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Tourism Stocks in Times of Crisis: An Econometric Investigation of Unexpected Nonmacroeconomic Factors

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Abstract

The relationship between the tourism industry and unexpected nonmacro incidents has received limited academic coverage. As a result, the quantifiable impact of such events on tourism-specific stock values, both in terms of returns and volatility, remains grossly underexamined. Motivated by the reasoning that the well-established features inherent to the tourism industry may trigger a different pattern of stock price movement compared with other industries, and by using econometric methodology, this article investigates the reaction of five hospitality/tourism stock indices to 150 incidents, depicting major Acts of Terrorism, natural catastrophes, and War conflicts that have taken place since the year 2000. Empirical findings underscore the effect of such incidents on stock indices, with distinctive differences among the types and specificities of each event under investigation. This article contributes to the extant literature and enhances our conceptual capital pertaining to the tourism industry's current financial practices related to stock performance and behavior.

Keywords

unexpected nonmacroeconomic factors, stock market, event study, econometric modeling

Introduction

On 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 associated with the Islamic State of Iraq and the Levant (ISIS), 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 €2 billion had been wiped off European travel and hotel shares (Wearden and Allen 2015).

Such events demonstrated the vulnerability of tourism-related stocks to unexpected nonmacro incidents that for the purposes of this article, refer to acts of terrorism, natural catastrophes, and war conflicts. The global coverage, fueled by a frenzied 24-hour news cycle and the Internet (particularly social networks), provided 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 impact of such incidents greatly affected the economics of tourism, with ramifications for financial institutions, individual investors, industry operators, local communities, and tourists. Nonetheless, despite the acknowledged importance, the specificities of this vulnerability remain largely unknown, thereby necessitating the full attention of industry stakeholders.

Without a doubt, the reaction of financial markets to unexpected nonmacro incidents is a contemporary topic worthy of empirical investigation, especially for the tourism industry. A quick foray into the most popular academic databases reveals the scarcity of studies measuring the effects of nonmacro incidents on financial markets, in general, and hospitality- and tourism-related stocks and indices, in particular (M. H. Chen, Jang, and Kim 2007; Drakos 2004; Leong and Hui 2014). There have been some notable attempts

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to investigate tourism-related topics, mostly in the sphere of macro-incidents (see M. H. Chen 2011; M. H. Chen, Jang, and Kim 2007; Zheng, Farrish, and Kitterlin 2016); nevertheless, they fail to adequately respond to a number of questions surrounding the behavior and reaction of hospitality- and tourism-specific stock indices following major, unexpected nonmacro incidents.

The extant business literature informs us that the exposure and reaction of market-specific stock sectors may differ based on the characteristics of the event and the region, as well as the idiosyncrasies of the specific industry (Aslam and Kang 2015; Chesney, Reshetarb, and Karaman 2011; Enders and Sandler 2012). Aslam and Kang (2015) indicate 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, Reshetarb, and Karaman (2011) revealed that the insurance sector and airline industry are more vulnerable to terrorism, compared to the banking sector, which is more significantly affected by financial downturns. The same authors argue that financial markets react differently to unpredicted natural catastrophes when compared to terrorism-related incidents, especially in the post-event period. In 2014, Essaddam and Karagianis introduced a regional aspect to the equation, by suggesting that focus should be put on investigating specific sectors, rather than following the norm of investigating the overall stock market sentiment, such as the effect on the FTSE 100 index (M. H. Chen 2007).

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

There is another dimension that cannot be ignored. The majority of existing studies that examine the effects of unexpected nonmacro incidents on general financial markets are limited (see Hall 2010), both in terms of the number of cases investigated and/or stock market locations/regions covered. More precisely, some studies investigate the effect of only a handful of incidents on financial markets (see Chesney, Reshetarb, and Karaman 2011; Johnston and Nedelescu 2006; Kollias, Papadaumou, and Stagiannis 2011; Nikkinen and Vähämaa 2010), with the September 11th (2001), Madrid (2004), and London (2005) attacks being the most popular. Others (Aslam and Kang 2015; M. H. Chen 2007; Eldor and Melnick 2004; Leong and Hui 2014) investigate the impact of a number of incidents on either a single regional market, or on a generic index, such as the Dow Jones Industrial Average (see A. H. Chen and Siems 2004).

In contrast, this article, 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 150, manually compiled, unexpected nonmacro incidents, which took place from 2000 to date. The use of GJR and GARCH models, an original approach for such an understudied, tourism-related topic, enables control for multivariate spillovers/effects across 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), as well as the specifics surrounding the postevent recovery period.

The empirical findings of the study suggest that unexpected nonmacro incidents cause a transitory effect on hospitality/tourism stock indices, with distinctive differences among the types of incidents, and the five regions under investigation. Furthermore, the specifics of each incident, as depicted by numerous variables, influence the incident's overall impact on both stock market returns and volatility, whereas the empirical findings provide new insight as to the volatility persistence of such an event. Findings, of value to industry stakeholders, especially hospitality and tourism stock investors, 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.

Literature Review

Tourism and Incidents of Instability

The multidimensional relationship of tourism and instability has received extensive scholarly attention (Theocharous 2010), with Sönmez (1998) arguing that using a soft target such as tourists is a deliberate act that helps achieve specific predetermined objectives. Terrorism has, over the years, become the industry's primary adversary, with a multitude of terrorist groups targeting its superstructure and infrastructure as a vital means to promote their ideological agendas. In the 1960s, the European continent experienced severe transnational terrorism, attributed to the rise of a number of Marxist/Leninist extremist groups, whereas in the Middle East, the issue of Palestine saw a rise in groups (e.g., the Popular Front for the Liberation of Palestine), often using aircraft hijackings as part of 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 an extensive loss of human life, including tourists' (Drakos and Kutan 2003; Sönmez 1998).

Following the end of the Cold War in 1991, the global community saw the rise of Islamic fundamentalism, with Al Qaeda orchestrating, a decade later, the devastating September 11, 2001, attacks in New York, with detrimental effects on the tourism industry (Goodrich 2002). Al Qaeda, responsible for hundreds of attacks that destabilized the Middle East and other regions of the World in the decade that followed, 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) surfaced as the most formidable terrorist group of recent times.

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

Other than terrorist incidents, tourism has at times suffered from unanticipated natural catastrophes and pandemics (e.g., SARS), and other incidents, such as war conflicts and economic crises. Notable natural catastrophes since 2000 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 wars, the world has 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 essence of the industry, unfortunately, makes it a probable first casualty in such eventualities.

M. H. Chen, Jang, and Kim (2007) suggest that the outbreak of the Severe Acute Respiratory Syndrome (SARS) epidemic of 2003 caused an approximate decline of 29% 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, 642) reported an overall negative effect on financial markets, with a clarification that "even in an increasingly integrated world economy, not all international crises affect the stock markets in the same way." In terms of financial crises, numerous studies (M. H. Chen 2007; M. H. Chen, Kim, and Kim 2005) have investigated the impact of macro variables on hotel stock returns, with Brent Ritchie, Molinar, and Frechtling (2010) suggesting that the tourism industry suffers from enhanced vulnerability during economic recessions compared to other sectors of the economy.

The industry's distinctive operational characteristics and inherent vulnerability to such eventualities is highlighted in a number of studies (Faulkner 2001; Sönmez 1998), in view of the work by Pizam and Mansfeld (1996), which asserts that safety, security, and stability are mandatory preconditions for tourism-related activities. These preconditions have been severely challenged, with a growing body of literature suggesting that in recent times the global tourism industry has become more vulnerable to unexpected crises, disasters, and shocks (Faulkner 2001; Hall 2010; Ritchie 2004). Factors and pressures from the wider operating environment exacerbate this vulnerability, with industry managers rendered incapable of controlling these eventualities, which also severely diminishes their reflective capabilities (Evans and Elphick 2005; Ritchie 2004). As noted by Evans, Campbell, and Stonehouse (2003), industry traits such as perishability and the product's interdependent nature exponentially increase the degree of risk and uncertainty in managing such instances, especially since the rapid and unexpected decline in demand cannot be instantaneously countered by similar moves in supply.

From a different perspective, Bitner, Booms, and Tetreault (1990) highlighted the industry's dependence on consumers' discretionary income (optional spending after the essentials), which could be more receptive to animosity (such as unexpected nonmacro incidents). This can negatively influence buying behavior, especially in a competitive industry offering a plethora of travel options—a notion also supported by Roehl and Fesenmaier (1992). The same authors argue that consumers' level of perceived risk heavily influences their tolerance toward such eventualities, thus negatively affecting their buying behavior (for either hospitality/tourism products/experiences or financial products, such as stocks), an argument also echoed by others (see Floyd et al. 2004; Law 2006; Sharifpour, Walters, and Ritchie 2014).

The industry's established differences compared to other economic sectors has initiated a new stream of research in managing crises and disasters in tourism (see Evans and Elphick 2005; Paraskevas and Arendell 2007; Ritchie 2004, 2008), with Faulkner (2001) suggesting that new knowledge and a different mindset is essential to provide adequate responses. As a result, scholars have investigated the relationship between tourism and unexpected incidents, with an emphasis on terrorism, from an array of perspectives. Aligned with the characteristics and narrative of each era, investigations have covered the impact and effect of events on 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/crisis management approaches (Mansfeld 1999), and propounded destination-specific antiterrorism strategies (Paraskevas and Arendell 2007).

Nonmacro Incidents and Stock Behavior

Scholars who are investigating the impact of shocks on stock markets classify incidents into macro and nonmacro, with the former being more popular in research endeavors. M. H. Chen (2007, 992) describes macro variables generally as the "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, nonmacro variables encompass, among others, mega-sporting events, financial crises, natural disasters, wars, and terrorist attacks (M. H. Chen 2007; Cheng, Tzeng, and Kang 2011). As noted by a number of scholars (Cheng, Tzeng, and Kang 2011; Leong and Hui 2014), nonmacro incidents can be classified into two distinctive categories, namely expected and unexpected. Expected nonmacro incidents include major scheduled events, such as the Olympic Games and presidential elections, whereas unexpected nonmacro incidents include natural disasters, outbreaks of infectious diseases, and terrorist attacks.

Business literature, exploring the impact of nonmacro incidents associated with terrorism and natural catastrophes on financial markets, has reached a consensus on 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. Chesney, Reshetarb, and Karaman (2011) have indicated that two-thirds of the terrorist 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 only 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, effects on stock markets, especially on the first day, with recovery in most cases occurring within two days (Brounrn and Derwall 2010; Chesney, Reshetarb, and Karaman 2011; Drakos 2010). By contrasting 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 also 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, Papadaumou, and Stagiannis 2011), with the United Kingdom being a perfect example, following the 2005 London bombings. The same scholars argued that contingency plans involving the vast majority of the country's financial stakeholders, which were developed in the aftermath of the September 11 attacks in the United States, helped mitigate the negative effects, thereby ensuring smooth trading in the UK 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 indicating that this effect was larger in emerging markets (Arin, Ciferri, and Spagnolo 2008).

The specific characteristics of the incident have surfaced as a vital element of stock market reaction. Brounrn and Derwall (2010) have suggested that terrorism incidents have a greater economic impact, especially on the day of the event, compared to unanticipated natural catastrophes, whereas Chesney, Reshetarb, and Karaman (2011) argue that the latter phenomenon exhibits a longer post-event impact, because of the delay in measuring the actual fallout. Moreover, Aslam and Kang (2015) have posited that the location, type, intensity (measured by the number of fatalities), and tactics of the attack affect stock market behavior, notions that are also supported by Essaddam and Karagianis (2014). Kollias, Papadaumou, and Stagiannis (2011), for example, suggested that London's stock market was able to rebound faster after the 2005 attack because the attackers, unlike those of Madrid in 2004, were suicide bombers, so the imminent security danger was eliminated.

Stocks and Tourism Stakeholders

An enhanced understanding of stock behavior in times of crisis is an invaluable tool for industry stakeholders. It provides the ability to delineate related principles and concepts and develop analytical models and forecasting techniques, which are all essential in efforts to manage such eventualities. Stock dynamics are of paramount importance for tourism as they have an impact across the industry's economic aspects, that is to say, both at the macro and micro level. Indicatively, studies (Chu 2008; Lim and McAleer 2005; Paraskevas and Arendell 2007; Pizam and Fleischer 2002) have suggested that the risk and volatility associated with such eventualities could trigger wider economic problems for the industry's stakeholders, including local communities (residents and authorities), investors and financial institutions, as well as operators and workers.

Based on extant literature, such problems may include (a) higher insurance premiums due to the increased risk and uncertainty; a knock-on effect of which is an increase in the cost of tourism services (Kunreuther and Michel-Kerjan 2004); (b) higher market volatility severely limiting the scope for the beneficial practice of portfolio diversification by the global tourism industry (Lee, Wu, and Wang 2007);

(c) a significant drop in hotel occupancy, which would consequently reduce tourism-related jobs, increase unemployment rates in the local community, and negatively affect both the region's economy, and its residents' quality of life (Hitchcock and Darma Putra 2005); (d) the increased risk negatively influencing traveler perceptions, thus affecting travel behavior, subsequent decisions (e.g., cancellation intentions; see Hajibaba, Boztuğ, and Dolnicar 2016), and discretionary income allocation (Bianchi 2006; Bitner, Booms, and Tetreault 1990; Roehl and Fesenmaier 1992); (e) reduced dividends for existing stockholders compared to other economic sectors, thus making industry stocks less attractive to existing and potential investors (Chesney, Reshetarb, and Karaman 2011); (f) financial constraints, a price crash risk and difficulties to access investment funds—equity and debt financing—that can severely diminish the industry's sustainable development initiatives (Hadlock and Pierce 2010; Li 2011; Mao and Gu 2007); (g) enhanced rebuilding cost for the local community following a major catastrophe without any guarantees that the destination will rebound to its pre-event status (Miller, Gonzalez, and Hutter 2017); (h) reduced tourism revenues and fewer tourism-related private investments, severely diminishing the multiplier effect for the local community (Kuznets 1955); (j) significant HRM issues caused by a drop in demand and an increase in uncertainty that can severely affect the quality of tourism services for existing customers (Anderson, Fornell, and Lehmann 1994); (k) diminished ability to provide hard marketing incentives such as discounts and value-added extras that could boost demand and competitiveness (Bertrand et al. 2010); (l) negative impact for global hospitality organizations in terms of issuing more shares to raise revenue (danger of receiving a low return) (Lucas and McDonald 1990); (m) significant stock price drops, potentially increasing hospitality firms' vulnerability to "hostile" takeovers (Stein 1988), and creating problems in merger and acquisition scenarios (Shleifer and Vishny 2003); (n) significant changes in management structures and leadership styles (Warner, Watts, and Wruck 1988); (o) introduction of expensive (and at times questionable and/or ineffective) measures—paid by the local community (e.g., enhanced airport security, police patrols, hospitals, and fire stations)—that aim to prevent or reduce the impact of such disasters (e.g., the security measures taken by the city of Athens during the 2004 Olympic games, which were the first games following 9/11; see Samatas 2007); (p) scarcity of financial resources to rebound and rebuild (Miller, Gonzalez, and Hutter 2017) at a time in which the local community is enduring the socioeconomic impact of the incident (e.g., Sharm El Sheikh, Metrojet Bombing; see Kholaif 2015); and (q) significant stock market drops exacerbating the vulnerability experienced by financial institutions toward massive losses and liquidity dry-ups (Gennaioli, Shleifer, and Vishny 2012; Shleifer and Vishny 2010).

Nonmacro Incidents and Tourism

A handful of notable studies have been conducted by Ming-Hsiang Chen, mostly in relation to the business world in China, Japan, and Taiwan. His conceptual reasoning, which revolves around the investigation of macroeconomic and nonmacroeconomic variables, particularly hotel performance measurements, profitability, and stock performance (M. H. Chen 2007, 2011), is an extension of Barrows and Naka's (1994) seminal work, which investigated the influence of macroeconomic variables on restaurant and hotel stock returns of US companies. Espousing a similar reasoning, Wong and Song (2006) exemplified the dependence of hospitality stock indices in the US on macroeconomic variables, with interest rates being the most significant; M. H. Chen et al. (2012) explored the influences on hotel stock returns in Japan, whereas Leong and Hui (2014) investigated related topics in Singapore.

Nonmacro incidents have received considerably less attention from the academic community focusing on tourism, with only a handful of studies narrowly confined to regional investigations, using only a few incidents, and mostly with the premise of comparing their effects with macro events. The study by M. H. Chen, Kim, and Kim (2005) in Taiwan revealed that nonmacro events have a significant impact on hotel stock returns, which in most cases was more powerful compared to the effect of the macroeconomic variables under investigation, a premise that is also supported by others (see Cheng, Tzeng, and Kang 2011; Leong and Hui 2014). With regard to nonmacro events, M. H. Chen, Kim, and Kim (2005) posit that expected incidents positively influence stock returns, whereas those that are unexpected exhibit an adverse effect. Along the same lines, Chiang and Kee's (2009, 11) study in Singapore theorized that unexpected nonmacro 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 nonmacro investigations have been reported in the literature. For example, Leong and Hui (2014) were unable to support a positive association between expected nonmacro events and stock returns, whereas M. H. Chen (2007) suggested that an event might have a completely opposite effect on stock returns in different markets due to regional or national characteristics. As supported by M. H. Chen (2007), it seems clear that the effects of macro events are more distinct as compared with nonmacro, with the latter being more susceptible to other externalities, thereby necessitating further empirical investigation.

Methodology

The primary purpose of the article is to econometrically estimate the effects of unexpected nonmacro incidents (e.g., terrorism, natural catastrophes, 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 are thus considered to be ideal for our purposes. Their selection was also based on numerous study-specific criteria, such as the region, data period (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 nonmacro incidents to industry-specific stock market indices, rather than on individual company stocks. Industry-specific indices summarize stock performance by economic sector, 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 appropriate because 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, by comparing them to past averages, and facilitates meaningful comparisons among different regions. It is also important to note that the examination of unexpected nonmacro incidents on individual company stock returns might be misleading because of undesired firm-specific effects.

A database composed of 150 globally occurring, unexpected nonmacro incidents (in the time period of January 2000 to February 2016), was manually compiled from various online sources. The incidents, which represent the most important events of the particular time period, were classified into three distinctive categories, namely terrorist acts, natural catastrophes, and war conflicts (day of declaration). With the aim of further dissecting the relationship under investigation, thereby providing a more comprehensive view of stock market reaction to such incidents, additional variables were included in the analysis. In particular, data was collected pertaining to each incident's characteristics: date; category (terrorism, natural catastrophes, 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 vs. perpetrators that were later apprehended, or remain at large); affiliation of the attacker (known terrorist organizations vs. lone wolf attacks); and media exposure. 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 across all types of incidents (e.g., natural catastrophes).

Econometric Models

Impact of Events on Returns and Volatility

As previously stated, this article investigates the sensitivity of returns and volatility of H/T indices in reaction to 150 unexpected nonmacro incidents. In particular, we investigate whether there is a change in the returns and volatility of five major hospitality and tourism stock market indices after an unexpected nonmacro incident.

Subsequently, a time-series analysis is utilized, 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, as it accounts for asymmetric (i.e., whether negative shocks have a greater impact on conditional volatility than that of 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).[3]

The returns were modeled by an autoregressive process of order 1 to account for possible autocorrelation[4]:

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

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)[5]:

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

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

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.

The innovations, e_t, are assumed to be independently and identically distributed. In order to account for nonnormality 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 if not. 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.[6]

Table 1. Descriptive Statistics.

	World	Asia-Pacific	Australia	America	Europe
Mean	0.015	0.003	0.007	0.022	0.016
Standard Deviation	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
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	4219	4219	4219	4219	4219

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

As for the remaining variables, they are as follows: in equation (1), the coefficient φ_1 captures the lagged effects of the returns (i.e., whether the previous day's returns affect current returns), whereas 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 (i.e., 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 dummy vector $\overline{\mathrm{d}}$ tested in equations 1–3, are postulated:

Research question 1a: Do terrorist attacks have a significant effect on H/T stock indices (i.e., returns and volatility)?

$$\bar{d} = \left[Terrorism_t, Terrorism_{t+1}\right]$$

Research question 1b: Do "natural catastrophes" have a significant effect on H/T stock indices (i.e., returns and volatility)?

$$\bar{d} = \left[NatC_t, NatC_{t+1}\right]$$

Research question 1c: Do war conflicts (day of declaration) have a significant effect on H/T stock indices (i.e., returns and volatility)?

$$\bar{d} = \left[War_t, War_{t+1}\right]$$

Research question 2: Does the geographic location of the incident of instability affect H/T stocks (i.e., returns and volatility) in regional and/or global financial markets?

$$\bar{d} = [Europe_t, Europe_{t+1}, America_t, America_{t+1},$$

$$Asia_t, Asia_{t+1}, Australia_t, Australia_{t+1}, Africa_t, Africa_{t+1}]$$

Research question 3a: What is the impact on H/T stocks from incidents causing tourist fatalities?

$$\bar{d} = \left[Victims_t, Victims_{t+1}\right]$$

Research question 3b: What is the impact on H/T stocks from incidents according to the number (severity) of tourist fatalities?

$$\bar{d} = [Victims_t < 10, Victims_t < 100, Victims_t$$
$$> 100, Victims_{t+1} < 10, Victims_{t+1} < 100, Victims_{t+1} > 100]$$

Research question 4: What is the impact on H/T stocks from incidents involving attacks on tourism infrastructure/superstructure (such as restaurants, hotels, and airports)?

$$\bar{d} = \left[\text{Infrastructure}_t, \text{Infrastructure}_{t+1}\right]$$

Research question 5: Does the type of attack (perpetrators killed from suicide attacks or apprehended during the attack vs. perpetrators who were later apprehended or remain at large) influence the effect on H/T stock indices (i.e., returns and volatility)?

$$\bar{d} = \left[\text{Attack}_t, \text{Attack}_{t+1}\right]$$

Research question 6: Does the affiliation of the attackers (known terrorist organization vs. lone wolves) influence the effect on H/T stock indices (i.e., returns and volatility)?

$$\bar{d} = \left[\text{Affiliation}_t, \text{Affiliation}_{t+1}\right]$$

Research question 7: Does media exposure influence the effect on H/T stock indices (i.e., returns and volatility)?

$$\bar{d} = \left[\text{Media}_t, \text{Media}_{t+1}\right]$$

Empirical Findings

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

Table 2. Terrorism Incidents and H/T Stock Indices.

	World	Asia-Pacific	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: $^*p < 0.05$; $^{**}p < 0.01$.

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 showing 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.

Research Questions 1(a, b, c): Impact of Terrorist Attacks, Natural Catastrophes, and Wars 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 (research question 1a). As shown in Table 2, the results indicate a significant negative impact on H/T stock indices across all regions, except Australia. Throughout the 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 America, 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 region, 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 varying reactions of each market to specific shocks. Subsequent analysis, using Impulse Response Functions (see below), suggest that both the price drop and volatility increase recovered fully to their pre-event levels within two to three days following the incident. Therefore, it is prudent to suggest that the overall impact of such shocks is short-term.

Using similar reasoning, this article investigated the impact of natural catastrophes, widely defined as events outside human control, such as tsunamis and earthquakes, for which no one can be held responsible (research question 1b). Despite findings exhibiting a similar trend overall with terrorist attacks, certain differences are noteworthy (see Table 3). Specifically, natural catastrophes 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 on 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

Table 3. Natural Catastrophes and H/T Stock Indices.

	World	Asia-Pacific	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**)
NatC	−1.285	−0.990	−0.168	−1.167	−1.183
(*p* value)	(0.012*)	(0.026*)	(0.044*)	(0.013*)	(0.031*)
NatC(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
NatC	−0.356	1.192	2.745	2.007	1.085
(*p* value)	(0.851)	(0.020*)	(0.005**)	(0.011*)	(0.014*)
NatC(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-Pacific	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.

revealed a positive impact 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.

War conflicts (day of declaration) had a much different impact on H/T stock indices compared to terrorism incidents and natural catastrophes (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 declaration of war. The findings suggest that the uncertainty surrounding such events (e.g., the duration of an armed conflict, as well as

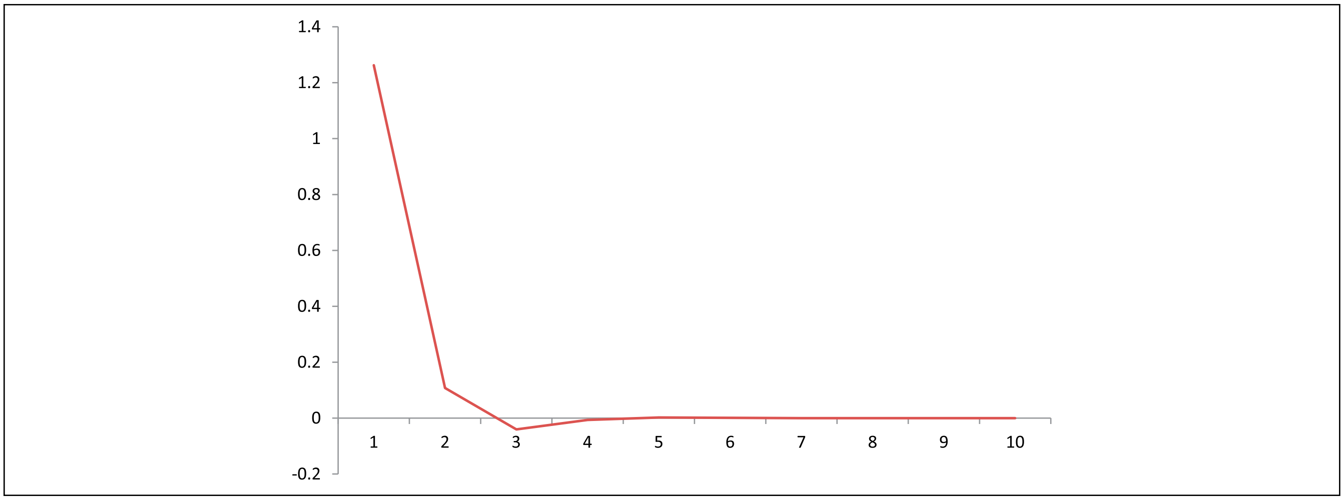

Figure 1. Impulse response function.

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, as 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.

Additional analysis using 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 (research question 1a) lasts for two to three 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 day or two, it dies out in subsequent periods. It is important to note that the results are similar for the rest of the estimates pertaining to natural catastrophes and war conflicts (research questions 1b and 1c—not presented here to save space).

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 United States) had a significant negative impact on the World, Australian, and American H/T stock indices (note the negative effect at $p < .10$ 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 have a negative effect across all H/T indices. Moreover, the estimated coefficients suggest volatility increases (either on the day of the shock, or the following day) when events occur in Europe or America in almost all markets, whereas spillover effects are rather sparse when events occur in other regions.

Research Question 3(a, b): Tourist Casualties, Number of Fatalities, and H/T Stock Indices

The third research question investigated the severity of the event, both in terms of 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 (Asia-Pacific being the exception) 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 the day of the event and on the following day.

The second part of the third question examined whether the number of tourist fatalities, a direct reflection of an incident's severity, impacted the H/T stock indices. For an empirical analysis, the events were grouped into three distinctive categories, namely, events with fewer than 10 fatalities (VICT10), events with 10 up to 100 fatalities (VICT_L100), and events with 100 or more casualties (VICT_G100). The findings (see Table 7) suggested that the higher the number of tourist fatalities, the higher the negative

Table 5. Geographic Location and H/T Stock Indices.

	World	Asia-Pacific	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: $*p < 0.05$; $**p < 0.01$.

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

Table 6. H/T Stock Indices and Tourist Fatalities.

	World	Asia-Pacific	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: $*p < 0.05$; $**p < 0.01$.

minor exceptions (e.g., events with fewer 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 impact of incidents with more than 10 and fewer than 100 victims were more than double, compared to the corresponding impact of incidents with fewer 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 fewer 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 most vulnerable to such events.

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

Historically, the industry's infrastructure and superstructure (such as airports, hotels, restaurants, and leisure venues) have been frequent targets, and yet 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 cause a significant positive impact on the corresponding uncertainty of these markets across regions, again with the European and Asia-Pacific indices recording the highest volatility increases.

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

The fifth research question asked 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 apprehended later or remain at large. The results, shown in Table 9, indicate that the type of attack was relevant to the European index only, 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.

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

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 the logistical support of

Table 7. Severity (Number of Tourist Casualties) and H/T Stock Indices.

	World	Asia-Pacific	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: *$p < 0.05$; **$p < 0.01$.

an organized group, despite the fact that they may espouse a radical ideology (e.g., the 2015 Copenhagen shootings). The findings, presented in Table 10, suggest that attacker 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.

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

The final research question examined whether postevent media coverage impacts 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 online sources. The subjective nature of this exercise is duly acknowledged, and results are presented for illustrative purposes. The findings (see Table 11) indicated that media exposure had a significant negative impact on four indices (Asia-Pacific being the exception), 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.

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 $\ln(0.5)/\ln(a^2 + b^2)$, was used, because it

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

	World	Asia-Pacific	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-Pacific	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: *$p < 0.05$; **$p < 0.01$.

estimates the period of time (or number of days) it takes for the shock's impact to decrease by one-half. The particular technique has been used by numerous scholars (see, 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 four to five 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.

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

	World	Asia-Pacific	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-Pacific	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: $^{*}p < 0.05$; $^{**}p < 0.01$.

To check the robustness of the results, all hypotheses were retested using three alternative methodologies/specifications. First, in order to control for possible covariates among these events, types of events, and regions (as region dummies are included in each equation), we employed vector autoregressive analysis (VAR) that is designed to capture the entire range of model specifications. Second, we examined the robustness of the results using alternative regression analysis, namely a multivariate OLS regression model. Third, we further tested whether our findings remain the same using the individual stocks traded on the indices included in this study by using panel regression analysis with

Table 12. Half-life of Volatility Shocks Persistence.

Region	Without Dummies	RQ1a (Terrorism)	RQ1b (Natural Catastrophe)	RQ1c (War Conflicts)	RQ2 (Geographic Location)	RQ3a (Tourist Fatalities)	RQ3b (Number of Victims)	RQ4 (Infrastructure/ Superstructure)	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). RQ = research question.

stock and time fixed effects on all stocks that constitute the FTSE Travel and Leisure Europe index (one of the indices tested in the main analysis). The (untabulated) results based on the three new methodologies are qualitatively similar to the main findings, with the effects for each market/type of event having similar sign and significance. Nevertheless, although these methodologies offer alternative specifications for robustness testing, that is, control for possible covariates, alternative regression approach, and analysis on individual stocks rather than indices, they are not able to capture volatility effects, which are crucial for our study's main purpose. In addition, these approaches provide higher standard errors than those based on GJR, thus leading to possible misleading inferences. This may be due to possible heteroskedasticity issues, which are not properly captured by OLS and VAR specifications as these do not model the second moments of the equation (i.e., time-varying volatility).

Discussion and Implications

In agreement with existing business literature (Brounrn and Derwall 2010; Chesney, Reshetarb, and Karaman 2011; Drakos 2010), the findings suggest that unexpected non-macro incidents caused a short-term 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 the most significant drops statistically, especially on the day following the event, and natural catastrophes exhibiting drops on the day of the incident. In contrast, Wars had an insignificant effect on four of the five study-specific indices (the World index being the exception).

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, perpetrator affiliation, and postevent 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 Karaman 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 America have a global impact across 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 across all five indices, with this impact being 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, Papadaumou, and Stagiannis 2011) suggesting a number of different scenarios. For instance, Kollias, Papadaumou, and Stagiannis (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 because of the incident's nature (suicide bombings), compared to the slower recovery from 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 premise being that attacks conducted by known terrorist groups will have a longer lasting impact compared to lone wolf incidents. The findings fail to confirm this argument, however, 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 when the perpetrators are affiliated with a well-known terrorist group. Finally, and as expected, the sustained effects of media coverage, a pragmatic factor when incidents involve international tourist fatalities, influence 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 rest of the indices.

Nevertheless, compared to the existing literature, this article was unable to provide evidence to support claims that following a particular incident, volatility will significantly increase for up to 15 days (as suggested by Essaddam and Karagianis 2014), or that natural catastrophes increase uncertainty more, compared to other incidents, because of the observed postevent negative impact (as noted by Chesney, Reshetarb, and Karaman 2011). It would be prudent to encourage further empirical investigation in volatility persistence following such incidents.

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 nonmacro incidents. De Sausmarez (2007, 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 the adverse effect of such incidents on the stock market's sentiment, and hence the behavior of individual stock investors. This article provides a more thorough overview of stock market reactions to such eventualities, thereby providing comprehensive information that aims to be of substantial value to industry stakeholders.

The capability of financial institutions to predict both the likelihood and probable consequences of unexpected nonmacro incidents is crucial in today's business environment. With the use of an appropriate econometric methodology, this article enhances 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 exhibit some similarities with previous studies that investigated pertinent topics in general 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 (e.g., tour operators), and industry operators.

In particular, the findings revealed that the negative impact of nonmacro incidents on H/T stock indices (returns) is short-lived and does not last more than two to three 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 appear to be efficient and resilient in absorbing the initial shock of such incidents. It is apparent that recent experiences have forced the industry to create its own "antibodies" in order to protect itself and become in some ways immune to such eventualities. A contributing factor has been that in the aftermath of the September 11, 2001, attacks, the majority of financial markets, especially those operating in developed countries, undertook drastic measures to enhance their contingency plans and crisis management responses in order to mitigate their exposure and vulnerability (Kollias, Papadaumou, and Stagiannis 2011). It is also important to note that this short-term effect seems to be inconsistent with some recent calls (see Chesney, Reshetarb, and Karaman 2011) to avoid investing in hospitality- and tourism-related stocks because of terrorist-related incidents.

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).

The profile of an incident and its geographic location may assist financial institutions in better quantifying the likely risk exposure. Incidents that occur in developed countries (mostly in Europe and America), cause tourist fatalities, involve the industry's infrastructure and superstructure, and logically, generate extensive media coverage, thereby influencing individuals' psychosocial state, require the immediate attention of stakeholders as they can have a significant impact on markets. In contrast, terrorist incidents taking place in Africa, a troubled geostrategic region with numerous active conflict zones (e.g., Somalia, Yemen, and Libya), 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 of 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 governments, central banks, 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 proactive 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.

Over the past decade or so, many scholars (see, Chan, Lim, and McAleer 2005; Paraskevas et al. 2013) have argued that the severity of instability incidents and their associated economic ramifications of conducting day-to-day business (A. H. 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, across five different regions, following unexpected nonmacro 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 a more robust model of predicting H/T stock behavior following a particular incident, and the investigation of the indirect and systemic effects of unexpected nonmacro incidents; effects that cannot be reflected in the next day's stock market prices and returns. Finally, the authors acknowledge that the use of a manually compiled list of 150 incidents may be open to scrutiny.

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Notes

1. Despite being considered in the extant literature as unexpected nonmacro 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 article is to examine how exogenous shocks (such as wars and terrorist attacks) affect stock markets.
2. The application of a Multivariate GARCH specification that simultaneously models multiple dependent variables would possibly be a better method. However, because of the diverse nature of the research questions under examination, we opted to use the univariate specification. The application of the Multivariate GARCH models remains an open question for further research.
3. The diverse nature of research using econometric techniques with regard to tourism has been highlighted by Song and Li (2008), who attempted to expand horizons into new uncharted territories of empirical investigation. Indicatively, Drakos (2010) used pooled panel ARCH to model the effects of terrorism activities on the investor's psychosocial sentiment. Chesney, Reshetarb, and Karaman (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 European terrorist incidents, whereas Essaddam and Karagianis (2014) used the same method to examine the volatility of stock returns following a terrorist event. Peren, Ciferri, and Spagnolo (2008, 164) explored, with the use of VAR–GARCH, the effect of terrorist attacks on financial markets, which "[had] 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, data used in the studies exhibited such heterogeneities that definitive and comprehensive conclusions were impossible to reach.
4. The innovations, e_t, are assumed to be independently and identically distributed. In order to account for nonnormality in the returns shocks, the parameters were estimated by quasi-maximum likelihood (QML).
5. 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.
6. In practice, only the day after the event has an effect on either returns or volatility, so that in estimation we used only $\tau = 0$ and $\tau = 1$.

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