TI 2017-052/III
Tinbergen Institute Discussion Paper

Tourism Stocks in Times of Crises: An Econometric Investigation of Unexpected Non-macroeconomic Factors

Anastasios Zopiatis[1]
Christos S. Savva[1]
Neophytos Lambertides[1]
Michael McAleer[2]

[1] Cyprus University of Technology
[2] National Tsing Hua University, Taiwan; University of Sydney Business School; Erasmus University Rotterdam, The Netherlands; Complutense University of Madrid, Spain and Yokohama National University, Japan

Tinbergen Institute is the graduate school and research institute in economics of Erasmus University Rotterdam, the University of Amsterdam and VU University Amsterdam.

Contact: discussionpapers@tinbergen.nl

More TI discussion papers can be downloaded at http://www.tinbergen.nl

Tinbergen Institute has two locations:

Tinbergen Institute Amsterdam
Gustav Mahlerplein 117
1082 MS Amsterdam
The Netherlands
Tel.: +31(0)20 598 4580

Tinbergen Institute Rotterdam
Burg. Oudlaan 50
3062 PA Rotterdam
The Netherlands
Tel.: +31(0)10 408 8900

Tourism Stocks in Times of Crises: An Econometric Investigation of Unexpected Non-macroeconomic Factors*

Anastasios Zopiatis
Department of Hotel and Tourism Management
School of Business and Economics
Cyprus University of Technology

Christos S. Savva
Department of Commerce, Finance and Shipping
School of Business and Economics
Cyprus University of Technology

Neophytos Lambertides
Department of Commerce, Finance and Shipping
School of Business and Economics
Cyprus University of Technology

Michael McAleer
Department of Quantitative Finance
National Tsing Hua University, Taiwan
and
Discipline of Business Analytics
University of Sydney Business School
and
Econometric Institute, Erasmus School of Economics
Erasmus University Rotterdam, The Netherlands
and
Department of Quantitative Economics
Complutense University of Madrid, Spain
and
Institute of Advanced Sciences
Yokohama National University, Japan

Revised: June 2017

* For financial support, the fourth author acknowledges the Australian Research Council and the National Science Council, Ministry of Science and Technology (MOST), Taiwan.

Abstract

Following the recent terrorist attacks in Paris, the European media emphatically pronounced that billions of Euros were wiped from tourism related stocks. The theoretical relationship of the industry with such unexpected non-macro incidents received moderate academic coverage. Nevertheless, the quantifiable impact of such events on tourism-specific stock values, both in terms of returns and volatility, is still a barren landscape. Using econometric methodology, the paper investigates the reaction of five hospitality/tourism stock indices to 150 incidents depicting major Acts of Terrorism, 'Acts of God', and War conflicts in the 21st Century. Empirical findings underscore the effect of such incidents on hospitality/tourism stock indices, with distinctive differences among the different types, the specificities of each event, and the five regions under investigation. This paper contributes to the extant literature and enhances our conceptual capital pertaining to the industry's current financial practices that are related to stock performance and behavior.

Keywords: Unexpected Non-macroeconomic Factors, Stock Market, Event Study, Econometric Modeling.

JEL: C21, C58, G01, H12, Z32.

1. Introduction

November 13, 2015. Paris came under attack from radical Islamists, resulting in the death of 130 individuals from at least 26 countries. The perpetrators, believed to be ISIS related, deliberately attacked sport, leisure and entertainment venues, all related to the tourism industry, in their attempt to cause mass casualties and strike fear into the heart of Europe. The following day, financial markets suffered extensive losses, with estimates suggesting that more than €2bn had been wiped off European travel and hotel shares (Wearden and Allen 2015). A similar scenario was repeated immediately following the March 22, 2016 attacks at the Zaventem International Airport and the Maelbeek subway station in Brussels, again tourism related targets, with European stocks experiencing more heavy losses (Smout 2016).

Both events demonstrated the diachronic vulnerability of tourism related stocks to unexpected non-macro incidents which, for the purposes of the paper, encompass acts of Terrorism, 'Acts of God', and War conflicts. Unfortunately, the values and norms governing day-to-day tourism operations, along with its global exposure and volatile response qualities, portray the industry as a 'convenient' target for such incidents. Furthermore, the post-event generated global coverage, fueled in recent times by the 24-hour news media frenzy, the Internet, and social networks, provides unprecedented publicity to such events, thereby influencing geostrategic interests, regional and global policies and, of vital importance to the tourism industry, travel attitudes and behavior. Moreover, the probable impact of such incidents severely affects the economics of tourism, with ramifications for financial institutions, individual investors, industry operators, and tourists. Nonetheless, despite the acknowledged importance, the specificities of this vulnerability are still a barren landscape, thereby necessitating the full attention of tourism stakeholders.

Unequivocally, the reaction of financial markets to unexpected non-macro incidents is a contemporary topic worthy of empirical investigation, especially for the tourism industry. Nonetheless, a quick foray into the most popular academic databases reveals the scarcity of studies measuring the effects of non-macro incidents on financial markets, in general, and the hospitality and tourism related stocks and indices, in particular (Chen et al. 2007; Drakos 2004; Leong and Hui 2014). Some notable attempts to investigate tourism-related topics, mostly in the sphere of macro-incidents (see Chen 2011; Chen, Jang, and Kim 2007; Zheng, Farrish, and Kitterlin 2016) are noted. Nevertheless, they fail to respond convincingly to a number of questions surrounding the behavior and reaction of hospitality and tourism-specific stock indices following major unexpected non-macro incidents.

The extant business literature informs us that the exposure and reaction of market-specific stock sectors may differ according to the characteristics of the event and the region, and the idiosyncrasies of the specific industry (Aslam and Kang 2015; Chesney, Reshetarb, and Karamana 2011; Enders and Sandler 2012). Indicatively, Aslam and Kang (2015) suggest that the susceptibility, exposure and reaction of market-specific stock sectors to pertinent incidents deviates according to the type, strength and perceived repercussions of the event. In support of this argument, Chesney et al. (2011) reveal that the insurance and airline industry sectors are more vulnerable to terrorism, whereas the banking sector is mostly affected by financial downturns. The authors argue that financial markets react differently to unpredictable natural catastrophes (Acts of God) as compared with terrorism-related incidents, especially in the post-event period.

Echoing a similar reasoning, Brounrn and Derwall (2010) posited that industries that are directly affected by an incident (for example, the airline industry in the aftermath of the September 11, 2001 attacks in New York) exhibit stronger reactions that may not be adequately portrayed in generic market indices. Moreover, Essaddam and Karagianis (2014) introduce a regional aspect to the 'equation' by suggesting a paradigm shift which focuses on the investigation of specific sectors, rather than following the norm of investigating the overall stock market's sentiment, such as the effect on the FTSE 100 index (Chen (2007)).

Such investigations capture the uniqueness of each economic sector and enable meaningful comparisons that are of importance to investors, between industries and/or regions, especially during and following an event or incident. Motivated by this reasoning, the paper hypothesizes that the well-established unique features of the hospitality and tourism industry, emanating from its enhanced exposure, vulnerability and direct involvement with unexpected non-macro incidents, may trigger a different pattern of stock price movement (returns and volatility), as compared with other industries, that is worthy of empirical investigation.

There is another subtext that cannot be ignored. The majority of existing studies that examine the effects of unexpected non-macro incidents on general financial markets are limited, both in terms of the number of cases that are investigated and/or stock market locations/regions that are covered. More precisely, some studies investigate the effect of only a handful of incidents on financial markets (see Chesney et al. 2011; Johnston and Nedelescu 2006; Kolias et al. 2011; Nikkinen and Vähämaa 2010), with the September 11 (2001), Madrid (2004) and London (2005) attacks being the most 'popular'. Others (Aslam and Kang 2015; Chen 2007; Eldor and Melnick 2004; Leong and Hui 2014) investigate the impact of numerous incidents on either one regional market (for example, the Pakistani Stock Market), or on a generic index, such as the Dow Jones Industrial Average (see Chen and Siems 2004).

In contrast, this paper, which has been influenced by the recent work of Hobbs, Schaupp and Gingrich (2016), aims to enhance the existing conceptual capital by investigating, using a conditional volatility model specification, specifically GJR and GARCH, the reaction of five hospitality/tourism stock indices to one hundred and fifty (150), manually compiled, unexpected non-macro incidents of the 21st Century. The use of GJR and GARCH models, an original approach for such an under-studied tourism-related topic, enables the control for multivariate spillovers/effects among the five indices. The inclusion of additional variables enhances our collective understanding by addressing pertinent questions, such as whether the characteristics of each incident affect stock reaction (returns) and volatility (uncertainty) (see McAleer 2015), as well as the specificities surrounding the post-event recovery period.

The empirical findings of the paper suggest that unexpected non-macro incidents cause a short-term transitory effect on hospitality/tourism stock indices, with distinctive differences among the different types of incidents, and the five regions under investigation. Furthermore, the specificities of each incident, as depicted by numerous variables, influence its overall impact on both stock market returns and volatility, whereas the empirical findings provide new insights as to the volatility persistence of such events. These empirical findings, which are of substantial importance to stakeholders, especially to hospitality and tourism stock investors, a vital constituent to the industry's sustainable development initiatives (Mao and Gu 2007), could pave the way for meaningful contributions and interventions to current financial practices that are related to stock performance and behavior, risk adjustment and portfolio diversification.

The plan of the remainder of the paper is as follows. Section 2 provides a literature review, including tourism and incidents of instability, non-macro incidents and stock behavior, and econometrics and pertinent studies. Section 3 presents the methodology, while Section 4 discusses the econometric methods, including the impact of various events on returns and volatility. Section 5 discusses the descriptive statistics and empirical results, as well as the answers to a variety of questions and hypotheses. Section 6 raises several issues relating to implications of the empirical findings for the tourism and hospitality industry.

2. Literature Review

2.1 Tourism and Incidents of Instability

The multidimensional relationship of the two polar extremes of cultural activity, tourism and instability, has received extensive scholarly attention (Theocharous 2010), with Sönmez (1998) arguing that targeting tourists, a 'soft target', is a deliberate act that helps achieve specific predetermined objectives. Historically, terrorism surfaced as the industry's primary 'adversary', with a multitude of terrorist groups targeting its superstructure and infrastructure as a vital mean to promote their own ideological agendas. In the 1960's, the European continent experienced severe forms of transnational terrorism attributed to the rise of numerous Marxist/Leninist extremist groups, whereas in the Middle-East the issue of Palestine instigated the rise of groups (for example, the Popular Front for the Liberation of Palestine), which used aircraft hijackings extensively in their revolutionary struggles. During that turbulent period, airports, commercial aircraft, hotels, public mass transportation systems, restaurants, cruise liners, leisure venues, and nightclubs, became 'ideal targets of choice', with attacks causing a severe loss of human lives, including innocent bystanders and tourists (Drakos and Kutan 2003; Sönmez 1998).

On the eve of the 21st Century, and following the end of the Cold War in 1991, the global community experienced the rise of Islamic fundamentalism, with Al Qaeda orchestrating, a decade later, the devastating September 11, 2001 attacks in New York, with detrimental effects for the tourism industry (Goodrich 2002). This group, responsible for hundreds of attacks which destabilized the Middle East and other regions of the World for almost a decade, was gradually restrained, following two major War conflicts (Iraq, 2003-2011, and Afghanistan 2001-2014), and the death of its founder, Osama bin Laden, in 2011. Following Al Qaeda's demise, the Islamic State (IS, also known as ISIS or ISIL) has surfaced as the most formidable terrorist group in recent times.

By espousing an ultra-radical ideology based on an extremist interpretation of Islam, which promotes religious violence, the Islamic State (IS) is responsible for numerous barbaric acts to terrorism, most of which have directly targeted tourists. Attacks directed by and/or linked to the Islamic State include, among others, the Paris attacks (November 13, 2015), the Tunisia Beach resort attack (June 26, 2015), which cost an estimated $515 million in lost revenues (Cadavez 2016), and the downing of a Russian passenger jet over Sinai, Egypt (October 31, 2015) which killed 224 tourists who were departing from their vacations from Sharm el Sheikh. The attack outside the popular Red Sea resort had an estimated revenue loss of $843 million in just the first three months following the incident (Kholaif 2015).

Besides terrorist incidents, tourism suffered severely through unanticipated 'Acts of God' and pandemics (for example, SARS), and other incidents, such as War conflicts and economic crises. Notable 21st Century 'Acts of God' include the earthquakes in Chūetsu, Japan (2004), Christchurch, New Zealand (2011), and Nepal (2015), and the devastating tsunamis in the Indian Ocean (2004) and Tōhoku, Japan (2011). With regard to War conflicts, the 21st Century experienced major conflicts in Afghanistan (2001-2014), Iraq (2003-2011), Lebanon (2006), Georgia (2008), and Syria (2011 - present). The extant literature suggests that such unexpected incidents negatively affect the 'economics' of tourism in a multitude of ways, since the pure essence of the industry, unfortunately, makes it a 'probable first casualty' in such eventualities.

Indicatively, Chen et al. (2007) suggest that the Severe Acute Respiratory Syndrome (SARS) epidemic outbreak of 2003 caused an approximate 29% decline in Taiwanese hotel stock prices, whereas the 2004 Indian Ocean tsunami caused the death of 300,000 individuals, including thousands of Western tourists, at an estimated economic cost of $10 billion (Sharpley 2005). Similarly, with regard to War conflicts, Schneider and Troeger (2006) reported an overall negative effect on financial markets, although they do clarify that "…even in an increasingly integrated world economy, not all international crises affect the stock markets in the same way" (p. 642). In terms of financial crises, numerous studies (Chen 2007; Chen, Kim, and Kim 2005) have investigated the impact of macro variables on hotel stock returns, with Brent Ritchie, Molinar and Frechtling (2010) suggesting the enhanced vulnerability of the industry during economic recessions as compared with other economic sectors.

Responding to the urgent need for conceptual clarity, scholars have investigated the relationship between tourism and instability incidents, with an emphasis on terrorism, from an array of different perspectives. Aligned with the characteristics and narrative of each era, scholars have measured the impact and effect of events for the industry (Enders, Sandler, and Parise 1992; Saha and Yap 2014), developed destination-recovery strategies (Blake and Sinclair 2003), proposed destination-image restoration tactics (Avraham 2013), introduced holistic strategic disaster/crises management approaches (Mansfeld 1999), and propounded destination-specific anti-terrorism strategies (Paraskevas and Arendell 2007).

2.2 Non-Macro Incidents and Stock Behavior

Scholars who are investigating the impact of shocks on stock markets classify incidents into macro and non-macro, with the first being more 'popular' in research endeavors. As suggested by Chen (2007, p. 992), macro variables "…generally consist of industrial production growth rate, inflation rate, growth rate of money supply, yield spread, changes in unemployment rate, growth rate of imports and changes in exchange rates." In contrast, non-macro variables encompass, among others, mega-sporting events, financial crises, natural disasters, Wars, and terrorist attacks (Chen 2007; Cheng, Tzeng, and Kang 2011). As noted by a number of scholars (Cheng et al. 2011; Leong and Hui 2014), non-macro incidents can be classified into two distinctive categories, namely expected and unexpected. Expected non-macro incidents include major scheduled events, such as the Olympic Games and Presidential elections, whereas unexpected non-macro incidents include natural disasters, outbreaks of infectious diseases, and terrorist attacks.

The generic business literature, exploring the impact of non-macro incidents associated with terrorism and natural catastrophes on financial markets, has reached a consensus in suggesting the existence of an adverse effect (Arin, Ciferri, and Spagnolo 2008; Charles and Darne 2006; Eldor and Melnick 2004; Nikkinen and Vähämaa 2010). Despite the fact that the negative direction of the relationship is unambiguous, the externalities of the event's magnitude and the post-event recovery period are contested issues. Indicatively, Chesney et al. (2011) suggested that two-thirds of the terrorists' attacks investigated in their study caused a significant negative effect on stock markets. Charles and Darne (2006) argued that the shock, both permanent and temporary, is extensive, whereas Brounrn and Derwall (2010) posited that terrorist attacks produce mildly negative price effects on stock market prices. It is, therefore, prudent to conclude that methodological heterogeneities, the characteristics of the economic sector under investigation, the specificities of the actual event, and the target-destination idiosyncrasies, influence the overall impact, a notion that is supported by Essaddam and Karagianis (2014).

The stock market's recovery period following an incident has also captured the attention of scholars. Overall, research suggests that such incidents cause drastic, but short-term transitory effects on stock markets, especially on the first day, with recovery in most cases occurring within two days (Brounrn and Derwall 2010; Chesney et al. 2011; Drakos 2010). By contrasting the stock behavior following the attacks in Madrid (2004) and London (2005), Kollias, Papadaumou and Stagiannis (2011) suggested that recovery may be affected by both the type of attack, and the promptness and adequacy of the country's institutional responses, an argument that is supported by Aslam and Kang (2015).

Countries whose financial institutions were equipped with informed contingency plans were able to mitigate the negative effects of such incidents (Kollias et al. 2011), with the United Kingdom being a perfect example, following the 2005 London bombings. The same scholars argued that contingency plans, developed in the aftermath of the September 11, 2001 attacks in New York, involving the vast majority of the country's financial stakeholders, helped mitigate the negative effects, thereby ensuring smooth trading in the United Kingdom financial markets. With regard to volatility, the literature suggests a significant increase for up to 15 days following the incident (Drakos 2004; Essaddam and Karagianis 2014), with some suggesting that this effect is larger in emerging markets (Arin et al. 2008).

The incident's specific characteristics have surfaced as a vital element of stock market reaction. Indicatively, Brounrn and Derwall (2010) suggested that terrorism incidents have a greater economic impact, especially on the day of the event, compared with unanticipated natural catastrophes, whereas Chesney et al. (2011) argued that the latter exhibit longer post-event impact due to the delay in measuring their actual catastrophic effects. Moreover, Aslam and Kang (2015) posited that the location, type, intensity (measured by the number of fatalities), and tactics of the attack affect stock market behavior, whereas Essaddam and Karagianis (2014) argued that the geographic location in which the attack occurred influenced its overall impact.

By comparing the attacks in Madrid (2004) and London (2005), Kollias et al. (2011) suggested that London's market was able to rebound faster due to the fact that the attackers were suicide bombers, so that the imminent security danger ceased to exist. From a different perspective, Zussman and Zussman (2006) argued that markets react differently to Israeli's controversial policy of assassinating Palestinian political and military leaders, with the first causing strong negative reactions, while Eldor and Melnick (2004) suggested that Palestinian attacks on transport infrastructure caused a transitory effect on the Tel Aviv Stock Exchange (TASE).

In the tourism arena, a handful of notable studies has been conducted by Ming-Hsiang Chen, mostly in the Chinese, Japanese and Taiwanese business settings. His conceptual reasoning, which revolved around the investigation of macroeconomic and non-macroeconomic variables, particularly hotel performance measurements, profitability, and stock performance (Chen 2007; 2011), was an extension of Barrows and Naka's (1994) seminal work, which investigated the influence of macroeconomic variables on restaurant and hotel stock returns of companies in the USA. Espousing a similar reasoning, Wong and Song (2006) exemplified the dependence of hospitality stock indices in the USA on macroeconomic variables, with interest rates being the most significant. Chen, Agrusa, Krumwiede and Lu (2012) explored the influences on hotel stock returns in Japan, whereas Leong and Hui (2014) investigated pertinent topics in Singapore.

Non-macro incidents has received considerably less attention in the tourism academic community, with a handful of studies narrowly confined in mostly regional investigations, using only few incidents, and mostly with the reasoning of comparing their effects with macro events. The study by Chen et al. (2005) in Taiwan revealed that non-macro events have a significant impact on hotel stock returns, which in most cases was more powerful compared with the effect of the macro-economic variables under investigation, a premise that is also supported by others (see Cheng et al. 2011; Leong and Hui 2014). With regard to non-macro events, Chen et al. (2005) posit that expected incidents positively influence stock returns, whereas unexpected exhibit a more powerful adverse effect. Along the same lines, Chiang and Kee's (2009, p. 11) study in Singapore theorized that unexpected non-macro incidents are "…important determinants of hotel stock returns… (with) much stronger explanatory power in explaining hotel stock returns compared to the macroeconomic variables".

It is important to acknowledge that mixed or inconclusive results pertaining to non-macro investigations have been reported in the literature. Indicatively, Leong and Hui (2014) were unable to support a positive association between expected non-macro events and stock returns, whereas Chen (2007) suggested that an event might have a completely opposite effect on stock returns in different markets due to regional or national characteristics. Apparently, and as supported by Chen (2007), the effects of macro events are more distinct and clear as compared with non-macro events, with the latter being more susceptible to other externalities, thereby necessitating further empirical investigation.

2.3 Econometrics and Pertinent Studies

Econometric modeling has received considerable attention during the past few decades, with applications ranging from forecasting cycles and risk, assessing and analyzing the impact of events, and modeling turning points and directional changes. The diverse nature of research using econometric techniques in the tourism literature has been highlighted by Song and Li (2008), who attempted to expand horizons into new 'uncharted' territories of empirical investigation. Despite the newfound popularity, to the best of our knowledge, no tourism-related study has used econometrics in investigating the effects of non-macro incidents on the industry's stock indices. The vast majority of related studies, which have used econometric techniques extensively in their analysis, are derived from the generic business, finance and economics literature.

Indicatively, Drakos (2010) used pooled panel ARCH to model the effects of terrorism activities on the investor's psychosocial sentiment. Chesney, Reshetarb, and Karamana (2011) used a filtered GARCH–EVT approach to study the impact of incidents on stock behavior. Kollias, Papadaumou and Stagiannis (2011) applied the GARCH model to investigate the effects of two major terrorist incidents that occurred in the European continent. Essaddam and Karagianis (2014) used GARCH to examine the volatility of stock returns following a terrorist event. Peren, Ciferri, and Spagnolo (2008, p. 164) explored the effect of terrorist attacks on financial markets which "…has not received the same level of attention (compared to the short-term effects on major macroeconomic variables)". It is important to note that, despite the methodological similarities, the data used in the studies exhibited heterogeneities such that they restrict any attempts to reach definitive and comprehensive conclusions.

3. Methodology

The primary purpose of the paper is to measure econometrically the effects of unexpected non-macro incidents (for example, Terrorism, 'Acts of God', and War Conflicts[1]) on hospitality/tourism stock indices that are currently trading in international stock markets. In particular, five hospitality/tourism-related stock return indices from different regions, namely FTSE Travel and Leisure World, FTSE Travel and Leisure Asia Pacific, FTSE Travel and Leisure Australia, FTSE Travel and Leisure America, and FTSE Travel and Leisure Europe, were selected for analysis from the Thomson Reuters Datastream at a daily frequency. These five indices (henceforth H/T indices) cover the vast majority of hospitality, tourism, and leisure organizations from around the globe, and so are considered to be ideal for our purposes. Their selection was also based on numerous study-specific criteria, such as the region covered, years of data coverage (going back to 2000), volume and content.

Influenced by the methodological specificities of Brown and Warner's (1985) seminal work, which has subsequently been adopted by others (see Brounrn and Derwall 2010), an event study method was used to examine the reaction of unexpected non-macro incidents to industry-specific stock market indices, rather than on individual company stocks. Industry specific indices summarize stock performance by economic sectors, thereby enabling investors and scholars to benchmark, compare and monitor the overall behavior of a particular segment, especially its reaction to an event or incident. This method was deemed

[1] Despite being considered in the extant literature as unexpected non-macro incidents, financial crises are excluded from the empirical analysis since these events are endogenous shocks on stock markets. It is important to reiterate that the aim of the paper is to examine how exogenous shocks (such as wars and terrorist attacks) affect stock markets.

appropriate since it enables the econometric investigation of the hospitality and tourism market sector reactions, both in terms of stock returns and volatility, during and after an incident, compared with past averages, and facilitates meaningful comparisons among different regions. It is also important to note that the examination of unexpected non-macro incidents on individual company stock returns might be misleading due to undesired firm-specific effects.

A database including one hundred and fifty (150) unexpected non-macro incidents, occurring in the World in the 21st Century (January 2000 until February 2016), was manually compiled from various Internet sources. The incidents, which represent the most important events of the particular time period, were classified into three distinctive categories, namely terrorism acts, 'Acts of God', and War conflicts (day of declaration). With the aim of further dissecting the relationship under investigation, thereby enhancing the existing body of knowledge by providing a more comprehensive view of stock market reaction to such incidents, additional variables were included in the analysis.

In particular, for each incident, data pertaining to its characteristics, namely date, category of the event (Terrorism, 'Acts of God', War conflict), geographic location (country / region), tourist fatalities (number), infrastructure/superstructure involved (tourist related, such as hotels, restaurants, and airports), type of attack (perpetrators killed or apprehended during the attack versus perpetrators that were later apprehended, or are still at large), affiliation of the attack (known terrorist organizations versus Lone Wolf attacks), and media exposure, were collected. It is important to indicate that each incident included in the database had to be verified from at least two independent sources. Note that some variables are not related with all types of incidents (for example, Acts of God).

4. Econometric Models

4.1 Impact of Various Events on Returns and Volatility

As previously stated, the paper investigates the sensitivity of returns and volatility of H/T indices in reaction to 150 study-specific unexpected non-macro incidents. In particular, and following the discussion in the previous section, we investigate whether there is a change in the returns and volatility of five (5) major hospitality and tourism stock market indices of tourism and hospitability after an unexpected non-macro incident.

Subsequently, a time series analysis is used and the GJR specification of Glosten, Jagannathan and Runkle (1993) is used to model the autoregressive daily returns (denoted r_t) augmented by the appropriate random indicator variables and their conditional variance (volatility), denoted h_t (also augmented by appropriate random indicator variables).[2] The GJR specification is an extension of the traditional GARCH model since it accounts for asymmetric (that is, whether negative shocks have a greater impact on conditional volatility than do positive shocks of the same magnitude), but not leverage effects, whereby negative shocks increase conditional volatility and positive shocks decrease conditional volatility (for further detail, see McAleer, 2014).

The returns were modelled by an autoregressive process of order 1 to account for possible autocorrelation:

$$r_t = c + \varphi_1 r_{t-1} + \theta_{j,\tau} d_{j,t,\tau} + u_t \quad (1)$$

and the conditionally heteroskedastic error term, u_t, was assumed to follow the asymmetric process according to the GJR(1,1) specification (see McAleer 2014) [3]:

$$u_t = \sqrt{h_t} e_t , \quad (2)$$

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_{j,\tau} d_{j,t,\tau} . \quad (3)$$

in which the parameters γ_1 and α_1 are strictly positive, while β_1 lies in the range (-1, 1) as a stability condition.

[2] The application of a Multivariate GARCH specification that simultaneously models multiple dependent variables would possibly be a better method. However, due to the different nature of the research question examined, we opted to use the univariate specification. The application of Multivariate GARCH models remains an open question for further research.
[3] As the empirical section reveals, a lag order of 1 of the returns specification and GJR(1,1) are adequate to remove any possible autocorrelation in the returns and to model volatility, respectively.

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Terrorism_t + \theta_2 Terrorism_{t+1} + u_t$$

The innovations, e_t, are assumed to be independently and identically distributed. In order to account for non-normality in the returns shocks, the parameters were estimated by the quasi-maximum likelihood (QML) method.

The variables denoted $d_{j,t,\tau}$ are dummy variables indicating the existence of an event described in the research question j (j=1, 2, …., 7) during period t. It is equal to 1 if there is such an event, and 0 otherwise. The index τ indicates an observation window:

1. Concurrent event period (τ =0) captures the effects of the event on returns and volatility on the same date;
2. A period after the event (τ =1, 2, 3 …) captures the effects of the event on returns and volatility in the following days.[2]
3.

If these dummies are significant, it can be inferred that the events described in the research questions have impacts on returns and/or volatility.

As for the remaining variables, they are explained as follows: In equation (1), the coefficient φ_1 captures the lagged effects of the returns (that is, whether the previous day's returns affect current returns), while in equation (3), the coefficients α_1 and β_1 capture the short-run persistence and contribution to the long-run persistence of shocks to conditional volatility. Finally, the coefficient γ_1 captures the asymmetry in conditional volatility (that is, whether negative shocks have a greater impact on subsequent conditional volatility as compared with positive shocks of the same magnitude).

Specifically, the following seven research questions, together with the corresponding equations tested, are postulated:

RQ1a: Do terrorist attacks have a significant effect on H/T stock indices (that is, returns and volatility)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Terrorism_t + \theta_2 Terrorism_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Terrorism_t + \xi_2 Terrorism_{t+1}.$$

RQ1b: Do ‘Acts of God’ have a significant effect on H/T stock indices (that is, returns and volatility)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 GOD_t + \theta_2 GOD_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 GOD_t + \xi_2 GOD_{t+1}.$$

RQ1c: Do War conflicts (day of declaration) have a significant effect on H/T stock indices (that is, returns and volatility)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 War_t + \theta_2 War_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 War_t + \xi_2 War_{t+1}.$$

RQ2: Does the geographic location of the incident of instability affect H/T stocks (that is, returns and volatility) in regional and/or global financial markets?

$$\begin{aligned} r_t = c + \varphi_1 r_{t-1} + \theta_1 Europe_t + \theta_2 Europe_{t+1} + \theta_3 America_t + \theta_4 America_{t+1} + \\ \theta_5 ASIA_t + \theta_6 ASIA_{t+1} + \theta_7 Australia_t + \theta_8 Australia_{t+1} + \\ \theta_9 Africa_t + \theta_{10} Africa_{t+1} + u_t \end{aligned}$$

and

$$\begin{aligned} h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Europe_t + \xi_2 Europe_{t+1} + \xi_3 America_t + \xi_4 America_{t+1} + \\ \xi_5 ASIA_t + \xi_6 ASIA_{t+1} + \xi_7 Australia_t + \xi_8 Australia_{t+1} + \xi_9 Africa_t + \xi_{10} Africa_{t+1} \end{aligned}$$

RQ3: What is the impact on H/T stocks from incidents causing tourist fatalities? Is there a difference according to the number of fatalities (severity)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Victims_t + \theta_2 Victims_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Victims_t + \xi_2 Victims_{t+1}.$$

RQ4: What is the impact on H/T stocks from incidents involving attacks on tourism infrastructure / superstructure (such as restaurants, hotels, and airports)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Infrastructure_t + \theta_2 Infrastructure_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Infrastructure_t + \xi_2 Infrastructure_{t+1}.$$

RQ5: Does the type of attack [perpetrators killed from suicide attacks or apprehended during the attack, versus perpetrators who were later apprehended or are still at large] influence the effect on H/T stock indices (that is, returns and volatility)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Attack_t + \theta_2 Attack_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Attack_t + \xi_2 Attack_{t+1}.$$

RQ6: Does the affiliation of the attackers (known terrorist organization versus Lone Wolves) influence the effect on H/T stock indices (that is, returns and volatility)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Affiliation_t + \theta_2 Affiliation_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Affiliation_t + \xi_2 Affiliation_{t+1}.$$

RQ7: Does media exposure influence the effect on H/T stock indices (that is, returns and volatility)?

$$r_t = c + \varphi_1 r_{t-1} + \theta_1 Media_t + \theta_2 Media_{t+1} + u_t$$

and

$$h_t = \omega + \gamma_1 e_{t-1}^2 + \alpha_1 e_{t-1}^2 (e_{t-1} < 0) + \beta_1 h_{t-1} + \xi_1 Media_t + \xi_2 Media_{t+1} .$$

5. Empirical Findings

5.1 Descriptive Statistics

The descriptive statistics of the five indices are presented in Table 1. As can be seen, the average return of each index is positive, with America having the highest value, followed by Europe. Uncertainty, as approximated by the standard deviation, varies from 1.18 to 1.55, with America depicting the greatest value, followed again by Europe. The distribution of the returns suggests negative skewness for all indices, while the positive kurtosis implies that returns are leptokurtic. The ARCH test is highly significant, thereby suggesting that second moments are likely to experience time-varying dependencies, for which the use of conditional volatility models would be deemed useful and convenient.

INSERT TABLE 1

5.2 Research Questions 1(a,b,c): Terrorist Attacks, 'Acts of God', and Wars impact on H/T Stock Indices

The first research question investigates whether terrorist attacks have a significant effect on H/T stocks indices, both in terms of returns and volatility (RQ 1a). As shown in Table 2, the results indicate a significant negative impact on H/T stock indices in all regions, except Australia. In all cases, the indices were not affected by the specific event on day *t* (the day of the terrorist attack), but dropped significantly on the following day. In comparison, the next day drop of European indices was considerably larger (-0,360; *p* = 0,007) as compared with the American, Asia Pacific and World indices. With regard to Australia's index, which revealed insignificant results, a plausible explanation may revolve around the country's isolated geographical location and national risk, which makes it generally less vulnerable and susceptible to such shocks.

When investigating the volatility caused by terrorist attacks on H/T stock indices, with the exception of Australia, the results indicate a significant positive impact on the day of the event. Volatility is considerably higher for the European stock index, which continued to record significant increases on the day following the event, while in the Asia/Pacific this dropped the day after the event. In contrast, despite the volatility increases on the day of the event, the World and America indices remained unaffected on the following day.

This behavior may be attributed to the different reactions of each market to specific shocks. Subsequent analysis, using impulse response functions (see the following paragraphs), suggest that both the price drop and volatility increase recovered fully to their pre-event levels within 2 to 3 days following the incident. Therefore, it is prudent to suggest that the overall impact of such shocks is short term[4].

INSERT TABLE 2

With similar reasoning, the paper investigated the impact of 'Acts of God', widely defined as events outside human control, such as tsunami and earthquakes, for which no one can be held responsible (RQ1b). Despite the fact that the findings exhibited an overall similar trend with terrorist attacks, certain differences are noteworthy (see Table 3). Specifically, 'Acts of God' had a significant negative impact on all five H/T stock indices (returns) on the day of the event, which continued on the following day for the World, American and European indices. The overall effect for these indices for both days was identical, whereas the Asia-Pacific and Australian indices exhibited insignificant drops on the day after the incident. With regard to volatility, the findings revealed positive impacts on the day of the event for the Asia-Pacific, European, Australian and American stock indices, with the latter two also exhibiting significant increases on the following day.

INSERT TABLE 3

[4] Statistical power analysis for each test is conducted for all estimates. The power of each test is greater than 80%.

War conflicts (day of declaration) had a much different impact on H/T stock indices compared with terrorism incidents and ‘Acts of God’ (RQ1c). In particular, the findings presented in Table 4 revealed that such incidents had a significant negative effect only on the World stock index (-0,851; p = 0,027) on the day following the War declaration. The findings suggest that the uncertainty surrounding such events (for example, the duration of a War conflict, and anticipated human and material/economic losses) minimize stock market shocks during the first days of the conflict. In contrast, when investigating the volatility caused by such events, the findings portrayed a much different picture since the World, American, and European stock indices exhibited a significant increase on the day after, whereas the European index also experienced a significant increase on the day of the declaration.

INSERT TABLE 4

Additional analysis with the use of the Impulse Response Function in an AR process was conducted to predict the variable’s movements, given its past. This technique illustrates how the variable responds to a shock of a specific magnitude, and how long it takes to return to its original level. The findings shown in Figure 1 suggest that the shock from terrorist incidents (RQ1a) lasts for 2 to 3 trading days, a result that is consistent with the significance of the estimated (event) parameters. It can be inferred that, although the initial shock of such incidents is quite substantial for the first 1-2 days, it dies out in subsequent periods. It is important to note that the results are qualitatively similar for the rest of the estimates pertaining to ‘Acts of God’, and War conflicts (RQ1b and RQ1c - not presented to save space).

INSERT FIGURE 1

5.3 Research Question 2 - Geographic Location of the Incident and H/T Stock Indices

The second research question investigated whether the geographic location in terms of the five regions (Europe, America, Asia/Pacific, Australia, and Africa) of the actual attack impacts the five H/T stock indices. As shown in Table 5, incidents occurring in America (mostly in the USA) had a significant negative impact on the World, Australian and

American H/T stock indices (note the negative effect at $p < 0.10$ for the Asia-Pacific and Europe). Similarly, incidents occurring in Australia had a negative effect, mostly on the following day, on stock indices in Asia-Pacific, Australia and America, whereas European events seem to have a significant effect (negative) only on the European index (-0,399; p = 0,012) on the following day.

Events occurring in Africa and Asia-Pacific did not have any significant effect on any of the five indices. It is apparent that only incidents occurring in America influence negatively all H/T indices. Moreover, the estimated coefficients suggest volatility increases (either on the same day of the shock, or on the following day) when events occur in Europe or America in almost all markets, whereas there are rather sparse spillover effects when events occur in other regions.

INSERT TABLE 5

5.4 Research Question 3 – Tourist Casualties and H/T Stock Indices

The third research question investigated the severity of the event, in terms of both reported tourist fatalities and their volume. The findings, presented in Table 6, unequivocally indicate that incidents with reported tourist fatalities have a significant negative effect in four of the five regional indices (except for the Asia-Pacific) on the day following the event, with the World and Australian indices exhibiting the largest negative impact. In terms of volatility, almost all indices (except Australia) experienced a significant or marginally significant positive impact on the day of the event, with the European index recording the highest effect, both on both the day of the event and on the following day.

INSERT TABLE 6

The second part of the third question examined whether the number of tourist fatalities, a direct reflection of an incident's severity, impacted upon the H/T stock indices. For the empirical analysis, the events were grouped into three distinctive categories, namely events with less than 10 fatalities (VICT10), events with 10 to less than 100 fatalities (VICT_L100), and events with 100 or more casualties (VICT_G100). The findings (see

Table 7) suggested that the higher is the number of tourist fatalities, the higher is the negative impact of these incidents on hospitality and tourism stock indices, especially on the following day. The World, Asia-Pacific, and Australian stock indices exhibited a significant negative effect on the day of an event, which caused 100 or more tourist casualties. On the following day, almost all three categories negatively impacted the indices, with some minor exceptions (for example, events with less than 10 casualties have an insignificant effect on the Asia-Pacific, Australian, American and European indices).

It is important to note that, on average, the impacts of incidents with more than 10 and less than 100 victims were more than double compared with the corresponding impact of incidents with less than 10 victims. Interestingly, the impact of incidents with 100 or more victims was more than three times higher than the corresponding impact of incidents with more than 10 and less than 100 victims. Finally, in terms of volatility, all five stock indices experienced significant positive effects, both on the day of the event, and on the following day, with the Asia-Pacific and European indices being more vulnerable to such events.

INSERT TABLE 7

5.5 Research Question 4: Attacks on Tourism Infrastructure / Superstructure and H/T Stock Indices

Historically, the industry's infrastructure/superstructure (such as airports, hotels, restaurants, and leisure venues) have been ideal targets. Nevertheless, the actual impact of such attacks on H/T stock indices has received limited scholarly attention. The findings (see Table 8) suggest that attacks on tourism infrastructure cause a significant negative impact on most indices (except for the Asia-Pacific), mostly on the day following the event. The European index seems the most susceptible to such attacks, especially on the following day (-0,581; p = 0,001), a trend that is also evident with regard to volatility. Such attacks caused a significant positive impact on the corresponding uncertainty of these markets in all regions, again with the European and Asia-Pacific indices recording the highest volatility increases.

INSERT TABLE 8

5.6 Research Question 5: Type of Attack and H/T Stock Indices

The fifth research question explored whether the type of attack influences H/T stock indices. For this purpose, attacks were classified into two distinct categories according to the perpetrators' fate, namely killed or apprehended during the attack (such as suicide bombers), and perpetrators who were later apprehended or were still at large. The results, shown in Table 9, indicate that the type of attack was relevant only for the European index, with a significant negative impact on the following day of the event (-0,380; p = 0,005). It is apparent that the type of attack has no direct impact on the other regions' indices, whereas a significant positive impact on stock market uncertainty is revealed in the World (on the day of the attack), Asia-Pacific and European indices, again with the latter recording the highest increase for both days.

INSERT TABLE 9

5.7 Research Question 6: Affiliation of the Attackers and H/T Stock Indices

The recent literature (Aslam and Kang 2015) suggests that the specificities of a terrorist attack influence its overall impact on financial markets. In order to explore this argument further, the affiliation of the attackers, classified into known terrorist organizations (such as Al-Qaeda) and Lone Wolves, was examined. A Lone Wolf is defined as an individual who commits an act of violence alone without any logistical support from an organized group, despite the fact that they may espouse a radical ideology (for example, the 2015 Copenhagen shootings). The findings, presented in Table 10, suggest that the attackers' affiliation is not relevant to any of the five indices under consideration, as no significant changes are recorded. In contrast, when investigating a market's volatility, significant positive increases are revealed for both the Asia-Pacific and European indices, both on the day of the event and on the following day.

INSERT TABLE 10

5.8 Research Question 7: Media Exposure and H/T Stock Indices

The final research question examined whether post-event media coverage impacts on H/T stock indices, both in terms of returns and volatility. Each event's media coverage and exposure was classified as either High/Global or Low/Regional, based on information received from various Internet sources. The subjective nature of this exercise is dutifully acknowledged, so that the results are presented for illustrative purposes. The findings (see Table 11) indicated that media exposure had a significant negative impact on the four indices (except for the Asia-Pacific), mostly on the day following the incident. With regard to market uncertainty (volatility), all five indices experienced a significant increase, mostly on the day following the event, with the European index seen as the most susceptible to such an effect.

INSERT TABLE 11

5.9 Half-life Volatility Shocks

In an attempt to further investigate the volatility shock persistence for each of the seven research questions, the half-life method, defined as $ln(0.5)/ ln(a^2 + b^2)$, which measures the period of time (or number of days) it takes for the shock's impact to decrease by one-half, was used. The particular technique has been used by numerous scholars (see, for example, Lamoureux and Lastrapes 1990) for dissecting the behavior of volatility after a particular incident. The findings, presented in Table 12, suggest that volatility shocks, similar to returns, appear to be largely transitory in nature, with half-life estimates being around 4 to 5 days for most events. Noteworthy differences do exist, both between the five indices under consideration, particularly regarding the Asia-Pacific index, and according to the characteristics of the incidents.

INSERT TABLE 12

6. Discussion and Implications

Aligned with existing generic business literature (Brounrn and Derwall 2010; Chesney et al. 2011; Drakos 2010), the findings suggest that unexpected non-macro incidents caused a short-term transitory effect on H/T stock indices, with recovery occurring within two to three days. As revealed, noteworthy differences exist according to the incident type, with terrorist attacks recording statistically the most significant drops, especially on the day following the event, and 'Acts of God' exhibiting drops on the day of the incident. In contrast, Wars had an insignificant effect on four of the five study-specific indices (except for the World index).

The specificities of each event were explored with the use of a number of variables, such as geographic location, severity, specific target, type of the attack, perpetrators' affiliation, and post-event media exposure and coverage, in order to provide a more holistic overview of their effect. The literature (see Aslam and Kang 2015; Chesney, Reshetarb, and Karamana 2011; Essaddam and Karagianis 2014) suggests that the characteristics of each incident influence its overall impact on both stock market returns and volatility. Thus, an enhanced understanding of these parameter estimates would most certainly assist stakeholders in predicting the financial consequences of an incident, as well as instigating recovery initiatives. The findings suggest that only incidents occurring in the USA have a global impact on almost all indices, whereas other incidents mostly affect regional stock markets. In terms of severity (referred to in some studies as the intensity of the incident), the findings indicate that events resulting in tourist casualties have a significant negative impact on all five indices, whereas this impact was exponentially higher for incidents with more than 100 fatalities.

Incidents involving attacks on tourism infrastructure and superstructure had a significant negative effect on the World, European and American indices, mostly on the day following the event. This tends to support Brounrn and Derwall's (2010) argument that industries that are directly affected, or are involved in the attack, experience considerably stronger effects. The type of terrorist attack was also investigated, with research (see Eldor and Melnick 2004; Kollias et al. 2011) suggesting a number of different scenarios. For instance, Kollias et al. (2011) argued that stock behavior and the subsequent recovery period may be affected by the type of the attack, with London (2004) presented as an example of a single day recovery due to the incident's nature (suicide bombings), compared with the Madrid attacks in 2005 (where the perpetrators were apprehended a few days later). These empirical findings suggest that the European index is significantly more susceptible to this type of attack, both in terms of returns and volatility.

The affiliation of the perpetrators was investigated, with the reasoning being that attacks conducted by known terrorist groups will have a longer lasting impact as compared with Lone Wolf incidents. The findings fail to confirm this argument as no significant changes were recorded in any of the five indices. In contrast, market uncertainty is significantly higher for both the Asia-Pacific and the European indices, thereby suggesting that both regions are more vulnerable if the perpetrators' affiliation is a well-known terrorist group. Finally, and as expected, the sustained effects of media coverage, a pragmatic reality when incidents cause international tourists fatalities, influences the event's overall impact, both on returns and volatility.

With minor exceptions, volatility exhibits similar reactions to returns. The half-life volatility shock persistence estimates revealed some noteworthy differences, especially between the Asia-Pacific and the other indices. Nevertheless, in comparison with the existing literature, this paper was unable to provide evidence to support claims that, following a particular incident, volatility will be significantly increased for up to 15 days (as suggested by Essaddam and Karagianis 2014), or that 'Acts of God' increase uncertainty more, as compared with other incidents, due to the observed post-event negative impact (as noted by Chesney et al. 2011). It would be prudent to encourage further empirical investigation in volatility persistence following such incidents.

6.1 Implications for the Hospitality and Tourism Industry

Sustainable tourism development requires private initiatives and optimum financial and investment practices, all of which can be severely disrupted by unexpected non-macro incidents. De Sausmarez (2007, p. 701) suggested that such incidents "…jeopardize (tourism) development not only by the damage they inflict but also by their unpredictability", whereas Nikkinen and Vähämaa (2010) highlight their adverse effect on stock market's sentiment, and hence the behavior of individual stock investors. This paper provides a more thorough overview of stock market reactions to such eventualities, thereby providing comprehensive information that is of substantial value to industry stakeholders.

The capability of financial institutions to predict both the likelihood and probable consequences of unexpected non-macro incidents is crucial in today's business environment. With the use of an appropriate econometric methodology, this paper enhanced our conceptual knowledge as to how the characteristics of each incident (such as type, location, severity, and affiliation) affect stock market reactions and behavior, particularly those of the five study-specific H/T stock indices. Overall, our findings exhibited some similarities with previous studies that investigated pertinent topics in generic business indices (see Brounrn and Derwall 2010; Nikkinen and Vähämaa 2010). Nevertheless, noteworthy implications are of interest to individual investors who are contemplating H/T stock investments, financial institutions, local authorities, tourism-service providers (for example, tour operators), and industry operators.

In particular, the findings revealed that the negative impact of non-macro incidents on H/T stock indices (returns) is short lived and does not last more than 2-3 days. With the exception of cataclysmic events, such as the September 11, 2001 attacks in New York, or the 2004 Indian Ocean earthquake and tsunami, which had an unprecedented psychological impact on financial markets caused by the nature, magnitude, and severity of the incident (Drakos 2004), financial markets appeared to be efficient and resilient in absorbing the initial shock of such incidents. It is apparent that recent past experiences have ‘forced’ the industry to create its own ‘antibodies’ in order to self-protect and immune itself to such eventualities. A contributing factor was the fact that, following the aftermath of the September 11, 2001 attacks, the majority of financial markets, especially those operating in developed countries, undertook drastic measures in enhancing their contingency plans and crisis management responses in order to mitigate their exposure and vulnerability to such eventualities (Kollias et al. 2011).

In contrast to stock returns, market uncertainty (volatility) is still a contested topic that is worthy of further investigation. Note that for investors, high market volatility will severely limit the well-established benefits of portfolio diversification, an ideal investment practice for the global tourism industry, especially at the international level (Lee, Wu, and Wang 2007; McAleer 2015). Moreover, this short-term transient effect seems to be inconsistent with some recent calls (see Chesney et al. 2011) to avoid investing in hospitality and tourism related stocks due to terrorist-related incidents.

The profile of the incident and its geographic location may assist financial institutions in better quantifying their risk exposure. For tourism, incidents occurring in developed countries (mostly in Europe and the USA) that cause tourist fatalities, involve the industry’s infrastructure and superstructure and, logically, generate extensive media coverage, thereby influencing individuals’ psycho-social state, require immediate attention as they can have a significant impact on markets. In contrast, terrorist incidents occurring in Africa, a troublesome geostrategic region with numerous ‘active’ conflict zones (for example, Somalia, Yemen, and Libya, among others) have an insignificant effect on the study-specific indices.

At the destination level, the findings have implications for tourism policymakers who are striving to mitigate the negative impact from such events. Depending on the type, impact, severity, and location of the incident, stakeholders may undertake specific measures that minimize their risk exposure and safeguard the sustainability of their industry. The development of pre- and post-event strategies, and the adoption of specific measures by the destination’s highest institutions, both political and financial (such as Government, Central Bank, Local Authorities, and Regional Stock Markets), will enhance the confidence and trust of current and potential investors, and safeguard the industry’s financial interests. Furthermore, tourism organizations may undertake pro-active strategic market diversification initiatives, which may encourage, for example, the promotion of domestic tourism at destinations that are overly dependent on international markets, thereby minimizing their susceptibility to unexpected incidents, such as terrorism.

For the past decade or more, numerous scholars (see, for example, Chan, Lim, and McAleer 2005; Paraskevas, Altinay, McLean, and Cooper 2013) have argued that the severity of instability incidents and their associated economic ramifications of conducting day-to-day business (Chen and Siems 2004), necessitate industry-specific research that expands the collective conceptual capital in metrics and controls, both of which are essential in managing knowledge in tourism crises. This novel investigation provides an insightful view into the behavior and reaction of industry specific stock indices, at five different regions, following unexpected non-macro incidents.

Moreover, the inclusion of additional variables portraying the characteristics of each incident provides a more holistic overview of this relationship, and highlights numerous topics that are worthy of further empirical investigation. Possible topics include the conceptualization and development of an advanced model of predicting H/T stock behavior following a particular incident, and the investigation of the indirect and systemic effects of unexpected non-macro incidents, effects that cannot be reflected in the next day’s stock market prices and returns. Finally, the authors acknowledge that the use of the manually compiled list of 150 incidents may be scrutinized by some, which would be a most welcome initiative.

Endnotes

[1] The innovations, e_t , are assumed to be independently and identically distributed. In order to account for non-normality in the returns shocks, the parameters were estimated by quasi-maximum likelihood (QML).

[2] In practice, only the day after the event has an effect on either returns or volatility, so that in estimation we used only τ =0 and τ =1.

References

Arin, K. P., D. Ciferri, and N. Spagnolo. 2008. “The price of terror: The effects of terrorism on stock market returns and volatility.” Economics Letters 101 (3): 164-67.

Aslam, F., and H. G. Kang. 2015. “How different terrorist attacks affect stock markets.” Defence and Peace Economics 26 (6): 634–48.

Avraham, E. 2013. “Crisis communication, image restoration, and battling stereotypes of terror and wars: Media strategies for attracting tourism to Middle Eastern countries.” American Behavioral Scientist 57 (9): 1350–367.

Barrows, C. W., and A. Naka. 1994. “Use of macroeconomic variables to evaluate selected hospitality stock returns in the U.S.” International Journal of Hospitality Management 13 (2): 119–28.

Blake, A., and T, Sinclair. 2003. “Tourism crisis management: US response to September 11”. Annals of Tourism Research 30 (4): 813–32.

Brent Ritchie, J. R., C. M. A. Molinar, and D. C. Frechtling. 2010. “Impacts of the World recession and economic crisis on tourism: North America”. Journal of Travel Research 49 (1): 5–15.

Brown, S. J., and J. B. Warner. (1985). “Using daily stock returns; the case of event studies”. Journal of Financial Economics 14: 3–31.

Brounrn, D., and J. Derwall. 2010. “The impact of terrorist attacks on international stock markets”. European Financial Management 16 (4): 585-98.

Cadavez, C. 2016. “Tourism and terrorism: Protecting paradise”. Aviation Security International 22 (1): 28-30.

Chan, F., C. Lim, and M. McAleer. 2005. “Modelling multivariate international tourism demand and volatility”. Tourism Management 26: 459–71.

Charles, A., and O. Darne. 2006. “Shocks and the September 11th terrorist attacks on international stock markets”. Economic Modelling 23 (4): 683-98.

Chen, A. H., and T. F. Siems. 2004. “The effects of terrorism on global capital markets”. European Journal of Political Economy 20 (2): 349–66.

Chen, M. H. 2007. “Macro and non-macro explanatory factors of Chinese hotel stock returns”. International Journal of Hospitality Management 26 (4): 991–1004.

Chen, M. H. 2011. “The response of hotel performance to international tourism development and crisis events”. International Journal of Hospitality Management 30 (1): 200-12.

Chen, M. H., J. Agrusa, D. Krumwiede, and H. J. Lu. 2012. “Macroeconomic influences on Japanese hotel stock returns”. Journal of Hospitality Marketing and Management 21 (1): 81-99.

Chen, M. H., S. C. 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): 200-12.

Chen, M. H., W. G. Kim, and H. J. Kim. 2005. “The impact of macroeconomic and non-macroeconomic forces on hotel stock returns”. International Journal of Hospitality Management 24 (2): 243-58.

Cheng, C. M., Z. C. Tzeng, and W. L. Kang. 2011. “The impact of non-macroeconomic events on Taiwan electronic industry stock index returns”. Global Economy and Finance Journal 4 (1): 80-101.

Chesney, M., G. Reshetarb, and M. Karaman. 2011. “The impact of terrorism on financial markets: an empirical study”. Journal of Banking and Finance 35 (2): 253-67.

Chiang, L. C., and K. T. Kee. 2009. “Macroeconomic and non-macroeconomic variables link to Singapore hotel stock returns”. Proceedings of the Oxford Business and Economics

Conference Program, June 24-26, 2009, pp. 1-12. Oxford, UK: St. Hugh's College, Oxford University.

De Sausmarez, N. 2007. "Crisis management, tourism and sustainability: The role of indicators". Journal of Sustainable Tourism 15 (6): 700-14.

Drakos, K. 2004. "Terrorism-induced structural shifts in financial risk: Airline stocks in the aftermath of the September 11th terror attacks". European Journal of Political Economy 20 (2): 435-46.

Drakos, K. 2010. "Terrorism activity, investor sentiment, and stock returns". Review of Financial Economics 19 (3): 128–35.

Drakos, K., and A. Kutan. 2003. "Regional effects of terrorism on tourism in three Mediterranean countries". Journal of Conflict Resolution 47 (5): 621–41.

Eldor, R., and R. Melnick. 2004. "Financial markets and terrorism". European Journal of Political Economy 20 (2): 367–86.

Enders, W., and T. Sandler. 2012. The Political Economy of Terrorism. Cambridge: Cambridge University Press.

Enders, W., T. Sandler, and G. F. Parise. 1992. "An econometric analysis of the impact of terrorism on tourism". Kyklos 45 (4): 531–54.

Essaddam, N., and J. M. Karagianis. 2014. "Terrorism, country attributes, and the volatility of stock returns". Research in International Business and Finance 31: 87-100.

Glosten, L. R., R. Jagannathan, and D. E. Runkle. 1993. "On the relation between the expected value and volatility of nominal excess return on stocks". Journal of Finance 48 (5): 1779–801.

Goodrich, J. N. 2002. "September 11, 2001 attack on America: A record of the immediate impacts and reactions in the USA travel and tourism industry". Tourism Management 23: 573–80.

Hobbs, J., L. C. Schaupp, and J. Gingrich. 2016. “Terrorism, militarism, and stock returns”. Journal of Financial Crime 23 (1): 70-86.

Johnston, R. B., and O. M. Nedelescu. 2006. “The impact of terrorism on financial markets”. Journal of Financial Crime 13 (1): 7-25.

Kholaif, D. 2015. “Sharm El Sheikh Resorts Deserted as Tourists Stay Away”. The Wall Street Journal, December 3. http://www.wsj.com/articles/sharm-el-sheikh-resorts-deserted-as-tourists-stay-away-1449157831

Kollias, C., S. Papadaumou, and A. Stagiannis. 2011. “Terrorism and capital markets: the effects of the Madrid and London bomb attacks”. International Review of Economics and Finance 20 (4): 532–41.

Lamoureux, C., and W. Lastrapes. 1990. “Persistence in variance, structural change and the GARCH model”. Journal of Business and Economic Statistics 8: 225-34.

Lee, H. Y., H. C. Wu, and Y. J. Wang, 2007. “Contagion effect in financial markets after the South-East Asia Tsunami”. Research in International Business and Finance 21: 281-96.

Leong, C. C., and T. K. Hui. 2014. “Macroeconomic and Non-macroeconomic Variables Linking to Singapore Hotel Stock Returns”. In Advances in Hospitality and Leisure edited by J. S. Chen, 21–36. United Kingdom: Emerald Group Publishing Limited.

Mansfeld, Y. 1999. “Cycles of war, terror, and peace: Determinants and management of crisis and recovery of the Israeli tourism industry”. Journal of Travel Research 38 (1): 30–36.

Mao, Z., and Z. Gu. 2007. “Risk-adjusted stock performance: A cross-sector analysis of hospitality firms in the recent economic downturn”. International Journal of Hospitality and Tourism Administration 8 (4): 77-98.

McAleer, M. 2014. “Asymmetry and leverage in conditional volatility models”. Econometrics 2 (3): 145–50.

McAleer, M. 2015. “The fundamental equation in tourism finance”. Journal of Risk and Financial Management 8 (4): 369–74.

Nikkinen, J., and S. Vähämaa. 2010. “Terrorism and stock market sentiment”. Financial Review 45 (2): 263-75.

Paraskevas, A., and B. Arendell. 2007. “A strategic framework for terrorism prevention and mitigation in tourism destinations”. Tourism Management 28 (6): 1560–73.

Paraskevas, A., L. Altinay, J. McLean, and C. Cooper. 2013. “Crisis knowledge in tourism: Types, flows and governance”. Annals of Tourism Research 41: 130–52.

Peren, A. K., D. Ciferri, and N. Spagnolo. 2008. “The price of terror: The effects of terrorism on stock market returns and volatility”. Economic Letters 101 (3): 164–67.

Saha, S., and G. Yap. 2014. “The moderation effects of political instability and terrorism on tourism development: A cross-country panel analysis”. Journal of Travel Research 53 (4): 509–21.

Schneider, G., and V. E. Troeger. 2006. “War and the world economy.” Journal of Conflict Resolution 50 (5): 623-45.

Sharpley, R. 2005. “The tsunami and tourism: A comment”. Current Issues in Tourism 8: 344–49.

Smout, A. 2016. Travel Shares Fall After Explosions in Brussels. REUTERS, March 22. http://www.reuters.com/article/us-belgium-blast-stocks-idUSKCN0WO0PF

Song, H., and G. Li. 2008. “Tourism demand modelling and forecasting - A review of recent research”. Tourism Management 29 (2): 203–20.

Sönmez, S. 1998. “Tourism, terrorism and political instability”. Annals of Tourism Research 25 (2): 416–56.

Theocharous, A. L. (2010). “A contextual typology for the study of the relationship between political instability and tourism”. International Journal of Tourism Policy 3 (4): 354–63.

Wearden, G., and K. Allen. 2015. Billions Wiped off European Travel Shares after Paris Attacks. *The Guardian*. November 16. http://www.theguardian.com/business/2015/nov/16/billions-wiped-off-european-travel-shares-after-paris-attacks

Wong, K. K. F., and H. Song. 2006. "Do macroeconomic variables contain any useful information for predicting changes in hospitality stock indices?" Journal of Hospitality and Tourism Research 30 (1): 16-33.

Zheng, T., J. Farrish, and M. Kitterlin. 2016. "Performance trends of hotels and casino hotels through the recession: An ARIMA with intervention analysis of stock indices". Journal of Hospitality Marketing and Management 25 (1): 49-68.

Zussman, A., and N. Zussman. 2006. "Assassinations: Evaluating the effectiveness of an Israeli counterterrorism policy using stock market data". Journal of Economic Perspectives 20 (2): 193-206.

Table 1. Descriptive Statistics

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Mean	0.015	0.003	0.007	0.022	0.016
Std. Dev.	1.189	1.238	1.181	1.549	1.494
Skewness	-0.229	-0.316	-0.390	-0.155	-0.177
Kurtosis	13.346	8.908	7.397	11.212	8.160
ARCH test	21.164	38.629	41.554	19.183	33.412
	(0)	(0)	0)	(0)	(0)
Observations	4219	4219	4219	4219	4219

Table 2. Terrorism Incidents and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,030	0,024	0,046	0,039	0,040
	(0,040*)	(0,180)	(0,050*)	(0,091)	(0,426)
FTSE(-1)	0,096	0,003	0,017	-0,010	0,055
(p value)	(0,002**)	(0,929)	(0,471)	(0,502)	(0,027*)
TERRORISM	0,022	-0,105	-0,127	-0,069	-0,126
(p value)	(0,899)	(0,645)	(0,297)	(0,587)	(0,258)
TERRORISM(1)	-0,131	-0,301	-0,195	-0,202	-0,360
(p value)	(0,017*)	(0,049*)	(0,128)	(0,034*)	(0,007**)
Results - Variance					
C	0,012	0,023	0,028	0,027	1,300
	(0,007**)	(0,002**)	(0,007**)	(0,001**)	(0,005**)
RESID(-1)^2	0,019	0,044	0,033	0,021	0,072
RESID(-1)^2*(RESID(-1)<0)	0,079	0,048	0,066	0,094	0,011
GARCH(-1)	0,939	0,925	0,930	0,941	0,588
TERRORISM	0,214	0,516	-0,009	0,227	0,836
(p value)	(0,014*)	(0,004**)	(0,935)	(0,054)	(0,009**)
TERRORISM(1)	-0,071	-0,306	0,130	-0,009	1,461
(p value)	(0,280)	(0,004**)	(0,584)	(0,946)	(0,006**)

Note: * p <0.05; **p < 0.01

Table 3. 'Acts of God' and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,033	0,030	0,005	0,030	0,028
	(0,058)	(0,170)	(1,008)	(0,171)	(0,091)
FTSE(-1)	0,096	-0,003	0,025	-0,005	0,053
(p value)	(0,001**)	(0,821)	(0,482)	(0,548)	(0,004**)
GOD	-1,285	-0,990	-0,168	-1,167	-1,183
(p value)	(0,012*)	(0,026*)	(0,044*)	(0,013*)	(0,031*)
GOD(1)	-1,072	-0,725	-0,159	-1,290	-1,048
(p value)	(0,017*)	(0,077)	(0,672)	(0,018*)	(0,044*)
Results - Variance					
C	0,013	0,018	1,859	0,024	0,029
	(0,009**)	(0,008**)	(0,002**)	(0,009**)	0,009
RESID(-1)^2	0,019	0,047	-0,030	0,015	0,029
RESID(-1)^2*(RESID(-1)<0)	0,081	0,051	0,099	0,098	0,121
GARCH(-1)	0,945	0,922	0,567	0,933	0,913
GOD	-0,356	1,192	2,745	2,007	1,085
(p value)	(0,851)	(0,020*)	(0,005**)	(0,011*)	(0,014*)
GOD(1)	0,615	-0,538	2,752	2,130	-1,054
(p value)	(0,757)	(0,486)	(0,066)	(0,013*)	(0,002**)

Note: * $p < 0.05$; ** $p < 0.01$

Table 4. Wars and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,041	0,026	0,029	0,021	0,039
	(0,025*)	(0,202)	(0,282)	(0,329)	(0,067)
FTSE(-1)	0,098	0,006	0,011	-0,006	0,047
(p value)	(0,007**)	(0,914)	(0,914)	(0,664)	(0,025*)
WAR	0,474	0,419	-0,456	1,465	0,191
(p value)	(0,783)	(0,468)	(0,584)	(0,324)	(0,795)
WAR(1)	-0,851	-1,015	0,438	-1,119	0,288
(p value)	(0,027*)	(0,109)	(0,713)	(0,229)	(0,823)
Results - Variance					
C	0,188	0,018	0,585	0,142	0,032
	(0,002**)	(0,002**)	(0,007**)	(0,003**)	(0,008**)
RESID(-1)^2	0,091	0,047	0,186	0,108	0,024
RESID(-1)^2*(RESID(-1)<0)	0,419	0,051	0,275	0,244	0,121
GARCH(-1)	0,614	0,918	0,434	0,753	0,912
WAR	9,965	0,120	-1,032	9,995	2,078
(p value)	(0,058)	(0,958)	(0,246)	(0,083)	(0,050*)
WAR(1)	-0,728	-0,002	-0,092	-1,950	-0,880
(p value)	(0,010*)	(1,002)	(0,833)	(0,004**)	(0,004**)

Note: * p <0.05; **p < 0.01

Figure 1. Impulse Response Function

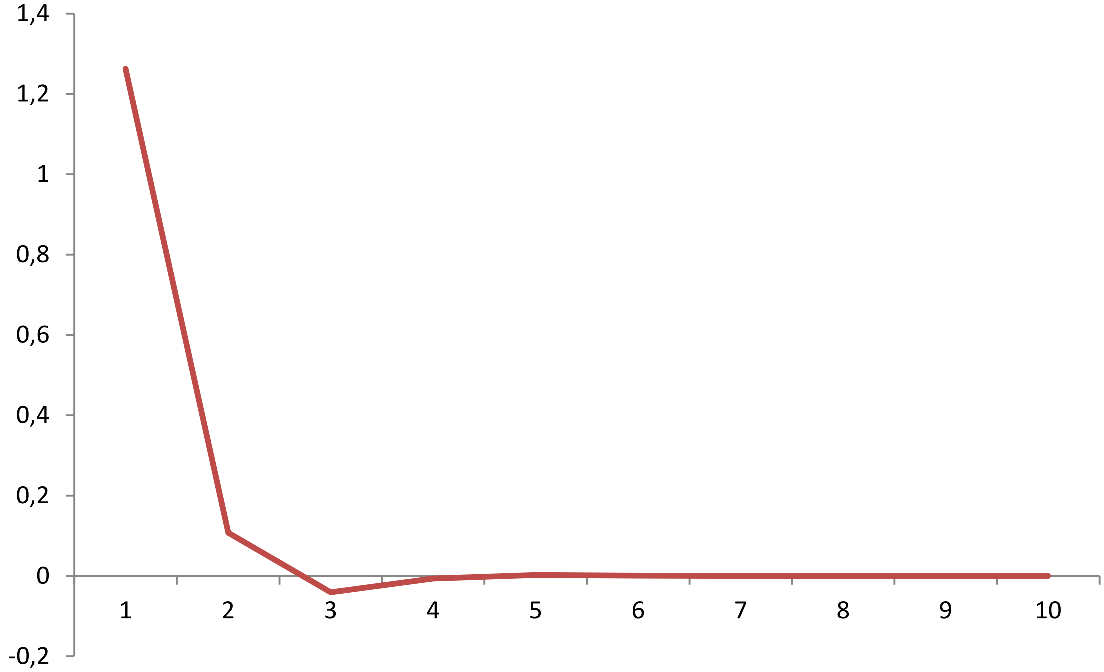

Table 5. Geographic Location and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
FTSE(-1)	0,096	0,008	0,012	-0,016	0,054
(p value)	(0,007**)	(0,832)	(0,660)	(0,375)	(0,051)
EUROPE	-0,022	0,127	0,061	0,011	-0,117
(p value)	(0,906)	(0,527)	(0,833)	(0,973)	(0,055)
EUROPE(1)	-0,540	-0,306	-0,082	0,005	-0,399
(p value)	(0,070)	(0,253)	(0,747)	(0,987)	(0,012*)
AMERICA	-0,480	-0,889	-0,512	-0,820	-0,108
(p value)	(0,014*)	(0,063)	(0,043*)	(0,034*)	(0,785)
AMERICA(1)	-0,468	-0,235	-0,416	-0,575	-0,363
(p value)	(0,014*)	(0,645)	(0,014*)	(0,012*)	(0,067)
ASIA	-0,259	-0,234	-0,455	-0,088	-0,020
(p value)	(0,178)	(0,143)	(0,137)	(0,764)	(0,904)
ASIA(1)	0,280	0,209	-0,009	0,108	-0,138
(p value)	(0,558)	(0,517)	(0,983)	(0,598)	(0,673)
AUSTRALIA	-1,475	-0,700	-0,341	-1,813	-0,443
(p value)	(0,764)	(0,876)	(0,650)	(0,288)	(0,396)
AUSTRALIA(1)	-1,702	-0,756	-1,882	-3,101	-1,069
(p value)	(0,638)	(0,046*)	(0,036*)	(0,007**)	(0,065)
AFRICA	0,027	-0,120	-0,112	0,065	-0,017
(p value)	(0,925)	(0,508)	(0,580)	(0,676)	(0,887)
AFRICA(1)	-0,026	0,045	-0,107	-0,049	-0,365
(p value)	(0,903)	(0,862)	(0,727)	(0,725)	(0,188)
Results - Variance					
C	1,172	1,255	1,335	0,568	1,396
	(0,001**)	(0,000**)	(0,005**)	(0,008**)	(0,009**)
RESID(-1)^2	0,035	0,046	0,038	0,144	0,071
RESID(-1)^2*(RESID(-1)<0)	0,060	0,030	0,034	0,213	0,011
GARCH(-1)	0,577	0,588	0,577	0,581	0,588
EUROPE	0,697	0,956	0,951	0,082	0,870
(p value)	(0,057)	(0,007**)	(0,466)	(0,879)	(0,017*)
EUROPE(1)	1,005	1,275	1,278	0,154	1,205
(p value)	(0,016*)	(0,004**)	(0,223)	(0,793)	(0,001**)
AMERICA	2,009	0,515	0,520	1,558	1,646
(p value)	(0,019*)	(0,482)	(0,757)	(0,056)	(0,020*)
AMERICA(1)	2,635	2,669	2,677	0,304	2,263
(p value)	(0,005**)	(0,006**)	(0,002**)	(0,098)	(0,025*)
ASIA	0,965	1,460	1,461	1,442	1,219
(p value)	(0,088)	(0,006**)	(0,713)	(0,021*)	(0,012*)
ASIA(1)	0,627	0,781	0,789	0,943	0,744
(p value)	(0,494)	(0,134)	(0,442)	(0,007**)	(0,201)
AUSTRALIA	0,231	0,275	0,273	0,701	0,014

(p value)	(0,988)	(0,884)	(0,553)	(0,605)	(0,998)
AUSTRALIA(1)	2,256	2,691	2,695	1,365	3,542
(p value)	(0,921)	(0,214)	(0,012*)	(0,640)	(0,008**)
AFRICA	1,106	1,158	1,156	0,605	0,117
(p value)	(0,001**)	(0,004**)	(0,011*)	(0,110)	(0,122)
AFRICA(1)	0,737	1,007	1,004	0,415	0,138
(p value)	(0,037*)	(0,009**)	(0,130)	(0,208)	(0,127)

Note: * $p < 0.05$; ** $p < 0.01$

Table 6. H/T Stock Indices and Tourist Fatalities

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,030	0,010	0,035	0,026	0,030
	(0,027*)	(0,175)	(0,051)	(0,086)	(0,025*)
FTSE(-1)	0,086	-0,006	0,011	-0,011	0,031
(p value)	(0,005**)	(0,885)	(0,454)	(0,514)	(0,016*)
Tourist Victims	0,055	-0,061	-0,097	-0,029	0,035
(p value)	(0,675)	(0,630)	(0,581)	(0,871)	0,819
Tourist Victims(1)	-0,308	-0,200	-0,309	-0,434	-0,723
(p value)	(0,007**)	(0,074)	(0,005**)	(0,019*)	(0,019*)
Results - Variance					
C	0,000	0,014	0,022	0,014	0,012
	(0,003**)	(0,009**)	(0,003**)	(0,008**)	(0,005**)
RESID(-1)^2	0,009	0,042	0,018	0,002	0,001
RESID(-1)^2*(RESID(-1)<0)	0,073	0,044	0,058	0,088	0,096
GARCH(-1)	0,932	0,915	0,924	0,932	0,921
Tourist Victims	0,144	0,346	0,059	0,144	1,695
(p value)	(0,011*)	(0,005**)	(0,079)	(0,046*)	(0,001**)
Tourist Victims(1)	0,017	-0,163	0,088	0,112	2,105
(p value)	(0,832)	(0,180)	(0,737)	(0,059)	(0,002**)

Note: * p <0.05; **p < 0.01

Table 7. Severity (*number of tourist casualties*) and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,032	-0,004	0,045	0,033	0,013
	(0,027*)	(0,979)	(0,021*)	(0,071)	(0,558)
FTSE(-1)	0,085	-0,004	0,004	-0,019	0,040
(p value)	(0,001**)	(0,847)	(0,517)	(0,492)	(0,038*)
VICT10	0,031	-0,304	-0,127	-0,056	0,088
(p value)	(0,900)	(0,028*)	(0,059)	(0,776)	(0,781)
VICT_L100	0,023	0,000	-0,206	-0,051	-0,031
(p value)	(0,836)	(0,988)	(0,026*)	(0,802)	(0,798)
VICT_G100	-0,195	-0,539	-0,247	-0,089	0,015
(p value)	(0,035*)	(0,009**)	(0,049*)	(0,690)	(0,969)
VICT10(1)	-0,122	-0,111	0,001	-0,353	-0,173
(p value)	(0,026*)	(0,068)	(0,966)	(0,102)	(0,065)
VICT_L100(1)	-0,208	-0,248	-0,205	-0,451	-0,416
(p value)	(0,099)	(0,019*)	(0,030*)	(0,083)	(0,002**)
VICT_G100(1)	-0,646	-0,512	-0,634	-0,709	-0,465
(p value)	(0,003**)	(0,020*)	(0,013*)	(0,058)	(0,001**)
Results - Variance					
C	0,005	1,150	0,020	0,023	0,866
	(0,009**)	(0,009**)	(0,005**)	(0,002**)	(0,004**)
RESID(-1)^2	0,008	0,052	0,019	0,019	0,049
RESID(-1)^2*(RESID(-1)<0)	0,085	0,045	0,051	0,099	0,119
GARCH(-1)	0,942	0,572	0,921	0,934	0,574
VICT10	0,287	0,636	0,554	0,182	1,159
(p value)	(0,005**)	(0,034*)	(0,016*)	(0,028*)	(0,042*)
VICT_L100	0,279	0,807	0,070	0,531	0,639
(p value)	(0,024*)	(0,004**)	(0,841)	(0,014*)	(0,010*)
VICT_G100	0,206	1,350	0,791	0,583	1,279
(p value)	(0,066)	(0,005**)	(0,023*)	(0,051)	(0,021*)
VICT10(1)	0,244	1,294	0,310	0,139	2,235
(p value)	(0,009**)	(0,004**)	(0,036*)	(0,048*)	(0,005**)
VICT_L100(1)	0,081	0,960	0,264	0,176	1,265
(p value)	(0,507)	(0,009**)	(0,095)	(0,047*)	(0,008**)
VICT_G100(1)	0,381	0,688	0,725	0,873	0,643
(p value)	(0,039*)	(0,003**)	(0,026*)	(0,029*)	(0,008**)

Note: * $p < 0.05$; ** $p < 0.01$

Table 8. Attacks on Tourism Infrastructure H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,033	0,009	0,030	0,044	0,037
	(0,022*)	(0,748)	(0,044*)	(0,060)	(0,007**)
FTSE(-1)	0,089	0,001	0,012	-0,016	0,034
(p value)	(0,010*)	(0,909)	(0,464)	(0,519)	(0,021*)
Infrastructure	-0,049	-0,212	-0,111	-0,183	-0,005
(p value)	(0,648)	(0,002**)	(0,363)	(0,163)	(0,997)
Infrastructure(1)	-0,228	0,005	-0,255	-0,316	-0,581
(p value)	(0,013*)	(0,922)	(0,087)	(0,041*)	(0,001**)
Results - Variance					
C	0,006	1,062	0,031	0,009	0,013
	(0,000**)	(0,003**)	(0,010*)	(0,008**)	(0,005**)
RESID(-1)^2	0,019	0,053	0,030	0,015	0,007
RESID(-1)^2*(RESID(-1)<0)	0,082	0,051	0,061	0,101	0,101
GARCH(-1)	0,928	0,556	0,932	0,925	0,926
Infrastructure	0,167	1,063	0,155	0,234	1,088
(p value)	(0,023*)	(0,006**)	(0,042*)	(0,013*)	(0,003**)
Infrastructure(1)	-0,010	0,871	0,081	0,051	1,434
(p value)	(0,926)	(0,002**)	(0,080)	(0,790)	(0,002**)

Note: * p <0.05; **p < 0.01

Table 9. Type of Attack and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,034	0,027	0,044	0,029	0,024
	(0,040*)	(0,141)	(0,042*)	(0,101)	(0,653)
FTSE(-1)	0,087	0,000	0,004	-0,017	0,053
(p value)	(0,002**)	(0,849)	(0,473)	(0,503)	(0,040*)
Attack	-0,036	-0,131	-0,196	-0,152	-0,114
(p value)	(0,710)	(0,216)	(0,127)	(0,323)	(0,413)
Attack(1)	-0,087	-0,094	-0,190	-0,137	-0,380
(p value)	(0,398)	(0,288)	(0,144)	(0,278)	(0,005**)
Results - Variance					
C	0,002	0,025	0,025	0,022	1,401
	(0,000**)	(0,001**)	(0,008**)	(0,004**)	(0,007**)
RESID(-1)^2	0,014	0,036	0,036	0,012	0,066
RESID(-1)^2*(RESID(-1)<0)	0,072	0,041	0,052	0,086	0,032
GARCH(-1)	0,936	0,917	0,937	0,924	0,594
Attack	0,240	0,291	0,137	0,220	0,769
(p value)	(0,008**)	(0,008**)	(0,543)	(0,196)	(0,000**)
Attack(1)	0,115	0,231	-0,025	-0,007	1,703
(p value)	(0,134)	(0,003**)	(0,916)	(0,977)	(0,002**)

Note: * p <0.05; **p < 0.01

Table 10. Affiliation of Attackers and H/T Stock Indices

	WORLD	ASIA-PAC	AUSTRALIA	AMERICA	EUROPE
Results - Mean					
C	0,025	0,010	0,038	0,019	0,032
	(0,078)	(0,920)	(0,100)	(0,173)	(0,026*)
FTSE(-1)	0,097	-0,023	0,008	-0,016	0,041
(p value)	(0,008**)	(0,007**)	(0,449)	(0,558)	(0,020*)
Affiliation	0,165	-0,116	0,072	-0,151	0,139
(p value)	(0,285)	(0,057)	(0,663)	(0,439)	(0,367)
Affiliation(1)	-0,091	-0,098	0,007	-0,194	-0,535
(p value)	(0,488)	(0,139)	(0,986)	(0,302)	(0,082)
Results - Variance					
C	0,001	0,758	0,021	0,019	0,024
	(0,002**)	(0,006**)	(0,001**)	(0,000**)	(0,009**)
RESID(-1)^2	0,012	0,094	0,031	0,001	0,017
RESID(-1)^2*(RESID(-1)<0)	0,074	0,086	0,054	0,087	0,103
GARCH(-1)	0,947	0,349	0,935	0,942	0,914
Affiliation	0,101	0,618	0,339	0,096	1,376
(p value)	(0,394)	(0,007**)	(0,208)	(0,739)	(0,005**)
Affiliation(1)	0,010	0,853	0,252	0,128	1,618
(p value)	(0,900)	(0,004**)	(0,351)	(0,627)	(0,003**)

Note: * $p < 0.05$; ** $p < 0.01$

Table 11. Media Exposure and H/T Stock Indices

	WORLD	**ASIA-PAC**	**AUSTRALIA**	**AMERICA**	**EUROPE**
Results - Mean					
C	0,029	0,025	0,040	0,033	0,043
	(0,031*)	(0,145)	(0,055)	(0,077)	(0,026*)
FTSE(-1)	0,089	0,005	0,011	-0,008	0,043
(p value)	(0,005**)	(0,777)	(0,489)	(0,543)	(0,029*)
Media	-0,073	-0,231	-0,179	-0,149	-0,207
(p value)	(0,561)	(0,064)	(0,025*)	(0,046*)	(0,025*)
Media(1)	-0,373	-0,162	-0,323	-0,488	-0,870
(p value)	(0,000**)	(0,176)	(0,017*)	(0,021*)	(0,014*)
Results - Variance					
C	0,016	0,018	0,013	0,020	0,011
	(0,008**)	(0,003**)	(0,002**)	(0,001**)	(0,005**)
RESID(-1)^2	0,019	0,035	0,025	0,000	0,013
RESID(-1)^2*(RESID(-1)<0)	0,082	0,046	0,063	0,087	0,109
GARCH(-1)	0,936	0,909	0,926	0,928	0,913
Media	0,026	0,351	0,234	-0,059	1,165
(p value)	(0,086)	(0,007**)	(0,046*)	(0,892)	(0,002**)
Media(1)	0,207	0,114	0,484	0,488	1,562
(p value)	(0,026*)	(0,042*)	(0,025*)	(0,014*)	(0,006**)

Note: * $p < 0.05$; ** $p < 0.01$

Table 12. Half-life of Volatility Shocks Persistence

Region	**W/O dummies**	**RQ1a** (Terrorism)	**RQ1b** (‘Acts of God’)	**RQ1c** (War Conflicts)	**RQ2** (Geograph. Location)	**RQ3_fatal** (Tourist Fatalities)	**RQ3_tour_vic** (Number of Victims)	**RQ4** (Infrastr. / Superstr.)	**RQ5** (Type of Attack)	**RQ6** (Affiliation)	**RQ7** (Media Coverage)
WORLD	95.139	5.513	6.098	0.728	0.632	5.755	4.890	4.680	5.219	6.382	5.249
ASIA PAC	152.826	4.503	4.325	4.118	0.656	0.625	3.934	0.596	4.023	0.340	3.680
AUSTRALIA	45.331	4.842	0.612	0.462	0.632	4.228	4.424	4.946	5.388	5.241	4.513
AMERICA	71.438	5.716	5.019	1.267	0.676	5.058	4.907	4.475	4.419	5.835	4.656
EUROPE	31.226	0.662	3.844	3.777	0.661	0.628	4.185	4.537	0.673	3.847	3.834

Note: Period of time (Number of days)