



Natural disasters, investor sentiments and stock market reactions: Evidence from Turkey–Syria earthquakes

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ABSTRACT

This study provides stylised facts on the relationships between natural disasters, investor sentiments and stock market performance using the recent Turkey–Syria earthquakes. We employ daily stock market data relating to Turkey's 21 major trading partners and find significant negative impact of the disaster on the sampled countries' stock market returns, particularly for countries near Turkey.

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1. Introduction

“The devastating earthquakes in Turkey and Syria are expected to have an impact on not just their economies but also on a global scale.” [Financial Times, 9 February 2023.]

On February 6, 2023, powerful 7.7 and 7.8 magnitude earthquakes struck Turkey's Southeast and neighbouring Syria, killing tens of thousands of people, destroying homes, and leaving millions of people homeless. A day later, the main index of Istanbul's stock exchange witnessed a sharp drop of about 7% (Markets Insider, 2023) leading to an immediate suspension of trading to avert panic selloffs. Similarly, the stock markets of some of Turkey's largest European trading partners, specifically UK and Germany, witnessed about 1% drop in price (Markets Insider, 2023). Considering Turkey's geographical and economic

importance¹ to world trade, this natural disaster raises important questions about its impact on global investor sentiments and stock market outcomes. To our knowledge, this paper is the first to explore such a relationship.

To this end, we draw on the behavioural strand of finance and employ daily stock market data from 21 countries over the period from 1 February 2023 to 20 February 2023. Our findings show an immediate negative and significant impact of the disaster on the stock market returns of the sampled countries. Seemingly, the negative response of the stock markets to the disaster shows that there is a contagion of investors' sentiments. Specifically, when we interact the earthquake variable with the proxy for economic ties (the percentage of Turkey's export to each sampled country), we observe a further significant negative impact on the market returns. Additionally, an increase in the total number of deaths also reveals a significant negative impact on the sampled countries' stock returns. Lastly, we observe that the negative

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¹ Geographically, Turkey is located between Europe and Asia, and serves as a vital route for global shipping. Economically, Turkey is one of the G-20 countries and plays a key role in world trade.

Table 1
Natural disaster and stock market returns.

	Stock market returns		
	Model 1	Model 2	Model 3
Earthquake	−2.019** (0.16)	−1.355*** (0.44)	−0.967*** (0.39)
Earthquake*economic ties	−1.650* (0.22)	−0.221** (0.30)	−0.105* (0.19)
Deaths	−0.108*** (0.05)	−1.301* (0.55)	−0.278** (0.11)
Number of countries	21	21	21
Country fixed effect	Yes	Yes	Yes
Day fixed effect	Yes	Yes	Yes
R ²	0.318	0.226	0.401

This table shows the impact of Turkey–Syria earthquake on the returns of global stock market using Turkey's major trading partners as samples. Models 1, 2 and 3 above denote Panel OLS, GLM and Prais–Winsten regression models, respectively. The coefficients of the explanatory variables are shown above while the robust standard errors are quoted in parenthesis. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

impact of the disaster was more pronounced for stock markets geographically closer to Turkey than those very distant from it.

Our findings offer some important contributions. First, the results provide an insight into the dynamic connectedness between asset prices and investor sentiment in the wake of natural disasters. This allows investors, portfolio managers and policy-makers to properly design investment strategies in the event of any future disaster. Second, by investigating the impact of the earthquake on investor sentiments and stock market reactions, we complement the current body of knowledge in behavioural finance on the relationship between natural disasters and stock market performance (such as [Shan and Gong, 2012](#); [Boudreaux et al., 2019](#); [Malik et al., 2020](#)).

The rest of the paper is structured as follows. The next section shows the data and empirical strategy, followed by the results in Section 3 and the paper is concluded in Section 4.

2. Data and empirical strategy

We use daily stock market data of 21 sampled countries that are Turkey's major trading partners.² and cover the period from 1 February 2023 to 20 February 2023 (the day when most rescue efforts were halted). Daily index data of the markets was obtained from <https://www.investing.com/>. We refine the price index of each stock market to returns using their daily logs and then estimate the impact of the explanatory variables on the returns.

For the explanatory variables, first we measure investor sentiment by using data on search volumes related to the Turkey–Syria earthquakes, downloaded from Wikipedia Trends.³ Furthermore, we use data on the percentage of export to the sampled countries and, finally, data on increase/decrease in the daily official number of deaths. To analyse the impact of the explanatory variables on

stock market returns, we use a normal panel regression (Eq. (1)) and for robustness, we use both generalised linear model (GLM) (Eq. (2)) and Prais–Winsten regression (to correct for potential endogeneity and cross-sectional dependence) (Eq. (3)). The equations are shown below:

$$\text{Returns}_{it} = \beta_0 + \beta_1 \text{Earthquake}_{it} + \beta_2 \text{Earthquake}^* \text{Economic ties}_{it} + \beta_3 \text{Deaths}_{it} + \theta_t + \lambda_i + \epsilon_{it} \quad (1)$$

$$g(\text{Returns}_{it}) = \beta_0 + \beta_{it} X_{it} + \epsilon_{it} \quad (2)$$

$$\epsilon_{it} = \alpha \epsilon_{it-1} + \beta_{it} \quad (3)$$

where *Returns* represent the log of the daily price index of country *i* on day *t*. *Earthquake* denotes the log of internet search intensity related to the Turkey–Syria earthquake on Wikipedia in country *i* on day *t*. We further interact the earthquake data with economic ties – percentage of Turkey's exports to the sampled countries – to ascertain the moderating impact. *Deaths* stand for changes in the daily announced total number of deaths. We adopt a country-level clustered and robust standard error. We also control for both time and country fixed effects in the regression model using θ_t and λ_i , respectively.

3. Results

This section of the paper provides stylised facts with respect to the relationships among natural disasters, investor sentiments and market performance. Basically, we generate four outputs. First, we assess the impact of the earthquake on the stock market returns of the sampled countries. Next, we explore if there is a significant difference in the returns of the countries pre- and post- earthquake. In the third analysis, we investigate how sampled stock markets recovered from the disaster in subsequent days. Finally, we examine whether the impact of the earthquake varies by geographical distance to Turkey.

In [Table 1](#), our findings reveal a negative and statistically significant relationship at the 1% level between the earthquake disaster and the returns of the sampled stock markets. Essentially, the results indicate that an increase in the number of deaths, moderating variable and search intensity significantly reduces the returns of the market. This suggests that investors reacted negatively to the earthquake event and the markets suffered some decline. Our result is in tandem with prior studies that have also found significant negative relationship between natural disasters and stock market performance ([Toya and Skidmore, 2007](#); [Berkman et al., 2011](#); [Malik et al., 2023](#); [Paterson et al., 2023](#)). For instance, [Bourdeau-Brien and Kryzanowski \(2017\)](#) report that major natural disasters often increase risk aversion and induce abnormal stock returns and volatilities.

² Although the earthquakes rocked both Turkey and Syria, it is difficult to analyse data relating to Syria due to Western sanctions that affect Syria's economic and financial systems. Turkey's largest trading partners and the percentage of exports (in parenthesis) include: Germany: US\$19.3 billion (8.6% of total Turkish exports), United States of America: \$14.7 billion (6.5%), United Kingdom: \$13.7 billion (6.1%), Italy: \$11.5 billion (5.1%), Iraq: \$11.1 billion (4.9%), Spain: \$9.6 billion (4.3%), France: \$9.1 billion (4.1%), Netherlands: \$6.8 billion (3%), Israel: \$6.4 billion (2.8%), Russia: \$5.8 billion (2.6%), United Arab Emirates: \$5.5 billion (2.4%), Romania: \$5.2 billion (2.3%), Belgium: \$4.9 billion (2.2%), Poland: \$4.7 billion (2.1%), Egypt: \$4.5 billion (2%), Bulgaria: \$4 billion (1.8%), China: \$3.7 billion (1.6%), Greece: \$3.1 billion (1.4%), Morocco: \$3 billion (1.3%), Ukraine: \$2.9 billion (1.3%), Iran: \$2.8 billion (1.2%), Libya: \$2.8 billion (1.2%), Azerbaijan: \$2.3 billion (1%), Syrian Arab Republic: \$2.1 billion (0.9%), Serbia: \$2 billion (0.9%) (Source: World Trade Organisation, 2022). During the sampling process, we dropped some countries without functional stock market such as Iraq, Libya, and Syria.

³ In estimating the sentiment variable, we follow the methodological approach of [Boungou and Yatié \(2022\)](#).

Table 2
Stock market returns of countries pre and post natural disaster.

	Stock market returns		
	Full period	Before	After
Earthquake	−0.433* (0.01)	−0.127 (0.09)	−1.003*** (0.20)
Earthquake*economic ties	−0.330*** (0.19)	−1.002 (0.10)	−0.012** (0.00)
Deaths	−0.04** (0.12)	−0.020 (0.33)	−0.115** (0.08)
Number of countries	21	21	21
Country fixed effect	Yes	Yes	Yes
Day fixed effect	Yes	Yes	Yes
R ²	0.227	0.410	0.336

This table shows the impact of Turkey–Syria earthquake on the returns of global stock market pre and post the earthquake disaster. Columns 2, 3 and 4 above respectively represent the market returns for the full, before and after the disaster periods. The coefficients of the explanatory variables are shown above while the robust standard errors are quoted in parenthesis. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Table 3
Natural disaster and stock market returns days after event.

	Stock market returns			
	1 day after	3 days after	5 days after	10 days after
Earthquake	−0.680*** (0.22)	−0.452* (0.10)	−1.283 (0.12)	−0.463 (0.07)
Earthquake*economic ties	−0.459*** (0.02)	−1.550*** (0.20)	−0.467* (0.19)	−0.355 (0.19)
Deaths	−0.982** (0.03)	−0.369** (0.01)	−0.448 (0.12)	−0.573 (0.30)
Number of countries	21	21	21	21
Country fixed effect	Yes	Yes	Yes	Yes
Day fixed effect	Yes	Yes	Yes	Yes
R ²	0.192	0.325	0.129	0.141

This table shows the impact of Turkey–Syria earthquake on the returns of global stock market days after the earthquake disaster. Columns 2, 3, 4 and 5 above respectively represent the market returns for 1, 3, 5 and 10 days after the disaster periods. The coefficients of the explanatory variables are shown above while the robust standard errors are quoted in parenthesis. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Table 4
Natural disaster and stock market returns based on geography.

	Close proximity	Distant
Earthquake	−0.384* (0.20)	−1.020 (0.09)
Earthquake*economic ties	−1.330** (0.01)	−0.266 (0.50)
Deaths	−0.055** (0.00)	−0.359** (0.12)
Country fixed effect	Yes	Yes
Day fixed effect	Yes	Yes
R ²	0.187	0.260

This table shows the impact of Turkey–Syria earthquake on the returns of markets based on the proximity to the epicentre. Column 2 shows the returns for markets close to Turkey while column 3 represents the market returns for countries distant from Turkey. The coefficients of the explanatory variables are shown above while the robust standard errors are quoted in parenthesis. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

In Table 2, we divide our sample into subsamples and explore whether a significant difference exists in the returns of the market before and after the earthquakes. Our results are consistent with the initial findings as the output shows the presence of a significant difference, particularly after the earthquakes.

In Table 3, we deepen our analysis by investigating the reactions of the sampled stock markets a day, 3 days, 5 days, and 10 days after the earthquakes. The results reveal that the returns of the markets on the first and third days after the event were negatively impacted but started recovering thereafter.

Lastly, we conduct a check on the impact of the earthquakes on stock markets located close to Turkey vs those more distant

from it. We account for geographical variation by investigating if the market returns could vary by proximity to the epicentre. Previous studies show empirical differences between performance of financial markets in Europe and those in Middle-East (Yartey and Adjasi, 2007; Narayan et al., 2011). To this end, we divide our sample based on distance of the markets to the location of the disaster. The results in Table 4 show that markets within proximity suffered more than those geographically farther.

4. Conclusion

In this paper, we provide the first empirical evidence of the impact of the Turkey–Syria earthquakes on stock market returns

using daily stock market data of Turkey's 21 largest trading partners, over the period from 6 February 2023 to 20 February 2023. Our results reveal an immediate negative and significant impact of the disaster on the stock market returns of the sampled countries. Our findings provide important information for relevant stakeholders in the stock market and resonate with prior studies on the relationship between natural disasters and stock markets. Our study creates fresh avenue for further research. We address the impact of natural disasters on global market behaviour using returns of the sampled markets. Future research may illuminate on the impact of natural disasters on market volatility. Shedding light on this area would provide immense benefits to the corporate world and academic community.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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