Terrorism and its impact on the stock market: broad results from Tunisia

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Abstract

Purpose – The purpose of this study is to investigate the impact of terrorist attacks on the volatility and returns of the stock market in Tunisia.

Design/methodology/approach – The employed sample comprises 1250 trading day from the Tunisian stock index (Tunindex) and stock closing prices of 64 firms listed on the Tunisian stock market (TSM) from January 2011 to October 2015. The research opts for the general autoregressive conditional heteroscedasticity (GARCH) and exponential generalized conditional heteroscedasticity (EGARCH) models framework in addition to the event study method to further assess the effect of terrorism on the Tunisian equity market.

Findings – The baseline results document a substantive impact of terrorism on the returns and volatility of the TSM index. In more details, the findings of the event study method show negative significant effects on mean abnormal returns with different magnitudes over the events dates. The outcomes propose that terrorism profoundly altered the behavior of the stock market and must receive sufficient attention in order to protect the financial market in Tunisia.

Originality/value – Very few evidence is found on the financial effects of terrorism over transition to democracy cases. This paper determines the salient reaction of the stock market to terrorism during democratic transition. The findings of this study shall have relevant implications for stock market participants and policymakers.

Keywords GARCH, Event study, Terrorism, Stock market

Paper type Research paper

1. Introduction

Terrorism conceptually involves numerous costs that directly affect the population well-being, the decision-making of venture capitalists and firms, and the financial and economic stability of the country. These devastating costs or consequences of terrorism can reflect short-term effects that may also persist to a longer period of time depending on many features of terrorism.

Insurgencies and violence acts have overtaken the entire Middle East and North Africa (MENA) region over the period 2010–2013. A root cause behind this instability is notoriously related to MENA countries that faced political regime changes after the occurrence of a sequence of massive revolutions referred to as the Arab spring. Tunisia was the only country to realize a successful transition from autocracy towards democracy (Günay & Sommavilla, 2020; Levin, Ali, & Crandall, 2018; Masoud, 2015). Nonetheless, the road from dictatorship to democracy can incurs high levels of aggravating political circumstances. According to

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Kis-Katos, Liebert, and Schulze (2011), and Savun and Daniel (2011), terrorism increases during regime transitions. More recently, Baek and Bouzinov (2021) also posited that the process of democratic transition can upsurges terrorism. Indeed, insecurities in Tunisia have increased due to the proliferation of national terrorist attacks that have occurred after the revolution. Such atrocities have harmfully intimidated the overall Tunisian public environment that became less optimistic toward democracy (Andersen & Brym, 2017). In addition to human fatalities, terrorist incidents inflicted core concerns and ambiguity which elicit detrimental financial and economic downturns. This paper hence considers the financial impact of terrorism associated with the Tunisian democratic transition experience during 2011–2015. For this purpose, the study first embeds the general autoregressive conditional heteroscedasticity (GARCH) and exponential generalized conditional heteroscedasticity (EGARCH) models to assess the overall impact on returns and volatility of the Tunisian stock market (TSM) index, and the event study methodology to determine cumulative mean abnormal returns (CMARs) around the event window.

Prior scholars have explosively studied the pivotal influence of terrorist attacks on a variety of financial and economic indicators – e.g. capital and money markets (see for example Papakyriakou, Sakkas, & Taoushianis, 2019; Balcilar, Gupta, Pierdzioch, & Wohar, 2018; El Ouadghiri & Peillex, 2018; Drakos, 2010), foreign direct investment and trade (Arif, Rawat, & Khan, 2021; Bandyopadhyay, Doucouliagos, & Pham, 2021; Polyxeni & Theodore, 2019; Filer & Stanišić, 2016; Hasnat, 2015), economic growth (Bardwell & Iqbal, 2021; Meierrieks & Schneider, 2021; Halkos, Managi, & Zisiadou, 2017; Estrada & Koutronas, 2016; Drakos & Kallandranis, 2015; Mehmood, 2014; Freytag, Krüger, Meierrieks, & Schneider, 2011; Gries, Krieger, & Meierrieks, 2011) and others - proving that, in addition to the social disturbance that people encounter after hideous terroristic events, this environment of instability poses depressing ramifications on economic and financial situations. The majority of these articles typically focused on terrorist attacks that befell the United States and Western European countries, for example the 9/11 attack in New York (United States, 2001), the Madrid and London attacks (respectively in Spain, 2004; and the United Kingdom, 2005), the bombing attack in Boston (United States, 2013), the Paris and Brussels attacks (respectively in France, 2015; Belgium, 2016), among other themes. In fact, there is mounting evidence from their studies that can uniquely be classified into the following: Terrorism has marginal and differential effects on stock market returns (Markoulis & Katsikides, 2020; Aslam & Kang, 2015; Essaddam & Mnasri, 2015; Baumert, Buesa Blanco, & Lynch, 2013; Ramiah, Cam, Calabro, Maher, & Ghafouri, 2010; Gheno & Lee, 2006), and terrorist attacks have eventually a credible impact on stock markets returns (Corbet, Gurdgiev, & Meegan, 2018; Aloui & Nguyen, 2014; Chou, Zaabar, & Wang, 2013; Arin, Ciferri, & Spagnolo, 2008; Charles & Darné, 2006; Johnston & Nedelescu, 2006; Drakos, 2004). Fundamentally, fluctuations in stock prices are influenced by investors responses to expected and unexpected events. According to Burch, Emery, and Fuerst (2016), the degree of changes in stock prices is related to explanatory characteristics of financial assets and the occurred event. During terrorism, shareholders become skeptical and frequently sell their stocks seeking for safer investments.

In that regards, this article aims to improve upon the existing empirical literature in four ways. First, as mentioned above, past inspections have examined the financial repercussions of terrorism mainly in countries with quite stable political systems. This essay rigorously tests the hypothesis that terrorism can negatively threaten the stock market in Tunisia during political transition days in support for the generally revealed conceptual evidence on the financial market consequences of terrorism (Iwanicz-Drozdowska, Rogowicz, Kurowski, & Smaga, 2021). Second, this study is conducive to developing countries and investors of emerging markets as it documents the stock market uncertainty to terror events during democratic transition. Third, there are few studies that utilized conditional volatility and

event study analyses to assess the financial effects of terrorism. This study is also innovative at the methodological level by adopting the following approach: the framework starts to observe the reaction of the TSM index by using GARCH and EGARCH models, and then via the event study method it considers plausible abnormal stock returns of each listed company which performs in distinctive manner and provides more precise results. Fourth, the current analysis offers some clues for policymakers, stockholders and vulnerable businesses in Tunisia since it empirically clarifies how terrorism might impinge on stock prices and provides further information to implement better risk management strategies and avert the harms of terrorism.

The remainder of the paper is structured as follows. In the following section 2, the literature review is illustrated. Section 3 describes the data, methodology and results. Section 4 presents the conclusion of the study.

2. Literature review

An emerging body of related literature can mainly be categorized in studies on the effect of terrorism on stock indices in emerging markets (Shaikh, 2019; Bassil, Hamadi, & Bteich, 2018; Orbaneja, Iyer, & Simkins, 2018; Shahzad, Stauvermann, Kumar, & Ahmad, 2017; Mnasri & Salem, 2016; Alam, 2012), the effect of terror attacks on stock markets of developed regions (Bevilacqua, Morelli, & Uzan, 2020; Ramiah, Wallace, Veron, Reddy, & Elliott, 2019; Corbet *et al.*, 2018; Narayan, Le, & Srianantha kumar, 2018; Hudson & Urquhart, 2015; Kollias, Papadamou, & Arvanitis, 2013; Kollias, Kyrtsou, & Papadamou, 2013; Nikkinen and Vähämaa, 2010 ; Chuliá, Climent, Soriano, & Torro, 2009; Johnston & Nedelescu, 2006), and the effect of terrorism on international stock markets (Park & Newaz, 2018; Goel, Cagle, & Shawky, 2017; Coleman, 2012; Brounen & Derwall, 2010; Arin *et al.*, 2008; Chen & Siems, 2004).

The following is a summary of the contemporary research on the impact of terrorism on stock markets globally and in developed countries: Johnston and Nedelescu (2006) examined the reaction of financial markets to terrorist attacks in New York (2001) and Madrid (2004). The authors generally found that financial markets in both countries were highly volatile during terrorism but the attack in Madrid had only a regional effect while the 9/11 attack in New York disturbed the global financial systems. Haque and Kouki (2009) questioned whether the terrorist attack of 9/11 in New York (United States, 2001) caused volatility effects in the stock markets. The authors used six developed market indices and applied a GARCH mechanism. Results from their study displayed that the volatility and the correlation among developed stock markets have evolved due to the 9/11 tragedy in consistence with the findings of Charles and Darné (2006). Barros and Gil-Alana (2009) applied long memory regression models and analyzed the impact of terrorism on the Spanish stock market index. Their results specified that terror attacks consistently decrease the returns of the stock market. Using the event study methodology, Brounen and Derwall (2010) investigated the stock price reactions of international financial markets to terrorism. Their results illustrated a sizeable impact of terrorism on stock markets where price reactions are more pronounced in markets that are directly affected by these troubling attacks. Chesney, Reshetar, and Karaman (2011) employed an event study approach and the GARCH-Extreme Value Theory (EVT) model to analyze the effect of terrorism on three aspects of financial markets: stock, commodity, and bond markets. The sample contained 25 American and European countries over 11 years. Their findings indicated that two thirds of the selected terrorist attacks had severe negative impact on at least one of the stock markets under consideration. Kollias, Papadamou *et al.* (2013) and Kollias, Kyrtsou *et al.* (2013) explored the issue of whether national and transnational terrorism in France, Germany, Spain, and Great Britain affect returns and variances of the time-varying stock-bond covariance. Based on Vector

Autoregressive model (VAR) (p)-GARCH in mean model, the authors fruitfully found that terrorist attacks have dramatic consequences on the returns and volatility of the stock markets and a flight-to-safety effect was detected mainly in France and Germany, and to a less extent in Spain and Great Britain. Kolaric and Schiereck (2016) examined the stock prices of 27 European and North American air companies surrounding the Paris and Brussels terrorist attacks that happened respectively in November 2015 and March 2016. The authors utilized the event study methodology and the ordinary least squares (OLS) regression. Their results reported a negative and significant effect of both events on the valuation of airline industries. However, this outcome was less intense for Brussels airport attack. Nevertheless, Apergis and Apergis (2016), investigated the impact of Paris terrorist attack occurred in November 2015 on the stock returns of global defense industries using the event study technique. The authors noticed an upward trend in cumulative abnormal returns across all selected companies during the post-event windows. In a broader perspective, other scholars considered the deleterious impact of terrorism on publicly traded firms (e.g. Essaddam & Karagianis, 2014; Karolyi & Martell, 2010). Their analyses implied that attacks on firms located in countries which are wealthier and more democratic are associated with greater volatility in stock returns. Notably, Ilalan (2017) argued that stock markets might adjust to terrorism after myriad occurrences of these illicit activities. The author declared the latter notion by comparing the impact of terrorist attacks in France, Belgium and Turkey. Under the same supposition, Markoulis and Katsikides (2020) quantitatively confirmed that the Paris attacks in 2015, the Nice, Brussels and Berlin attacks in 2016, the Belgium attack in 2016, and the Westminster attack (United Kingdom) in 2017 had no substantial effect on both local and global stock markets in contrast to previous terrorist attacks (such as the New York attack in 2001, the Madrid attack in 2004, the London attack in 2005 and the Boston attack in 2013).

Another part of the literature examined terrorism and the stock market in developing and emerging markets. Using the event study method, Ramiah (2012) explored the impact of five international terrorist attacks that happened in Bali (Indonesia), New York (United States), London (United Kingdom), Madrid (Spain) and Mumbai (India) on the Malaysian stock exchange. The authors found that, except for the New York attack, Malaysian equity markets were not sensitive to subsequent attacks in other countries. Similarly, Ramiah and Graham (2013) examined the Indonesian stock market behavior following the same five terrorist attacks that were selected by Ramiah (2012). Their findings proved that domestic terrorism produced the worst outcomes followed by overseas terrorist attacks. Aslam, Rafique, Salman, Kang, and Mohti (2018) evaluate the effect of 410 terrorist attacks on the indices of five Asian stock markets using regression analysis from 1997 to 2011. Results mostly validate that the terrorist attacks have significant negative impact on stock markets on the day of event. The authors detected major variances in the effects of terrorism that are related to the severity of the incidents. Chaudhry, Roubaud, Akhter, and Shahbaz (2018) adopted an event study analysis and the fixed effect regression technique to evaluate the effect of terrorism on stock market returns of SAARC countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri-Lanka). The authors recognized that the terrorist attacks had a negative and strict impact, over the attack day and the next day after the incident, on the returns of the stock markets. Using regression analysis, Orbaneja *et al.* (2018) demonstrated that terrorist attacks in the Middle East had considerable impact on the abnormal returns of crude oil prices. Kong, Xiong, and Xiang (2021) utilized the OLS regression in order to investigate the impact of terrorist attacks on stock prices of energy firms in China. The authors provided evidence that terrorism substantially enhance stock price crash risk for the case of Chinese energy listed firms. Souffargi and Boubaker (2021) tested the effect of terrorism on the performance of the general index of the TSM by utilizing GARCH model and event study method. The authors main finding is that terrorism has a negative impact on the

TSM and indicate different effects of terrorist attacks centered on its type and severity. Aksoy and Demiralay (2019) explored the impact of terror attacks on the Turkish financial market by employing the event study methodology. Results of their study show that returns, abnormal returns and cumulative abnormal returns were not influenced by the terrorist attacks. Also, Gok, Demirdogen, and Topuz (2020) asserted that the Turkish stock market is resilient to major terrorist attacks. They employed an event study analysis and the EGARCH (1,1) model to identify terror effects on the Borsa Istanbul equity market.

Overall, there has been a broad-based literature into the topic of terrorism and its impact on financial markets with little emphasis on its firm or country-specific effects and the global political situation of the targeted country. This paper endeavors to go a step further and provides additional insights to the existing evidence on the impact of terror attacks on stock markets.

3. Data, methodology, and results

The data is gathered from the TSM official website http://www.bvmt.com.tn/. The study employs data that consists of 1250 trading days and cover major listed companies (64 company, see Appendix) from the stock market of Tunisia for the period January 01, 2011 to October 16, 2015.

3.1 GARCH and EGARCH estimation

To predict the return and volatility of the market index, the study uses GARCH (1, 1) model (Bollerslev, 1986), with a dummy variable that corresponds to the shift points which are represented by the event dates of the terrorist attacks under scrutiny (Table 1). GARCH (1, 1) model is defined as follows:

$$\sigma_t^2 = c + d_t D_{TA+} \alpha_1 e_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (1)$$

where σ_{t-1}^2 is the conditional variance at time t, D_{TA} denotes dummy variables that takes the value 1 at the date of terrorist attacks and zero otherwise, and e_{t-1}^2 represents the former squared shocks.

Firstly, the stationarity of the return series is checked through augmented Dickey-Fuller (ADF) test. The results are given in Table 2. The results of ADF test reject the unit root at 1% significance level indicating that the data is stationary at first difference. Once return series are stationary, a test for ARCH effect is conducted using Lagrange multiplier (LM) test. Results are reported in Table 3. The *p*-value of Chi-Square is equal to zero which is less than 5%, indicating that returns have an ARCH effect. Once the returns of Tunindex are heteroscedastic, their volatilities can be modeled by GARCH model (see Table 4).

Date	Event description
First event: February 6, 2013	Assassination of Choukri Belaid: The first assassination in post-revolutionary period. Chokri Belaid, an opposition leader, was shot dead in front of his home
Second event: July 25, 2013	Assassination of Mohamed Brahmi: The leader of the opposition People's Party, Mohammed Brahmi, was gunned down
Third event: March 18, 2015	The Bardo national museum attack: 22 people were killed, including 21 foreign tourists, after a gunmen opened fire in a famous museum (Bardo)
Fourth event: June 26, 2015	Sousse attack: A gun attack took place on a beachside, 38 people were killed

Source(s): Table by author

Table 1. Terrorist attacks in Tunisia 2011–2015

The dummy variable is found to be statistically significant at 1% in both the mean and variance equations demonstrating that terrorism decreases returns by 0.015 and increases the volatility by 7.67E−05. Clearly, the political instability driven by terrorism weakened the confidence of local and foreign investors in Tunisia. In particular, the stock market transaction volume decreased and produced an important drop in returns and rise in the volatility of the Tunindex. These findings are robust and consistent with previous studies (see for instance Talbi, Chaibi, & Maoueti, 2021; and Suleman, 2012) which report that domestic terrorist attacks have damaging effects on the returns of the stock market index and increasing effects on its volatility, more precisely over the Tunisian period of democratic transition as suggested by Souffargi and Boubaker (2021), Moussa and Talbi (2019), and Kobbi and Abdelhedi (2018). Furthermore, the coefficients of the variance equation provide a direct approximation of the persistence of volatility shocks. In existent findings, the sum of the coefficients (α1+β1) is close to one (0.907) which denotes that the impact of the events day' shock is highly durable and remains in the assessments of the variance for further periods in the future.

Next, the EGARCH (1,1) model (Nelson, 1991) is anticipated based on the below equation:

$$\ln\left(\sigma_t^2\right) = c + \beta_1 \ln\left(\sigma_{t-1}^2\right) + \mu_1 \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha_1 \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}}\right] \quad (2)$$

Table 2.
Unit root test results

Augmented Dickey-Fuller test statistics Return of Tunisian stock index = dlog (Tunindex)					
	Unit root test		Critical values		
Tunindex	*t*-test	Prob.	1%	5%	10%
1st difference	−19.45	0.0000	−2.56	−1.94	−1.61
Level	−0.03	0.6713	−2.56	−1.94	−1.61

Source(s): Table by author

Table 3.
ARCH (LM) test results

F-statistic	160.7691	Prob. F(2,1242)	0.0000
Obs*R-squared	256.0316	Prob. Chi Square(2)	0.0000

Source(s): Table by author

Table 4.
GARCH results

Variable	Coefficient	*Z*-statistic
Mean equation		
Constant	0.000142	1.256788
Dummy	−0.015754	−5.417900*
Variance equation		
Constant	1.77E−06	11.43561*
RESID $(-1)^2$	0.174883	9.627453*
GARCH (−1)	0.732565	45.30673*
Dummy	7.67E−05	2.391636*

Note(s): *Significant at 1, 5 or 10% level
Source(s): Table by author

where ln (σ_t^2) is the logarithm of the variance, c is the constant term, β_1 identifies the GARCH effect, μ_1 captures the asymmetric effects and α_1 stands for the ARCH effect.

A central hindrance of the GARCH model is that it reflects a symmetric output of the volatility to negative and positive shocks. This occurs because the conditional variance in equation (1) perceives the magnitudes of the residuals and not their signs. Though, different signs of shocks engender irregular shifts in the volatility. Therefore, the EGARCH (1,1) model is engaged in order to identify such asymmetries (Chang & McAleer, 2017). In the case of this study, Tunisian stock index is estimated with a binary variable (dummy of terrorism) which implies that the results are likely to be the same as for the projected GARCH model. Indeed, Table 5 depicts almost identical results of the GARCH (1,1) estimation with higher detected volatility. The dummy variable is significant at 1% in both the mean and variance equations signifying that terrorism decreases returns by 0.019 and increases the volatility by 0.87.

3.2 Event study methodology

In order to study the impact of each terrorism event as a part on returns of stocks listed in the TSM, the study applies the event study methodology (Fama, 1965). Initially, the events dates were determined by the actual date of the occurrence of each of the four terrorist attacks. The date of the events is t = 0 and is presented in Table 1. Moreover, daily excess returns were calculated by applying the mean-adjusted-returns approach (Brown & Warner, 1980), based on computing the abnormal return which is the return due to the presence of an event by subtracting the expected return from the observed or actual return. In other terms, abnormal returns are calculated as follows:

$$ARt = Rt - R^* \tag{3}$$

where ARt stands for the abnormal return of each company's stock at time t; Rt is the observed or actual rate of return, and R^* represents the mean of the daily stock return for each company. It is calculated over the estimation window [−60, −10] for the first three events. For the fourth event, the Sousse attack of July 2015, a [−30, −10] estimation period is used because this terrorist attack happened closely after the Bardo attack in March 2015. Also, two event windows [t0+5] and [t0+10] are employed to discern whether terrorism has a longer (5 and 10 days following the event) impact on the stock market or solely an instant effect (at t = 0).

Once abnormal returns are calculated, the mean abnormal returns on each day of the test period are computed, and for all the companies' stocks, as follows:

$$MARt = 1/70\,\Sigma ARi, t = 0\,to\,10(\mathrm{i} = 1\mathrm{to}70)\ (\mathrm{For\ Events\ 1, 2, and\ 3})$$

Variable	Coefficient	*Z*-statistic
Mean equation		
Constant	0.000322	1.616084
Dummy	−0.019754	−1.939521*
Variance equation		
Constant	−0.719014	−3.158195*
RESID $(-1)^2$	2.056458	10.69706*
GARCH (−1)	0.105243	0.947789*
Dummy	0.876142	22.74656*

Note(s): *Significant at 1, 5 or 10% level
Source(s): Table by author

Table 5.
EGARCH results

$$MARt = 1/40\Sigma ARi, t = 0\,\text{to}\,10(\text{i} = 1to40)\ (\text{For Event 4})$$

The significance of the MARs is tested using the statistical *t*-test:

$$\theta t = MAR/\sigma(MAR)$$

where (MAR) is the standard deviation of the mean abnormal return at date t of the event window

For the two selected event windows, the CMARs are calculated as follows:

$$CMARt = \Sigma MAR\ (\text{t} = 0\,\text{to}\,\text{T})$$

where t = 0 is the event day and T is respectively five and ten days after the event. The results are encapsulated in Table 6 and visually plotted in Figures 1–4.

Table 6 reports negative and significant market reactions to the first three terrorist attacks on the event day (t0). The strongest impact is observed for the first event (−2.9%) since the country at that time witnessed the first terrorist attack in the post-revolution period. The impact at *t*0 decreases gradually for the subsequent three events, and was unresponsive to the penultimate event 4. The ultimate explanation for this finding is that official information on the fourth terrorist attack were announced on a Friday afternoon, and as there is no trading on Tunindex on the weekend, stock market participants reacted after a lapse of time in the following day (t0+1) which exhibited a reliable drop of 0.9% in returns (see Figure 4). With regards to CMARs, the stock market reacts negatively and drastically for the 4 terrorist attacks over the 5-day window. Indeed, over democratic transition period, the local financial market is fragile and unstable which may lead to an overreaction of the stock market. Moreover, during instability period, the government's intervention is too slow to

Table 6.
Mean abnormal returns and *t*-test statistics

	Event day t0		6-day (t0+5)		11-day (t0+10)	
Terrorism events	MAR_t	*t*-stat.	$CMAR_t$	*t*-stat.	$CMAR_t$	*t*-stat.
Event 1	−0.029	−8.80*	−0.015	−4.64*	−0.027	−8.10*
Event 2	−0.013	−5.10*	−0.007	−2.80*	−0.003	−1.51
Event 3	−0.019	−4.90*	−0.014	−3.83*	−0.006	−1.79
Event 4	−0.012	−3.30*	−0.009	−5.99*	−0.029	−8.30*

Note(s): *Significant at 1, 5, or 10% level
Source(s): Table by author

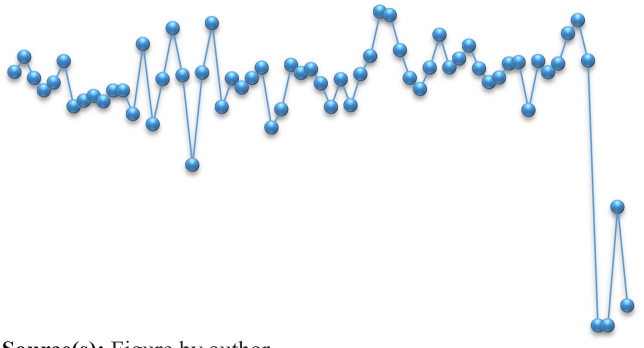
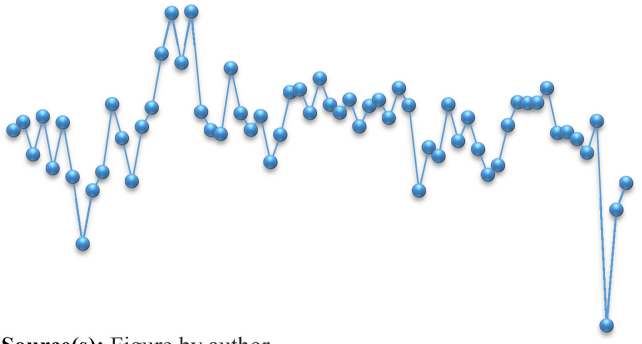


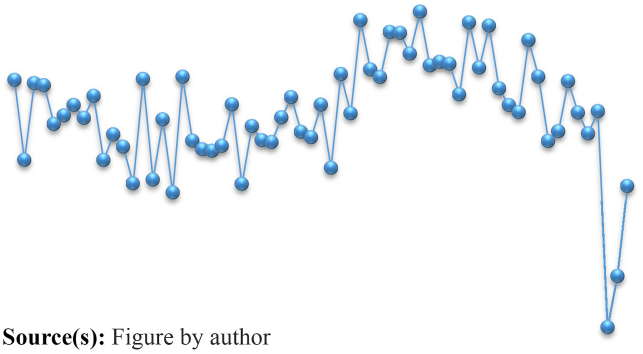
Figure 1.
T-test over the event window (first event)

Source(s): Figure by author



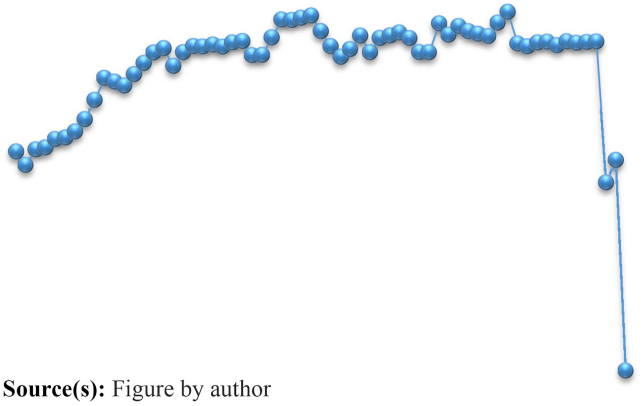
Source(s): Figure by author

Figure 2.
T-test over the event window (second event)



Source(s): Figure by author

Figure 3.
T-test over the event window (third event)



Source(s): Figure by author

Figure 4.
T-test over the event window (fourth event)

make necessary adjustments. Another reason is the fact that the meaningful impact of terrorist attacks tends to last for longer periods in emerging markets compared to developed markets as indicated by: Ahmad, Hussain, Akbar, and Rehman (2022), Lanouar and Goaied (2019), Mnasri and Salem (2016) and Diamonte, Liew, and Stevens (1996). For the 10-day

CMARs, only events 1 and 4 show negative and sizeable impact for the entire period. The variation might be partially explained by the fact that event 1 was the first and most intense terrorist attack which generates an atmosphere of fear and insecurity especially for investors who reduced their transaction activities in the stock market. Thereafter, the TSM may become enough resilient to absorb terrorism. Besides, event 4 does not set sights on political figures or national citizens, but targets tourists and killed 39 people. This catastrophic attack slows down the whole economy, especially the stock market which records a perceptible decline of 2.9% in stock returns. A common interpretation of the latter insight is that the features of terrorist attacks (i.e. the type, severity and location of the attacks) are unprecedented elements that determine the instantaneous reaction of the TSM as cited by Souffargi and Boubaker (2021). Additionally, a general note on the findings of this analysis is that they are in connection with prospects theories and rational theory of terrorism as proposed by Ahmad *et al.* (2022). Also, the concrete outputs corroborate that terrorism negatively affected the value of the TSM listed firms and recommend that monetary policy decisions and financial stability analyses must deliberately include the relentless role of terrorism when managing systemic risks. With respect to practical consequences, portfolio managers can also benefit from the current results for optimal trading strategies. In general, these findings complement the extant literature on the inexorable effect of terrorism on stock prices and ensure that domestic terrorist threats perturbed investor confidence and the stock market in Tunisia.

4. Conclusion

This paper estimated the intuitive impact of four terrorist attacks on the stock market during democratic transition (2011–2015) in Tunisia. Using GARCH (1, 1) and EGARCH (1,1) models, the findings presage a drastic decline in returns of the TSM index and an increment in its volatility. Next, the event study methodology is applied to detail the impact of each event. Altogether, terrorist attacks result in a negative and sharp plunge in stock returns on the event day (t0). Additionally, the analysis of CMARs reveals considerable negative effects for the 5 and 10-day post event window in the light of these terrorist events. The results emanating from this study have notable inferences related to tighter action plans that regulators in Tunisia must enact to moderate the impact of lethal incidents by establishing counter-terrorism policies that improve the security of the country and firms. Specifically, from a policy-making perspective, findings explicitly theorize a need to maintain long-term political stability in order to curb the ubiquity of terrorism and increase national security, prevent durable financial losses and attract local and international investors, in line with the propositions of Tahir (2020), and Nurunnabi and Sghaier (2018). Another potential implication of the present output is that investors should be decidedly more risk averse and amend their investment preferences accordingly. In short, this study assessed the acute effect of terrorism on the stock market and provided radical and comprehensive findings on their linkages during transition to democracy. It is best, therefore, to extend this analysis beyond the scope of this paper and to explore similar researches on other variables such as consumption, productivity and risk aversion for companies. Also, one more prominent reflection to point out is related to suggestions by Markoulis and Katsikides (2020), and Ilalan (2017). The authors hypothesized that investors, over time, are reacting more rationally in coping with the terror anxiety. To test this argument in a Tunisian context, future works effort can include other time periods, especially after the time period of this study, longer event window, as well as desirable information on private firms since this research have primarily analyzed publically available information. These directions can allow for a more straightforward version of the outcome of this study.

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Further reading

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(The Appendix follows overleaf)

Appendix

Table A1. Sample of listed companies (Tunisian stock market)

Monoprix (SNMVT)	Electrostar (LSTR)
Société Frigorifique et Brasserie de Tunis (SFBT)	Société de Transport des Hydrocarbures par Pipelines (STPIL)
Banque de Tunisie et des Emirates (BTE)	Société l'Accumulateur Tunisien (ASSAD)
Société de Placement et de Développement Industriel et Touristique (SPDIT)	Wifack International Bank (WIFAK)
Banque Attijari de Tunisie (TJARI)	Essoukna (SOKNA)
Banque Internationale Arabe de Tunisie (BIAT)	Societe Adwya (ADWYA)
Banque de l'Habitat (BH)	Tunisie Profiles Aluminum (TPR)
Tunisie Leasing (TLS)	Servicom (SERVI)
Banque de Tunisie (BT)	Les Ciments de Bizerte (SCB)
Air Liquide (AL)	La Société Tunisienne de Réassurance (TRE)
Union Bancaire pour le Commerce et l'Industrie (UBCI)	Ennakl Automobiles (NAKL)
Société Tunisienne de Banque (STB)	Telnet Holding (TLNET)
Banque Nationale Agricole (BNA)	Société Hexabyte (XABYT)
Amen Bank (AB)	One Tech Holding (OTH)
Arab Tunisian Bank (ATB)	New Body Line (NBL)
Union Internationale de Banques (UIB)	City Cars (CITY)
Société Immobilière et de Participation (SIMPAR)	Euro Cycles (ECYCL)
Compagnie Internationale de Leasing (CIL)	Cellcom (CELL)
Poulina Group Holding (PGH)	Société d'Articles Hygieniques (SAH)
Société Magasin General (MAG)	Manufacture de Panneaux Bois du Sud (MPBS)
Société Tunisienne d'Assurances et de Réassurances (STAR)	Societe Delice Holding (DH)
Société D'Assurances Salim (BHASS)	
Société Tunisienne De Verreries (STVR)	
Attijari Leasing (TJL)	
Société Tunisienne Industrielle du Papier et du Carton (SOTIPAPIER)	

Source(s): Table by author

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