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Assessing the Impact of Terrorist Attacks on Sovereign Risk Perception: Evidence from Turkey's CDS Market

Ecem Demirhan, Ekin Tokat, Hakkı Arda Tokat

TOBB University of Economics and Technology, Ankara, Turkey, email: ecem.demirhan@etu.edu.tr

Abstract

This study investigates the impact of terrorism on financial markets, focusing specifically on Turkey's sovereign Credit Default Swap (CDS) premiums from 2011 to 2017 – period characterized by frequent and diverse terrorist activities. Employing an EGARCH model with dummy variables for various terrorist groups, we analyze immediate and short-term market reactions across different event windows. Our findings reveal significant volatility in CDS premiums following terrorist incidents, with market responses varying depending on the terrorist group perpetrating the incident. This study enhances the understanding of capital market reactions on terrorist events through CDS instruments, highlighting their role in assessing sovereign credit and country risk.

Keywords: event studies, CDS markets, political stability, uncertainty, terrorist attacks

JEL Classification: D53, G11, G14, H56

1. Introduction

Terrorism is a significant global threat, which not only undermines social security but also inflicts deep economic wounds. Across the world, nations battle with the consequences of terrorist incidents, which range from immediate loss of life to long-term economic instability. These impacts are especially pronounced in financial markets, where the uncertainty caused by terrorism can alter investors' behavior and risk assessment significantly. As Cronin (2009) suggested, terrorism is no longer seen as a bilateral conflict between states and terrorist organizations; it is considered that a third actor, the "observer" also plays a role in this process. Within this context, international investors are among these third-party actors, whose risk perception is

immediately and significantly altered following terrorist incidents. These reactions have been extensively studied, yet there are still gaps in our understanding of them, especially in places where terrorism is a frequent occurrence.

Turkey, an emerging market within the G20, presents a unique case study in this global context. Between 2011 and 2017, Turkey experienced a continuous series of high-profile terrorist attacks by diverse groups such as ISIS, PKK, and FETO, leading to sustained geopolitical tensions. This environment provides a continuous timeline for investigating how persistent terrorist threats impact the adjustment processes of third-party actors, i.e., government, real economy, financial markets, and international investors. Moreover, Turkey's broad exposure to both politically and ethnically motivated terrorism provides a comprehensive framework to assess how different forms of terrorism influence economic indicators. Noteworthy among these were the ISIS-led Ankara bombing in October 2015, which claimed 105 lives and injured 245; and the FETO-initiated coup attempt in July 2016, which resulted in 251 deaths and 2,740 injuries.

While existing literature extensively addresses the short-term impacts of terrorism on various financial assets, including equities, bonds, commodities, and foreign exchange, the results obtained so far have been mixed. Studies such as those by Aslam and Kang (2015) and Bashir et al. (2013) have focused primarily on immediate market reactions, observing significant yet short-lived effects on stock markets. Conversely, broader macroeconomic implications, such as the effect on population growth, poverty, and political instability, have been associated with long-term negative consequences of terrorism (Araz-Takay et al., 2008; Malik and Zaman, 2013).

This study aims to investigate the effects of prolonged terrorist activities on investors' behavior in the context of Turkey, an emerging market that is fully integrated into global financial system. The article also extends the discussion by examining changes in sovereign Credit Default Swap (CDS) premiums, a metric that gauges long-term risk perceptions among international investors. These aims are motivated by the need to understand the longer-term implications of terrorism for capital markets beyond the transient stock market volatilities by employing CDS premiums as the subject of our analysis. For instance, Turkey's average benchmark CDS premium over the past decade has floated around 300, with notable increases during periods of political and social tensions, such as the Gezi protests in 2013 and the diplomatic conflict with the United States in 2016. Similarly, right after the Ankara Train Station attack, which is considered the biggest terrorist attack in the history of the country, the exchange rate of USD/TRY changed by about 1.15%, while the increase in Turkey's CDS premium was 3.5%. Sovereign CDS premiums, which investors use as a hedging tool against

the default risk of bond issuers, can be viewed as a forward-looking measure of idiosyncratic sovereign default risk as perceived by financial markets (Calice et al, 2014), and, therefore, may offer a good measure of the potential economic fears triggered by terrorism. In regard to the sovereign risk of the country, the hitherto literature has shown the sensitivity of sovereign CDS premiums to several economic and financial indicators. Determinants of sovereign CDS premiums are mostly grouped as country-specific macroeconomic factors and global uncertainty factors reflecting the investor sentiment (Calice et al., 2014; Kartal et al., 2022; Naifar, 2020). Moreover, the CDS instruments are useful tools for portfolio diversification, allowing investors to diversify their portfolios by providing exposure to credit markets without the need to directly own the underlying bonds. Therefore, any changes in CDS premiums due to terrorist attacks can lead to a change in cost of diversification and, therefore, have implications for portfolio diversification strategies.

This study aims to provide a more comprehensive understanding of the long-term financial impacts of terrorist incidents by not only focusing on CDS market but also employing a GARCH model to explore both the changes in CDS premiums and their volatility induced by terrorist activities. The GARCH methodology provides insights into the dynamics of risk perception, presenting the immediate effects of terrorist events on the perceived risk and demonstrating how these perceptions evolve with new information. Such approach is essential for understanding the long-term shifts in market behavior and investor sentiment that are often overlooked by single-event analyses.

The remainder of the paper is organized as follows. Section 2 reviews relevant literature. Section 3 describes the methodology and the data. The results are provided and discussed in Section 4. Afterwards, we conclude and discuss the implications of the obtained results.

2. Literature Review

The literature on the financial effects of terrorist incidents is vast, yet the results show considerable variability. Studies frequently indicate a transient negative impact of terrorist incidents on stock markets. Aslam and Kang (2015) and Bashir et al. (2013), which focused on the Pakistani stock market, noted substantial short-term declines following terrorist attacks. Eldor and Melnick (2004) found that intense Palestinian terrorist activities had a lasting adverse effect on the Israeli stock markets through 1990–2003, but a less pronounced impact on foreign exchange rates. Drakos (2010) assessed the daily returns of stock markets in 22 countries from 1994 to 2004, observing immediate drops in stock prices on the days of terrorist attacks, with the impact intensifying due to the psychosocial repercussions. Chen and Siems (2004) analyzed

reactions in U.S. capital markets to 14 significant terrorist attacks from 1915 to 2001, noting rapid recoveries after the attack, likely due to the stability of the U.S. banking sector.

In contrast, Ağırman et al. (2014) found no direct causal relationship between terrorism and stock market performance in their study of 35 countries from 2003 to 2011, suggesting that markets tend to correct themselves over time. Johnston and Nedelescu (2005) emphasized the resilience of well-diversified and liquid financial markets which could quickly absorb terrorist shocks, especially when supported by effective crisis management.

The scope of empirical research varies, with many studies examining the immediate effects of significant isolated terrorist events like September 11 on national markets, while others assess broader effects across multiple countries (Drakos, 2010; Chen and Siems, 2004; Chesney et al., 2011; Arin et al., 2008). Nikkinen et al. (2006) reported a brief negative impact on 53 stock markets following the September 11 attacks, with a subsequent quick rebound. Hon et al. (2004) identified spillover effects of the September 11 attacks across European financial markets. Similarly, Baumert et al. (2013) studied market reactions to the Boston Marathon bombing, finding dissimilar responses compared to the earlier incidents.

Research extending beyond stock markets includes analyses of bonds, commodities, and foreign exchange markets. Chesney et al. (2011) compared the effects of terrorism with other unexpected events like natural disasters across various financial instruments, observing significant yet varying impacts on stocks, bonds, and commodities. These findings highlight the broader financial vulnerability to terrorism, reflecting different levels of risk perception and investor reactions across asset classes, which has implications for portfolio diversification strategies.

The broader macroeconomic consequences of terrorism are also a significant area of study. Malik and Zaman (2013) link terrorism in Pakistan to long-term socio-economic challenges such as poverty and political instability. Altay et al. (2013) extend their analysis to the economies of the Middle East, including Turkey, Saudi Arabia, and Egypt, from 1996 to 2010, and discover that terrorism negatively impacts economic growth, employment, and investment levels. Furthermore, Abadie and Gardeazabal (2003, 2008) explore how terrorism influences investment decisions and GDP, showing that higher terrorism risks can discourage investments and lower GDP per capita, with specific emphasis on the economic downturn in the Basque Country due to ETA's activities.

In summary, the literature on the economic impacts of terrorism largely examines the immediate short-term effects on capital markets. Some studies have identified transitory negative impacts, while others have observed no significant market reactions or a rapid

recovery, potentially depending on the liquidity and development level of the analyzed markets. However, the studies focusing primarily on event studies or ordinary least squares regression and concentrating on variables capturing immediate market responses, may be overlooking the longer-term effects of terrorism on capital markets. To provide a more comprehensive perspective, some research has shifted towards analyzing long-term impacts through changes in sovereign credit ratings, reflecting the adjustment of sovereign risk. For instance, Procasky and Ujah (2016) explored the extended impact of terrorism on the sovereign credit ratings of 102 countries, discovering that even a moderate increase in terrorist activities results in a reduction in outlook in sovereign credit rating. Similarly, Biglaiser et al. (2023) investigated the impact of local terrorism on sovereign credit ratings, finding that terrorist attacks contribute to decreased credit ratings due to the associated security costs and political instability, which diminishes investor confidence and triggers capital flight. This study shares a perspective with the above-written analyses and examines how terrorist incidents influence investors' long-term country risk perceptions via changes in Credit Default Swaps (CDS) premiums, thus shedding light on the relatively prolonged effects in capital markets. It focuses solely on Turkey, a fully integrated emerging market closely monitored by international investors with interest in emerging markets, which between 2011 and 2017 was subjected to a series of terrorist attacks by three major terrorist groups. Employing the GARCH methodology, this study differs from the common event study and OLS methods by examining the impacts of terrorism on both the changes in CDS premiums and their volatility. It also considers the dissimilar impacts of different terrorist groups. In contrast to other studies that limit the event window to only a few days following the event, this study extends the analysis over various durations after the terrorist events to capture both immediate and sustained effects. This approach aligns with the studies by Nguyen and Chaiechi (2021) and Wang and Kutan (2013) on natural disasters, which fall under the same catastrophic events category as terrorist incidents. Nguyen and Chaiechi (2021) explore the impacts of natural catastrophes on the returns and volatility of Hong Kong stock market over periods ranging from one day to two months after the disaster, observing not only immediate negative impacts but also enduring effects that lasted up to ten days. Conversely, Wang and Kutan (2013) focused on the dissimilar impacts of natural disasters on the insurance sector and composite stock markets in Japan and the US, noting that there are significant effects on the insurance sectors dependent on the nature of the disaster, while composite stock markets exhibit robust diversification, showing no lasting impacts.

The review of previous studies highlights the complexity within the existing research on the economic impacts of terrorism on financial markets. To provide new insights, it becomes crucial to adopt methodologies that can capture both the immediate and extended impacts

of terrorism, thereby providing a clearer understanding of how such events shape financial stability and investor behavior over the longer time period. This study contributes to the literature by employing GARCH approach that considers the prolonged effects of terrorism on market dynamics, particularly through the lens of Credit Default Swaps, offering insights into the resilience and exposure of sovereign credit markets under the threat of terrorism.

3. Methodology and Data

The aim of this study is to examine the impact of terrorist attacks on Turkey's CDS premiums, which reflect investors' perception of country risk. We employ the GARCH process to capture and quantify the impact of these incidents[1]. GARCH modeling, known for allowing time-varying volatility, effectively captures market dynamics under the influence of external and unpredictable events, making it highly feasible for this study. GARCH(1,1) is a specification widely used in the literature for estimating volatility. Hansen and Lunde (2005) assessed over 300 conditional heteroscedasticity models and found that models with multiple ARCH and GARCH terms did not surpass the performance of the simpler GARCH(1,1) model. Furthermore, they demonstrated that the EGARCH(1,1) model, which incorporates asymmetry term to distinguish the differing impacts of positive and negative news on volatility, outperformed the standard GARCH(1,1). Motivated by these findings, this study utilizes the EGARCH(1,1) as follows:

$$Chg\_CDS_t = \alpha_0 = \alpha_1 Chg\_CDX_t + \alpha_2 Ret\_USD\_TRY_{t-1} + \alpha_3 TA_t + \varepsilon_t \tag{1}$$

$$\ln(h_t) = \beta_0 + \beta_1 \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \beta_2 \left(\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right) + \beta_3 \ln(h_{t-1}) + \beta_4 TA_t \tag{2}$$

Equation (1) describes the conditional mean model where the dependent variable *Chg_CDS* is the daily change in Turkey's 5-year CDS premium. As independent variables, we employ the daily change in CDX Emerging Markets Index (*Chg_CDX*) and US dollar-Turkish lira exchange rate return (*Ret_USD_TRY*). CDX Emerging Markets Index is used as a control variable to account for changes in Turkey's CDS premiums that may not be directly attributable to terrorist attacks, serving as a benchmark for global emerging market credit risk. This index

1 Preliminary analyses of the data were conducted using the event study methodology, and the results from Dependent Sample t-tests (Paired t-tests) and Wilcoxon Signed-Rank Tests revealed that out of 28 terrorist incidents, the changes in CDS premiums following five attacks showed statistically significant differences, while the volatility exhibited significant increases in 18 out of 24 incidents. These initial findings have guided the examination towards employing the GARCH methodology to model volatility and further explore the impact of terrorist events on the CDS market.

tracks the performance of credit default swaps on a diverse basket of sovereign bonds issued by emerging market countries, providing a broader market context and helping to isolate the specific impact of terrorist attacks from other simultaneous regional or global events that might affect the risk perceptions of emerging markets. The exchange rate movements of US dollar-Turkish lira are particularly relevant, as they reflect not only international economic conditions but also domestic financial soundness, directly impacting the value of Turkey's foreign currency debt and, consequently, CDS premiums. Due to the potential high sensitivity of USD/TRY to domestic events such as terrorist attacks and possible endogeneity problem where the control variables themselves could be influenced by the same events affecting the CDS premiums, the first lag of the *Ret_USD_TRY* is used. *TA* is a dummy variable that is assigned the value of one if a terrorist attack occurs and the value of zero otherwise.

Equation (2) models the natural logarithm of the conditional variance of the residuals ε_t using the EGARCH process. β_1 and β_3 represent the coefficients for ARCH and GARCH terms, respectively. β_2 denotes the coefficient of the asymmetric term which assesses whether the impact of the shock is negative or positive. To observe the impact of terrorist attacks on the conditional variance of CDS market, dummy variable TA_t is included in the conditional variance model.

4. Data

This study uses daily closing values of Turkey's five-year maturity sovereign Credit Default Swap (CDS) premiums, the CDX Emerging Market Index, and the U.S. dollar-Turkish lira spot rate (USD/TRY). Financial data for these variables are retrieved from the Bloomberg Database covering the period from 2012 to 2017.

Information on the terrorist attacks within Turkey is extracted from the Global Terrorism Database and the Presidential Institutional Communication Department of the Republic of Turkey. The Global Terrorism Database provides a comprehensive categorization of terrorist attacks by date, city, responsible group, number of casualties, target audience, and the method of attack; the data is available from 1970 to 2017.

During the period from 2011 to 2017, three primary groups were identified as responsible for significant terrorist activities within Turkey. These are PKK (Kurdistan Workers' Party), terrorist organization designated by Turkey and various other countries due to its campaign for Kurdish autonomy; ISIS (Islamic State of Iraq and Syria), recognized globally as a terrorist group for its violent jihadist operations; and FETO (Fethullahist Terrorist Organization), which the Turkish government classifies as a terrorist group following the 2016 coup attempt. The PKK was involved in 18 incidents resulting in 285 deaths and over 1,079 injuries. The attempted

coup by FETO resulted in 251 deaths and more than 2,740 injuries, while ISIS accounted for the highest number of casualties during the specified period. A more detailed categorization of the attacks, including the date, city, responsible group, the number of casualties, and the method of attack, is provided in the Appendix and summarized in Table 1.

Table 1: Terrorist Attacks in Turkey Between 2011–2017 by Terrorist Groups

Terrorist Groups	Total Number of Event	Total Number of Dead	Total Number of Injured
PKK	18	302	1,079+
ISIS	10	334	947
FETO	1	251	2,740

Source: authors' processing

The GARCH modeling is known for the estimation of the volatility of returns of financial assets, and the terminology typically involves the return of stocks, bonds, and other financial assets. CDS differ from traditional investments like stocks or bonds; they are insurance-like contracts against default risk. Then, the term 'return' is not entirely applicable to CDS as it suggests gains from asset appreciation. Therefore, in this study, we choose to use the term 'daily change' to describe fluctuations in CDS premiums and CDX[2]. Table 2 lists the descriptive statistics for the daily change in CDS and CDX EM Index and the USD/TRY return, presented as log differences of each corresponding series. As it is common for high frequency financial data, no series are normally distributed. Along with high kurtosis and positive skewness, the Jarque-Bera test provides evidence against the hypothesis of normality in all series (the null hypothesis of Skewness = 0 and Kurtosis = 3). The Ljung-Box Q statistics and Engle ARCH statistics indicate the presence of serial correlation and conditional heteroscedasticity in series' variance. Thus, a model incorporating ARCH or GARCH terms is likely appropriate for the data. All series are found to be stationary based on Phillips-Perron unit-root tests results.

2 For a more comprehensive discussion highlighting the need to differentiate between variations in credit spreads and true CDS returns from selling or buying of CDS contracts, see Augustin, Saleh and Xu (2020).

Table 2: Descriptive Statistics

Descriptive Statistics	Chg_CDS	Chg_CDX	Ret_USD_TRY
Mean	1.77E-05	–0.000401	0.000123
Std. Dev.	0.028232	0.0288	0.01098
Skewness	0.450687	–1.880548	–9.735281
Kurtosis	7.616709	28.44617	183.3291
Jarque-Bera	1248.302	37328.27	1855978
Probability	0.000	0.000	0.000
Q(10)	62.236	19.762	7.2024
p-value	0.000	0.032	0.706
ARCH(1)			
p-value	0.000	0.000	0.000

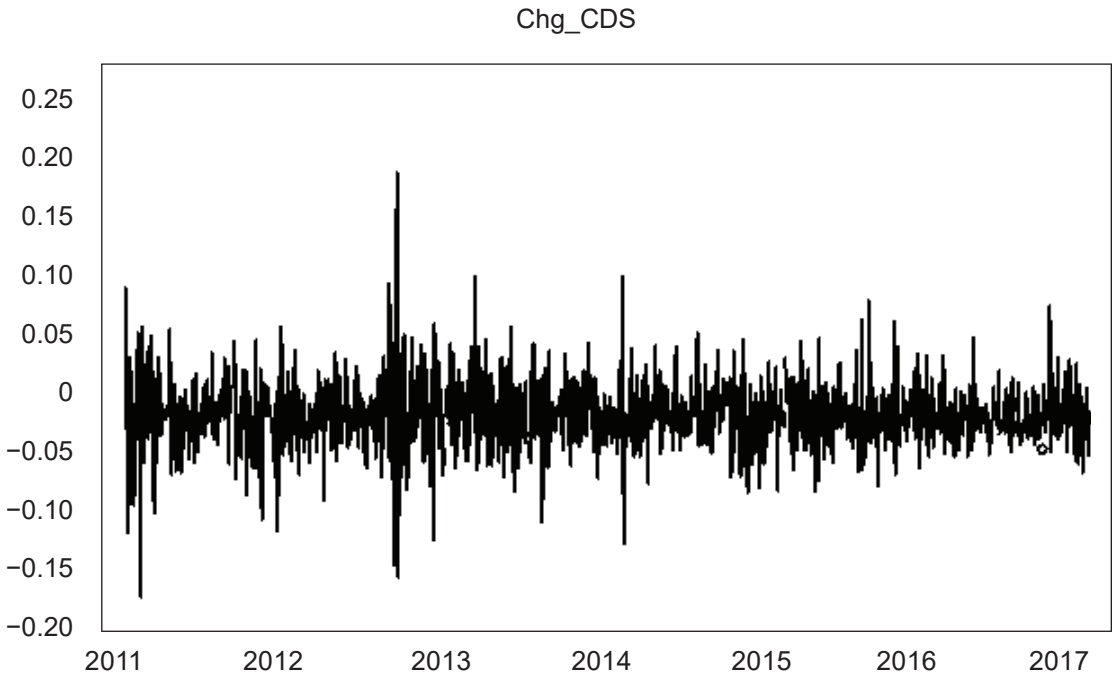
Notes: Q(10) is the Ljung-Box statistics for serial correlation. The Jarque-Bera statistic is used for the testing of normality in distrubition. ARCH(1) statistic tests for the heteroscedasticity in the models for the first moments. The stationarity of the series was examined using the Phillips-Perron test, and the probability values for all variables are 0.000

Source: authors' calculations

The volatility pattern in Turkey's CDS market can be observed from the development of daily changes in CDS premiums displayed in Figure 1. It illustrates that high volatility periods often occur consecutively, which is a phenomenon known as volatility clustering. This observation is consistent with the statistical finding of excess kurtosis suggesting time varying volatility.

To analyze the dynamic impacts of terrorist events on Turkey's CDS market, a dummy variable for terrorist attacks was included in both the conditional mean and variance equations of the EGARCH model (Model I). This model was estimated across three event windows – 1 day, 5 days, and 10 days – to capture immediate and short-term market reactions. The maximum duration for these windows is limited to 10 days due to the frequency of attacks and the overlapping of events, ensuring the isolation of individual attack impacts. The one-day window focuses on the day of the attack, assessing immediate market reactions in order to understand the first shock response, while the 5-day and 10-day windows allow us to observe the persistence and decay of this impact on market stability and investor behavior.

Figure 1: Daily Change in Turkey's 5-year CDS Premium



Source: authors' calculations

Results and Discussion

Model I estimations for different windows indicate a consistent and significant influence of the CDX EM Index and the USD/TRY exchange rate on Turkey's CDS premiums, highlighting investor sensitivity to broader emerging market risks and the depreciation of the Turkish lira. Sharp fluctuations in USD/TRY often reflect foreign investor activities, with the weakening of the lira seen as a strong signal of capital flight, thereby increasing perceived country risk. For instance, in the model with a 1-day event window, a 10% depreciation of the Turkish lira corresponds to a 3.18% increase in Turkey's CDS premiums.

For the shortest event window (1-day), the coefficient for *TA* is significant at the 1% level, indicating an immediate and significant response of the CDS premiums to terrorist attacks, which increase by approximately 0.75% following the attack. This immediate response captures the initial impact of the attack, reflecting the heightened risk perception among investors. This immediate effect decreases in the 5-day event window, where the coefficient for the terrorist attack dummy remains significant but is considerably lower (0.52%), indicating that the effect of the attacks continues but with decreasing intensity. In the 10-day event window, there is

impact of the attack, reflecting a market adjustment and diminishing sensitivity to the initial terrorist threat. Similarly, in the conditional variance equation, the coefficients of *TA* dummy also remained significant for the event window of 1 and 5 days, highlighting an increase in market volatility for up to 5 days following a terrorist attackk, which reflect the market's reaction to such events. However, the initial positive response in market volatility seems to be diminishing in 10-days window, which points towards a market adjustment to the terrorist attack's immediate impacts.

To further refine the analysis of terrorist attacks on Turkey's CDS market, individual dummy variables are employed to represent each major terrorist group – *ISIS, PKK,* and *FETO* – and the analysis was conducted over three event windows (1-day, 5-day, and 10-day) again (Model II). The results from the Model II's mean equation provide insight into how terrorist attacks by different groups impact Turkey's CDS market. Firstly, both control variables – CDX EM Index and USD/TRY rate – show highly significant effects across all windows, indicating a consistent sensitivity of Turkey's CDS premiums to changes in broader emerging market conditions and currency valuation. Regarding the impact of terrorist attacks based on the group, ISIS-related attacks have a significant immediate effect on CDS premiums, with a noticeable impact in the 1-day window that diminishes over the 5-day and 10-day range, suggesting a rapid adjustment of market risk perceptions to ISIS events (as opposed to findings of Gulley and Sultan, 2009). One interesting finding is market's significant reaction to FETO in longer windows (5-day and 10-day). The impact of FETO in the longer event windows (5-day and 10-day) likely stems from the nature of the 2016 coup attempt, FETO's only event in the dataset. This extraordinary event drove Turkey into a state of emergency, creating significant uncertainty and chaos, which likely caused delayed and extended financial market reactions as the flow of information was disrupted and investors took longer to assess the event's implications. The late yet sustained response in the CDS market suggests a continued evaluation of the attempted coup's broader economic and political consequences. Conversely, PKK attacks do not show a significant impact in any of the windows, suggesting that the market has potentially normalized the risk associated with these incidents, possibly due to the group's long-standing activity and historical presence in the region since 1984. Our results emphasize the impact of the nature of terrorist incidents on financial market reactions, underlining the importance of considering the specific characteristics of each terrorist group and event for evaluating their economic impact.

Post-estimation diagnostic tests, including ARCH results, indicate no significant auto-correlation or heteroscedasticity, affirming the model's robustness; the findings are reported in Table 3.

Table 3: E-GARCH for Terrorist Attacks and CDS

	MODEL I			MODEL II		
Event window	**1**	**5**	**10**	**1**	**5**	**10**
Panel A - Conditional Mean Equation						
Constant	−0.0006	−0.0007	−0.0004	−0.0006	−0.0007	−0.0006
Chg_CDX	0.4548***	0.4558***	0.4490***	0.4537***	0.4563***	0.4536***
Ret_USD_TRY	0.3184***	0.3134***	0.2648***	0.3048***	0.2971***	0.3052***
TA	0.0075***	0.0052***	0.0015			
ISIS				0.0137***	0.0080***	0.0057***
FETO				0.0355	0.0416***	0.0250***
PKK				0.0017	0.0010	−0.0010
Panel B - Conditional Variance Equation						
β_0	−0.3640***	−0.3829***	−0.3733***	−0.4045***	−0.3791***	−0.3701***
β_1	0.1724***	0.1734***	0.1693***	0.1778***	0.1726***	0.1707***
β_2	−0.0242*	−0.0286*	−0.0296*	−0.0292*	−0.0281*	−0.0239
β_3	0.9691***	0.9665***	0.9673***	0.9640***	0.9669***	0.9679***
TA	0.0988***	0.0324**	0.0180**			
ISIS				0.1106	0.0172	0.0064
FETO				0.6948**	0,1527	0.0446
PKK				−0.0490	0,0066	0.0100
Panel C - Diagnostic Tests						
Log-likelihood	3181.4	3180.1	3179.1	3179.1	3188.5	3182.8
$Q^2(10)$ Serial Correlation	0.8860	0.9010	0.8700	0.9120	0.9230	0.9610
Q(10) ARCH Effects	0.8780	0.8932	0.8558	0.9117	0.9222	0.9591

Notes: ***, **, * denote significance level at 1%, 5%, and 10% levels, respectively. The table presents the probability values of the ARCH LM test results and the Ljung-Box Q-Statistic test results.

Source: authors' calculations

Conclusion

The aim of this study was to examine the effects of terrorism on financial markets, with a specific focus on Turkey's Credit Default Swap (CDS) premiums. Utilizing a distinct dataset derived from Turkey's extensive experience with terrorism from 2011 to 2017, this research employed an EGARCH model enhanced with dummy variables representing different terrorist groups. By analyzing the immediate and short-term market reactions within 1-day, 5-day, and 10-day event windows, the study offered deeper insights into the dynamics of how terrorist attacks impact investor behavior and market volatility.

Our findings indicate that terrorist incidents lead to significant fluctuations in CDS premiums, underlining heightened market sensitivity for up to five days following the attack. Notably, the impact of ISIS-related attacks was immediate and significant, while the influence from FETO, particularly driven by the unique circumstances of the 2016 coup attempt, was more pronounced over extended periods. Conversely, the effects of PKK-related incidents were negligible, suggesting a market acclimatization to their activities over time.

This study contributes to the understanding of long-term effects of terrorism on capital markets through the channel of CDS markets, which can offer valuable guidance to investors, policymakers, and other stakeholders in constructing informed risk management strategies and understanding the broader implications of terrorism for country-specific financial stability. CDSs are instrumental as they serve as proxies for international investors' long-term expectations regarding sovereign credit and country risk. Sovereign CDSs are not only indicators of risk perception but also act as hedging tools against sovereign credit risks and provide alternatives to direct credit instruments, offering diversified way to access credit markets. One implication of our results is that the investors should not overly adjust their portfolio strategies based on immediate fluctuations following terrorist events but rather focus on long-term trends and stability. Moreover, we believe that the study's findings are relevant for the current period, when geopolitical risks are returning to the investors' agenda.

References

Abadie, A., Gardeazabal, J. (2003). The Economic Costs of Conflict: A Case Study for the Basque Country. *American Economic Review*, 93(1), 113–132. https://doi.org/10.1257/000282803321455188

Abadie, A., Gardeazabal, J. (2008). Terrorism and the World Economy. *European Economic Review*, 52(1), 1–27. https://doi.org/10.1016/j.euroecorev.2007.08.005

Ağırman, E., Özcan, M., Yılmaz, Ö. (2014). Terörizmin Finansal Piyasalara Etkisi: Ampirik Bir Çalışma. *BDDK Bankacılık ve Finansal Piyasalar*, 8(2), 99–117.

Altay, H., Ekinci, A., Peçe, M. A. (2013). Ortadoğu'da Terörün Ekonomik Etkileri: Türkiye, Mısır ve Suudi Arabistan Üzerine Bir İnceleme. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, 37, 1–22.

Araz-Takay, B., Arin, K. P., Omay, T. (2008). The Endogenous and Non-Linear Relationship Between Terrorism and Economic Performance: Turkish Evidence. *Defence and Peace Economics*, 20(1), 1–10. https://doi.org/10.1080/10242690701775509

Arin, K. P., Ciferri, D., Spagnolo, D. (2008). The Price of Terror: The Effects of Terrorism on Stock Market Returns and Volatility. *Economics Letters*, 101, 164–167. https://doi.org/10.1016/j.econlet.2008.07.007

Aslam, F., Kang, H. G. (2015). How Different Terrorist Attacks Affect Stock Markets. *Defence and Peace Economics*, 26(6), 634–648. https://doi.org/10.1080/10242694.2013.832555

Augustin, P., Saleh, F., Xu, H. (2020). CDS Returns. *Journal of Economic Dynamics and Control*, 118, 103977. https://doi.org/10.1016/j.jedc.2020.103977

Bashir, U., Haq, I., Gillani, S. M. A. H. (2013). Influence of Terrorist Activities on Financial Markets: Evidence from KSE. *Financial Assets and Investing*, 2, 5–13. https://doi.org/10.5817/FAI2013-2-1

Baumert, T., Buesa, M., Lynch, T. (2013). The Impact of Terrorism On Stock Markets: The Boston Bombing Experience in Comparison with Previous Terrorist Events. *Instituto de Análisis Industrial y Financiero*, 88.

Biglaiser, G., Hunter, L. Y., McGauvran, R. J. (2023). Domestic Terrorism and Sovereign Bond Ratings in the Developing World. *Terrorism and Political Violence*, 35(4), 754–784. https://doi.org/10.1080/09546553.2021.1974004

Calice, G., Miao, R., Štěrba, F., Vašíček, B. (2014). Short-Term Determinants of the Idiosyncratic Sovereign Risk Premium: A Regime-Dependent Analysis for European Credit Default Swaps. *ECB Working Paper Series,* No. 1717. https://doi.org/10.1016/j.jempfin.2015.03.018

Chen, A. H., Siems, T. (2004). The Effects on Terrorism on Global Capital Markets. *Journal of Political Economy*, 20, 349–366. https://doi.org/10.1016/j.ejpoleco.2003.12.005

Chesney, M., Reshetar, G., Karaman, M. (2011). The Impact of Terrorism on Financial Markets: An Empirical Study. *Journal of Banking & Finance*, 35(2), 253–267. https://doi.org/10.1016/j.jbankfin.2010.07.026

Cronin, A. K. (2009). How Terrorism Ends: Understanding The Decline and Demise of Terrorist Campaigns. Princeton, NJ: Princeton University Press.

Drakos, K. (2010). Terrorism Activity, Investor Sentiment, and Stock Returns. *Review of Financial Economics*, 19, 128–135. https://doi.org/10.1016/j.rfe.2010.01.001

Eldor, R., Melnick, R. (2004). Financial Markets and Terrorism: The Perspective of The Two Sides of The Conflict. *Journal of Business Administration Research*, 1, 18–29. https://doi.org/10.5430/jbar.v1n2p18

Gulley, O. D., Sultan, J. (2009). Risk Premium, Volatility, and Terrorism: New Evidence. In M. J. Morgan (Ed.), *The Impact of 9/11 on Business and Economics: The Day That Changed Everything*, Palgrave Macmillan, New York, 13, 185–209.

Hon, M. T., Strauss, J., Yong, S. Y. (2004). Contagion in Financial Markets After September 11: Myth or Reality. *Journal of Financial Research*, 27, 95–114. https://doi.org/10.1111/j.1475-6803.2004.00079

Johnston, R. B., Nedelescu, O. M. (2005). The Impact of Terrorism on Financial Markets. *Journal of Financial Crime*, 13(1), 7–25.

Kartal, M. T., Ertuğrul, H. M., Ayhan, F. (2022). Determinants of Sovereign Credit Default SWAP (CDS) Spreads in Emerging Countries: Evidence from Turkey. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 40(4), 742–761. https://doi.org/10.17065/huniibf.1054042

Malik, Z., Zaman, K. (2013). Macroeconomic Consequences of Terrorism in Pakistan. *Journal of Policy Modeling*, 35, 1103–1123. https://doi.org/10.1016/j.jpolmod.2013.08.002

Naifar, N. (2020). What Explains the Sovereign Credit Default Swap Spreads Changes in the GCC Region? *Journal of Risk and Financial Management*, 13(10), 245. https://doi.org/10.3390/jrfm13100245

Nguyen, T., Chaiechi, T. (2021). The Effects of Natural Disasters on Stock Market Return and Volatility in Hong Kong. *In Economic Effects of Natural Disasters*, 11–20, Academic Press. https://doi.org/10.1016/B978-0-12-817465-4.00002-9

Nikkinen, J., Omran, M. M., Sahlström, P., Äijö, J. (2006). Stock Returns and Volatility Following the September 11 Attacks: Evidence from 53 Equity Markets. *International Review of Financial Analysis*, 17, 27–46. https://doi.org/10.1016/j.irfa.2006.12.002

Procasky, W. J., Ujah, N. U. (2016). Terrorism and its Impact on the Cost of Debt. *Journal of International Money and Finance*, 60, 253–266. https://doi.org/10.1016/j.jimonfin.2015.04.007

Wang, L., Kutan, A. M. (2013). The Impact of Natural Disasters on Stock Markets: Evidence from Japan and the US. *Comparative Economic Studies*, 55, 672–686.

Appendix

Table A1: Terrorist Attacks Occurred in Turkey Between 2011–2017

City	Terror Incident Date	Terrorist Group	Number of Dead	Number of Injured	Description
Hatay	11.05.2013	ISIS	26	70	Reyhanlı town center; attack carried out by the explosion of explosives loaded onto 2 vehicles
Diyarbakır	05.06.2015	ISIS	2	51	The terrorist attack that occurred during the HDP's rally at İstasyon Meydanı
Suruç	20.07.2015	ISIS	34	101	The suicide attack that took place while members of the Socialist Youth Associations Federation gathered to deliver aid to Kobani and were making a press statement
Ankara	10.10.2015	ISIS	105	245	The attack that occurred at Ankara Train Station
İstanbul	12.01.2016	ISIS	13	13	The suicide attack that took place in Sultanahmet
İstanbul	19.03.2016	ISIS	5	36	The suicide bomb attack on Istiklal Avenue
Gaziantep	01.05.2016	ISIS	4	34	The attack involving a car bomb exploding on the street where the Metropolitan Municipality, Tax Office Directorate, and Provincial Police Department service buildings are located
İstanbul	28.06.2016	ISIS	48	235	The terrorist attack that occurred at Atatürk Airport
Gaziantep	20.08.2016	ISIS	58	91	The suicide bomb attack at a wedding
İstanbul	01.01.2017	ISIS	39	71	The armed attack on the Reina nightclub
Ankara-İstanbul	15.07.2016	FETO	251	2.740	The coup attempt
Ankara	20.09.2011	PKK	5	15	The terrorist attack that occurred on Kumrular Street in front of the Çankaya District Governorship
Gaziantep	20.08.2012	PKK	10	67	The terrorist attack on the police station with a car bomb
İstanbul	10.08.2015	PKK	3	0	The attack on the Fatih Police Station with a car bomb

Ankara	17.02.2016	PKK	29	61	The terrorist attack in Çankaya district, where a car loaded with explosives approached military service vehicles and detonated
Şırnak	08.03.2016	PKK	14	1	The bomb attack in İdil
Ankara	13.03.2016	PKK	37	71	The suicide bomb attack that took place in Güvenpark
Diyarbakır	10.05.2016	PKK	5	43	The bomb attack on a police minibus
İstanbul	07.06.2016	PKK	13	36	The attack on the riot police team
Mardin	08.06.2016	PKK	7	51	The terrorist attack on the Mardin Police Department with a car bomb
Hakkari	08.07.2016	PKK	17	0	The terrorist attack on a military zone in Şemdinli
Hakkari	30.07.2016	PKK	35	25	The terrorist attack targeting the military in Çukurca
Diyarbakır	15.08.2016	PKK	8	44	The attack on a police checkpoint on the highway with a car bomb
Şırnak	26.08.2016	PKK	13	77	The attack on the Riot Police Branch Directorate
Hakkari	09.10.2016	PKK	19	26	The bomb attack on Şemdinli Durak Police Station with a car bomb
Diyarbakır	04.11.2016	PKK	12	100+	The terrorist attack with a car bomb near the additional building where the Anti-Terrorism and Riot Police branch directorates of the Provincial Police Department are located
Hakkari	03.12.2016	PKK	20	0	The attack on the military in Çukurca
İstanbul	10.12.2016	PKK	48	150	The bomb attack with a car bomb at the gathering point of riot police units after a match at the stadium
Diyarbakır	31.03.2016	PKK	7	27	The terrorist attack with a car bomb during the passage of a police vehicle

Source: authors' processing