	N
Panel A: All Variables					
GARCH (1,1) (G)	-4.072	1.478	-8.873	1.663	1.571
EGARCH (EG)	-5.135	2.674	-11.854	3.191	1.503
Standard deviation (SD)	1.552	1.530	-2.523	4.514	1.496
Gross Domestic Productivity (GDP)	12.353	0.153	12.051	12.585	1.506
Tobin's Q	0.939	0.201	-2.598	1.152	1.486
Return on Equity (ROE)	0.000	0.134	-1.463	1.978	1.503
Net Profit Margin (NPM)	3.497	22.050	0.001	382.875	1.281
Temperature(T)	3.316	0.018	3.282	3.354	1.571
Rain Fall (RF)	5.470	0.264	4.903	6.062	1.571
Rain Day (RD)	16.764	2.974	8.667	21.867	1.571
Floods and Extreme Events (FEE)	0.272	0.445	0.000	1.000	1.571
Air Quality Index (AQI)	3.876	0.116	3.689	4.212	1.571
Greenhouse Gas Emissions (GHG)	12.508	0.099	12.278	12.657	1.571
Carbon dioxide Emissions (CO2)	5.494	0.091	5.321	5.630	1.571

V. ESTIMATION RESULTS FOR THE BASE LINE MODEL

Table II presented the estimation of the models in eq. (10) and Eq. (11) in which volatility and economic growth are the dependent variable generated from SD, G, EG and GDP. Since unobservable characteristics are inclined to influence each company's market value, we employ pooled OLS, fixed effect (FEM) and random effect (REM) estimators. The OLS model includes two-digit SIC dummy variables which tolerate a variety intercept for firms in tourism sector, while the FEM and REM models assign a unique intercept to each corporate. Hausman *et al*., [44] state that the FEM framework represents a common, unbiased method of controlling for omitted indicators in a panel data set.

TABLE II: THE IMPACT OF CLIMATE CHANGE AND ENVIRONMENTAL HAZARDS ON TOURISM FIRM PERFORMANCE IN MALAYSIA

	Stock Return Volatility			Economic Growth
	Standard Deviation	GARCH(1,1)	EGARCH	GDP
Constant	**1.920*** ** (14.16)	**-3.958*** ** (-13.61)	**-5.255*** ** (-11.03)	**12.254*** ** (338.88)
TOBINQ	**-0.374*** ** (-2.59)	**-0.077*** (-0.36)	**-0.188*** (0.72)	**0.146*** ** (3.80)
ROE	**0.284*** ** (2.69)	0.140 (0.91)	**-0.336*** (-1.75)	-0.039 (-1.40)
NPM	**-0.005*** ** (-6.31)	**-0.001*** (1.62)	0.002 (1.22)	**0.001*** ** (2.61)
R-Squared	0.71	0.36	0.21	0.30
F-test [p-value)	16.22***	9.8**	4.36	7.28***
LM test [p-value]	18777.93***	9654.11***	18891.24***	2.09*
Hausman Test	12.70***	-1.09	-1.47	20.59***
Observations	1248	1246	1246	1255
Number of groups	33	33	33	33
OLS				
Fixed-Effect	YES			YES
Random-Effect		YES	YES	

Notes: ***p < 0.01, **p < 0.05, *p < 0.1
ROE=Return of Equity, NPM= Net Profit Margin, OLS = Pooled Ordinary Least Squares, FE = Fixed Effect (within estimator), and RE = Random Effect.

TABLE III: THE IMPACT OF TOURISM FIRM PERFORMANCE ON MALAYSIA ECONOMIC RISK AND RETURN UNDER CLIMATE CHANGE AND ENVIRONMENTAL HAZARDS

	Stock Return Volatility			
	Standard Deviation	GARCH	EGARCH	Economic Growth
	Environmental Hazards			
Constant	**-0.001*** (5.83)	**-4.033** (-17.22)	**-5.392*** (-11.03)	12.326*** (3.509)
TobinQ*AQI*	-0.038 (-1.06)	**-0.001** (-2.14)	**0.018*** (3.51)	**0.001*** (14.76)
TobinQ*CO2	**-0.054*** (-4.63)	**-0.001*** (4.03)	**-0.007*** (3.98)	**0.005*** (-0.873)
TobinQ*GHG	**0.001*** (4.89)	**-0.001*** (-1.73)	-0.001 (-0.73)	-0.001 (-0.83)
ROE*AQI	-0.210 (-1.19)	0.020 (0.86)	-0.019 (-0.76)	**0.003** (-2.51)
ROE*CO2	**-0.344*** (-2.69)	**-0.004*** (0.21)	**-0.014*** (0.78)	0.001 (0.91)
ROE*GHG	-0.001 (-1.05)	0.001 (0.67)	-0.001 (-0.23)	-0.001 (-0.84)
NPM*AQI	-0.001 (-0.15)	0.001 (0.28)	0.005 (0.85)	0.001 (0.16)
NPM*CO2	**-0.001*** (-1.35)	**-0.002*** (-1.62)	**-0.003** (-1.95)	**0.001*** (1.55)
NPM*GHG	0.001 (0.61)	**-0.001*** (1.44)	**-0.001*** (1.63)	**0.001*** (-1.8)
	Climate Change			
TobinQ*T	0.223 (1.15)	**-0.027*** (-1.05)	**-0.068** (-2.41)	**-0.050*** (-23.42)
TobinQ*RF	**-0.001*** (1.38)	**-0.001*** (-1.08)	0.001 (0.07)	**-0.001*** (-15.69)
TobinQ*RD	**-0.123*** (-1.29)	**0.020*** (1.56)	-0.004 (-0.27)	**-0.001*** (18.57)
TobinQ*FEE	0.030 (0.06)	0.002 (0.030)	**-0.130*** (-1.82)	**0.012*** (8.33)
ROE*T	**3.956** (2.07)	-0.102 (-0.4)	-0.092 (-0.34)	-0.016 (-0.99)
ROE*RF	**-0.148*** (-3.11)	0.003 (0.55)	**0.011*** (1.58)	0.001 (1.22)
ROE*RD	**2.740*** (3.38)	-0.077 (-0.73)	**-0.144*** (-1.26)	**-0.018** (2.06)
ROE*FEE	**7.704*** (1.4)	-0.479 (-0.66)	-0.548 (-0.7)	**-0.141*** (-2.69)
NPM*T	0.083 (0.48)	0.001 (0.44)	-0.017 (-0.7)	-0.001 (-0.64)
NPM*RF	0.001 (0.47)	-0.001 (-0.87)	0.001 (1.15)	**-0.001*** (-1.35)
NPM*RD	**-0.031*** (-0.33)	**-0.015*** (-1.21)	0.005 (0.4)	**0.002*** (3.08)
NPM*FEE	0.001 (0.03)	**0.065*** (1.77)	-0.025 (-0.64)	**-0.001*** (-3.39)
R-Squared	0.66	0.58	0.61	0.71
F-statistic	180.75***	76.73***	77.68***	4.57***
Hausman Test	7.74***	22.27***	7.74***	154.57***
LM test	22.27***	12770.93***	22.27***	1.000***
Observations	1242	1242	1242	1242
OLS				
Fixed-Effect	YES	YES	YES	YES
Random-Effect				
LM test	22.27***	12770.93***	22.27***	1.000***
Observations	1242	1242	1242	1242
OLS				
Fixed-Effect	YES	YES	YES	YES
Random-Effect				

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
T=Temperature, RF= Rain Fall, RD= Rain Days, FEE= Floods and Extreme Events, AQI=Air Quality Index, CO2=Carbon Dioxide Emissions, GHG= Greenhouse Gas Emissions, NPM = Net Profit Margin and ROE = Return on Equity

Using SD, G and EG to measure stock returns volatile, majority of the estimates are consistent with the expected sign

with negative significant coefficient from tourist firm financial performance. This implies that tourist firm with better financial performance stabilizes Malaysia's stock volatility. The regression coefficient of Tobin's Q on SD, G and EG volatility are -0.374, -0.077 and -0.188 respectively. Higher negative coefficient of financial performance on volatility indicates well-financial performance which leads to Malaysia's price stability.

Nevertheless, the results also show that tourism firm financial performance increases economic growth. The Tobin's Q and net profit margin (NPM) show 10 percent positive significant on the economic growth. This implies better tourism firm financial performance provides a better Malaysia's economic growth. The regression coefficient of Tobin's Q and NPM are 0.1456 and 0.001 respectively. The results are parallel to the previous studies since tourism industry is one of the main contributors in Malaysia's economy.

Hypothesis 3 states that better tourism firm financial performance leads to lower volatile of stock return under lower climate change and environmental hazards conditions. The results are consistent with our expectation that the interaction term between financial firm performance and environmental hazards has a negative sign as climate change and environmental hazards are expected to diminish the stabilizing effect of the financial performance volatile. An increase of Tobin's Q moderated with CO2 decreases standard deviation, GARCH and EGARCH by 0.054, 0.001, and 0.007 respectively. An increase of NPM moderated with CO2 reduces standard deviation, GARCH and EGARCH by 0.001, 0.002, and 0.003 respectively at 1 percent significance level. However, the results show minor significance between firms' financial performance and country risk under climate change conditions.

Hypothesis 2 states that tourism firm financial performance may increase nation's economic growth, with a lower climate change and environmental hazards. A negative sign is expected for the tourism firm financial performance and environment hazards. Table III reports estimation of the interaction term. 7 out of 12 climate change items are depicting negative significant in the last column. This implies that tourism firm performance decreases economic growth if climate change persists to deteriorate. Nevertheless, 5 out of 9 environment hazards items show positive significant sign. This means that tourism firm performance increases economic growth slightly under the environmental hazards.

In conclusion, the results in Table III indicate that we do have strong evidence that hypothesis 2 and 3 are partly hold. In short, in Malaysia, the environmental hazards did seriously affect tourism industry firm performance. Nevertheless, the climate change did seriously impact the economic growth.

VI. Conclusion

This study investigates the impact of tourism corporate financial performance and Malaysia's stock return volatility and economic growth. Tourist firm financial performance is measured by Tobin's Q, return on equity (ROE) and net profit margin (NPM) while Malaysia's volatile of stock return is analyzed using GARCH conditional volatility, EGARCH and standards deviations. Using the panel data of 32 public listed tourist firms in Malaysia for a period of 12 years, empirical results shows that the firm financial performance has stabilizing effect on country's stock return volatility and increase economic growth in Malaysia.

We further examine whether increasing climate change and environmental hazards contribute to the relationship between financial performance and country's risk and growth. The empirical results show that tourism firm performance still increases economic growth even under the influence of climate change and environmental hazards conditions. Besides that, substantial empirical results prove the hypothesis that tourism firm financial performance induce climate change and environmental hazards that may affect economic risk in Malaysia. In conclusion, tourism industry in Malaysia are impacted by environmental hazards, especially CO2 but less affected by climate change. Besides that, economic growth in Malaysia is affected by climate change but less affected by environmental hazards.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Chuiehong Tan and Seenie Lee conducted the research, analyzed the data and wrote the paper; Shufen Chuah improved and edited the paper; all authors had approved the final version.

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