The Impact Of 6 February Earthquake On The Stock Returns In Damascus Securities Exchange (DSE) (An Event Study)

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□ ABSTRACT □

This research investigated the effects of the 06.02.2023 earthquake as a natural disaster hits parts of Syria on daily stock returns of firms listed in Damascus securities exchange (DSE) by using an event study methodology to detect an abnormal returns around the event day.

The data used consists of the stock close prices of firms listed in DSE and the Damascus securities exchange index (DWX) prices**,** it obtained from the website of DSE at: http://www.dse.gov.sy**.**

The research found that there is a negative impact of earthquake on the stock prices/ returns of firms listed in DSE, and on market index prices in the post-event period, but its severity and time of occurrence differed for the sectors.

The researcher recommended that company managers take care of risk management in order to avoid the negative effects of future sudden and unexpected events.

Key words: Earthquake, Event Study, Damascus Securities Exchange, Stock Returns.

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أثر زلزال 6 شباط على عوائد الأسهم في سوق دمشق للأوراق المالية (دراسة حدث)

الدكتور منذر مرهج*

(تاريخ الإيداع 8 / 4 / 2023. قُبِل للنشر في 25 / 5 / 2023)

□ ملخّص □

تقصى هذا البحث آثار زلزال 6 شباط 2023 ككارثة طبيعية ضربت أجزاء من سورية، على عوائد الأسهم اليومية للشركات المدرجة في سوق دمشق للأوراق المالية (DSE) باستخدام منهجية دراسة الحدث للكشف عن العوائد غير العادية حول يوم الحدث.

تتكون البيانات المستخدمة من أسعار إغلاق أسهم الشركات المدرجة في سوق دمشق للأوراق المالية وأسعار المؤشر المثقل بالقيمة السوقية لسوق دمشق للأوراق المالية (DWX)، والتي تم الحصول عليها من موقع سوق دمشق للأوراق المالية على العنوان: http: //www.dse.gov.sy.

وجد البحث أن هناك تأثيراً سلبياً للزلزال على أسعار/ عوائد أسهم الشركات المدرجة في سوق دمشق للأوراق المالية، وعلى أسعار مؤشر السوق في فترة ما بعد الحدث، ولكن شدة التأثير ووقت حدوثه اختلفت فيما بين قطاعات السوق.

وأوصى الباحث مديري الشركات بالاهتمام بإدارة المخاطر لتلافي الآثار السلبية للأحداث المستقبلية المفاجئة وغير المتوقعة.

الكلمات المفتاحية: الزلزال، دراسة الحدث، سوق دمشق للأوراق المالية، عوائد الأسهم.

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1. Introduction:

Natural hazards were not, until a relatively short time ago, part of Syrian environment, until the 6 Feb. 2023 where a strong earthquake struck both Syria and Turkey, as a sudden and unpredictable natural event that had wide effects on property and lives.
Hence, this research comes to examine the impact of such natural disasters on stock returns using an event study methodology which is an empirical analysis that is normally used to measure the effect of an event on stock prices/ returns.
Finance theories suggest that capital market reflects the information of firms in its stock prices, the event study methodology is a statistical method to examine the behavior of firms' stock prices around an event, however, based on previous studies and event analysis of natural disasters' impact on stock markets, the researcher expected that the 6. Feb. earthquake has a short-term negative impact on Syrian securities exchange (DSE).

2. Research Objective:

The objective of the research is to examine how different sectors of the economy affected by the 6. Feb. 2023 earthquake as a sudden and unanticipated natural event, and how it affected the stock returns of firms listed in Damascus Securities Exchange.

3. Research Importance:

The research derives its practical importance in terms of providing new evidence for the impact of natural disasters (6. Feb. 2023 earthquake) on Syrian capital market.
It derives its scientific importance also from being the first research to investigate this impact at the local level using the event study methodology, and contributes to the relevant literature.

4. Research Issue:

The researcher raised his interest the effects of the earthquake as an unexpected natural event on the performance of various economic sectors in the capital market represented by the firms listed in it, which necessitated asking the following question:
Did the earthquake of 06. 02. 2023 as a sudden natural event affect the prices/returns of stocks of firms listed in the Damascus Securities Exchange (DSE)?

5. Research Hypothesis:

The research is based on the following hypothesis:

There is a negative relationship between the occurrence of the sudden natural event (06.02.2023 earthquake) and the daily stock returns of firms listed in DSE.

6. Data Set and Methodology:

This research examined the shock impact of 06.02.2023 earthquake on the stock prices/ returns of firms listed in Damascus Securities Exchange (DSE) over the period of 03.01.2022 to 27.02.2023, the data set of daily firms close prices and market index (DWX) obtained from the website of DSE at: http://www.dse.gov.sy

To achieve the research objective, an event study methodology was used to measure the impact of 06.02.2023 earthquake on daily stock prices/ returns of firms listed in DSE.

7. Literature review:

The researcher reviews the prior literature that investigated the effects of natural disasters on stock returns.

(Luo, 2012) investigates the impact of the Japanese earthquake 2011 on six most representative stock markets all over the world depending on event study procedure, he found that a negative shock brought by this disaster exists in all of the six stock markets. The impact was small and insignificant on the six stock markets, and significant for some individual stocks.

(Galido & Khanser, 2013) examined the impact of earthquakes, cyclones and volcanic on the Philippine Stock Exchange index (PSEi) over the period 2 January 1985 to 30 December 2010, they found that the disasters have an insignificant effect on the market returns.

(Scholtens and Voorhorst, 2013) investigate the impact of more than 100 earthquakes with fatalities on financial markets in 21 countries from five continents in the period 1973–2011, by an event study methodology, and concluded that there are significant negative effects on stock market value. But they found that the stock market's response to earthquakes is more pronounced in recent years than in the 1970s and 1980s. There is no difference in the responses to the most and least severe earthquakes or to those in high-income and low-income countries. This suggests that the stock market is not very sensitive regarding key characteristics of earthquakes.

(Takao et al, 2013) investigated how the great east Japan earthquake of 11 march 2011 influenced the stock prices of Japanese insurance companies, they found that the value of insurance companies decreased right after the earthquake.

(Ruiz & Barrero, 2014) tested stock price reactions to the 2010 Chilean earthquake and tsunami, they used a sample of 42 firms listed in the Santiago Stock Exchange, depending on event study methodology, they found that Chilean stock market volatility increased by 240% during the five trading days and 120% during the eleven trading days after the earthquake. The results are informative about the behavior of the stock prices: returns are positive in sectors the retail, real estate, and banking sectors and negative in food, steel, and forestry.

(Ferreira & Karali, 2015) examined how main earthquakes affected the returns of stock market indices and its volatility in 35 markets over the last 20 years. they concluded that the global markets are resilient to impacts of earthquakes, and the stock market volatility is unaffected by earthquakes, except for Japan.

(Slothouber, 2017) tested the effect of a natural disaster on a firm, industry and state level in the United States from 1980 to 2016, and found a significant negative abnormal return during natural disasters, this negative abnormal return is stronger when the firm affected is either older or smaller, and the industry in which the firm operates affects the impact of the natural disaster on an individual firm's stock return, but it remains uncertain how and why.

(Arndt , 2018) concerned with estimating the effects of natural hazards on companies' daily stock returns, he found that large earthquakes have a significant, negative effect on a company's stock return on the same day, and this negative effect increases with the company's exposure to the earthquake.

(Barragan, 2018) examined the impact of 83 earthquakes on 7 Latin American stock market indices during the period of 1989-2018 by an event study methodology, he found

that the earthquakes have a significant and negative effect on stock markets on the day they strike and within the following five days. On the event day, stock markets have a stronger response to recent earthquakes in recent years than in the past.
(Lee et al, 2018) focused on the major natural disasters that occurred worldwide during the last decade, especially those in Asia–Pacific region, and the economic effects of global financial crises. They compared the contagion impact in the stock markets of the initiating country on other countries, the concluded that the 2008 Sichuan Earthquake in China caused a substantial effect in the stock markets of Asian countries.
(Yıldırım & Alola, 2020) examined the shock impact of earthquake on the stock index of the Republic of Turkey over the period of 2/2000 to 12/2017, they found that there is a dynamic impact of earthquake and exchange rate on the Turkish index.
(Wang, 2022) introduced the great Lushan earthquake in 2013 in China as an unexpected shock to explore the causal effects on public firms in both the long and short term, he implemented event study method to investigate the general effects of some strong earthquakes on public firms locally. he found that the cash flow to sales ratio declined and recovered in three following semesters, and the event negatively impacts the profitability and the cash flow liquidity.
(Pandey et. al, 2023) applied the event study method to the daily returns of 382 listed firms, and found that the Turkey-Syria earthquake significantly affected the stock returns. The impact on all sectors was negative, except of basic materials, and the larger companies was more resilient, while the riskier companies bear more losses.
(Gürsoy et. al, 2023) investigated the effects of the 2023 Turkey earthquake on financial markets. Their study used a test of Li and Enders (2018), and concludes that the effects of the earthquake differ for the sectors, where the earthquake-sized effect did not have an effect in the Food, REIT and Mining sectors traded in Borsa İstanbul, there was an effect in the volatility in the sectors of textile, banking, brokerage, SME, and IT.

The current research differs from the previous studies in terms of the application environment and the specificity of the local environmental disaster (earthquake), as well as in the time period studied, and most importantly the difference in the nature and level of efficiency of the local stock market.

8. Discussion and Results:

The research community divided into its constituent economic sectors shown in following table 1.:

Table 1. Description of the research community

No.	Sector	Number of firms	Labels of firms	Percentage
1	Banking	14	ARBS, BASY, BBSF, BSO, IBTF, SIIB, BBS, QNBS, BOJS, SGB, SHRQ, FSBS, CHB, BBSY.	%52
2	Insurance	6	UIC, AROP, NIC, ATI, SAIC, SKIC.	%22
3	Services	2	AHT, UG.	%7

4	Agriculture	1	NAMA.	%4
5	Industrial	2	AVOC, ABC.	%7
6	Communications	2	SYTEL, MTN.	%7
Total		**27**		**% 100**

Source: the table prepared by the researcher depending on the data of Damascus Securities Exchange at: http://www.dse.gov.sy.

To conduct the standard event study methodology, the researcher divided it into five steps:

8.1. Estimation and Event windows:

Firstly the researcher define an estimation window to estimate the normal returns of each stock in the sample of the study, he consider the period [03/01/2022 -15/01/2023] (241 days) as the estimation period, where all the studied firms have recent and sufficient data for estimation.

The researcher labeled the event day as (t_0) and therefore defined the event window as t-15 to t+15, followed a rule based on the trading behavior of the stocks in terms of daily turnover as the ratio of trading volume to stocks outstanding as shown in figure 1. below, (Krivin et. al, 2003, p. 9, 13).

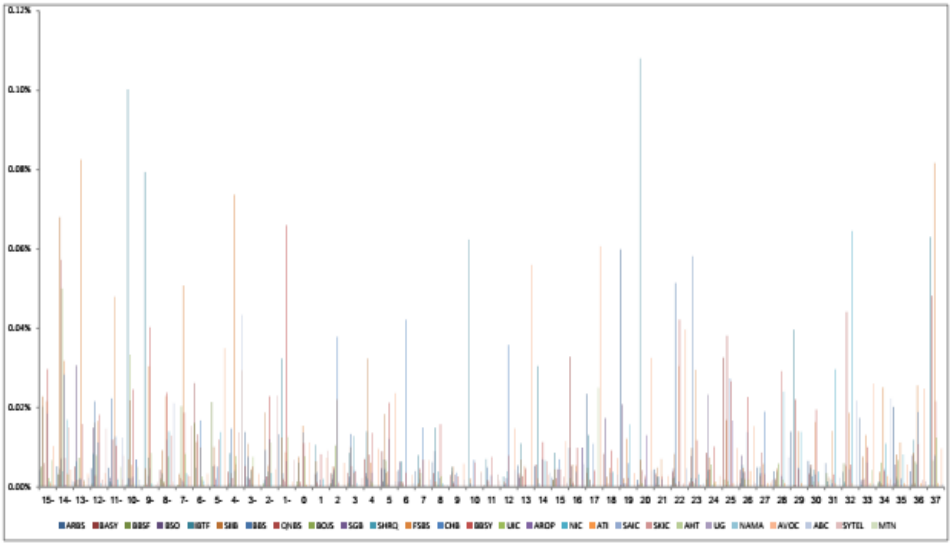

Figure 1. daily turnover of studied firms

Source: the figure prepared by the researcher depending on the firms data of Damascus Securities Exchange at: http://www.dse.gov.sy.

The event window divided into three sub-periods: pre-event window t_{-15} to t_{-1} [16/01/2023-05/02/2023] (15 days),event day t_0 [06/02/2023] (1day) and post-event window t_{+1} to t_{+15} [07/02/2023 – 27/02/2023] (15 days), Figure 2. below illustrate the estimation and event windows.

Event Window

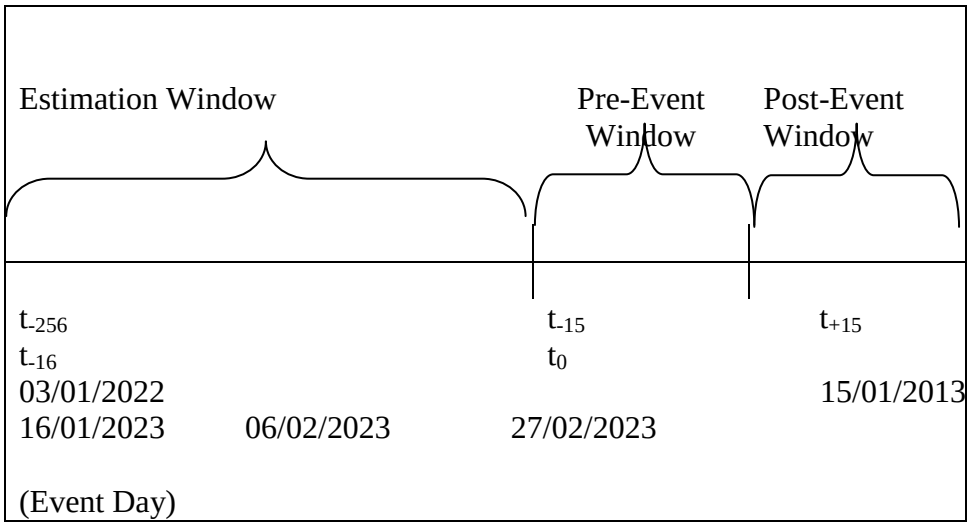

Figure 2. The event timeline

Source: The figure prepared by the researcher.

8.2. Calculation the abnormal returns:

Abnormal or excess stock returns indicate the market reaction to the unanticipated event, first the researcher calculate the daily actual return of each of the studied firms along the trading days during the estimation and event periods as in equation (1):

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}} \quad (1)$$

Where:

R_{it}: the actual return of the firm (i) in day (t).

P_{it}: the stock close price of firm (i) in day (t).

P_{it-1}: the stock close price of firm (i) in day (t-1).

As well as the market return is calculated as in equation (2):

$$R_{mt} = \frac{MI_t - MI_{t-1}}{MI_{t-1}} \quad (2)$$

Where:

R_{mt}: the actual return of the market in day (t).

MI_t: the close price of Damascus Securities Exchange Index (DWX) in day (t).

MI_{t-1}: the close price of Damascus Securities Exchange Index (DWX) in day (t-1).

Then the daily normal returns (NR_{it}) calculated using the market model, where the α_i and β_i parameters derived from the regression between the stock returns of firm (i) and the respective benchmark index returns over the estimation window as in equation (3). (Gupta, 2018, p. 5)

(3) $R_{mt}\ \beta_i + \alpha_i = NR_{it}$

Then the daily abnormal returns calculated as in equation (4).

$AR_{it} = R_{it} - NR_{it}$ (4)

8.3. Cross-sectional aggregation of abnormal returns:

The average of abnormal returns done across the firms for the entire event window as per Equation (5)

Average Abnormal Return $(AAR_t) = \frac{1}{N} \sum_{i=1}^{N} Ar_{it}$ (5)

Where N is the number of studied firms (observations or sector size) in each sector at day (t) throughout the event window.

The cumulative average abnormal returns ($CAAR_t$) for the all market sectors also calculated as per Equation (6):

Cumulative Average Abnormal Return $(CAAR_t) = \sum_{t=-15}^{+15} AAR_t$ (6)

8.4. Testing the significance of the abnormal returns:

The researcher tested the significance of the abnormal returns by conducted the test-statistics as per Brown and Warner (1980, 1985) in Equations (7) and (8): (Kumari et. al, 2023, p. 1046)

$$t(AAR_t) = \frac{AAR_t}{\sigma_{N,e}} \quad (7)$$

where $\sigma_{N,e} = \sqrt{\frac{\sum_{f=1}^{N} \sigma_{i,e}^{2}}{N^2}}$ is the aggregated estimation period standard deviation, and $\sigma_{i,e}^{2}$ is the estimation-period variance for each of the market sector.

$$t(CAAR_t) = \frac{CAAR_t}{\sigma_{N,e} \cdot \sqrt{T}} \quad (8)$$

where T, is the number of window period days.

The average, and the cumulative average abnormal returns and the corresponding t-values throughout the event window for each sector are shown as in tables (2, 3, 4, 5, 6), and its corresponding graphic figure (3, 4, 5, 6, 7) respectively.

The researcher points out that the two firms, NAMA and MTN, were excluded from the study due to the absence of their average return during the study period, and therefore the agricultural sector was completely excluded and the communications sector represented by SYTEL firm only, and accordingly five economic sectors represented by 25 firms were studied.

Table 2. Average and cumulative average abnormal returns and the corresponding t-values during the event window for the entire banking sector (N= 14).

Day	AAR	t_{AAR}	CAAR	t_{CAAR}
t_{-15}	0.011487 *	1.921781	0.011487 *	1.921781
t_{-14}	0.008883	1.486219	0.02037 *	2.40982
t_{-13}	0.006617	1.106985	0.026987 *	2.606728
t_{-12}	0.003437	0.574976	0.030423 *	2.544981
t_{-11}	-0.00696	-1.16503	0.02346 *	1.755282
t_{-10}	-0.00483	-0.8077	0.018632	1.272603
t_{-9}	-0.00699	-1.16979	0.01164	0.736061
t_{-8}	0.008325	1.392768	0.019965	1.18094
t_{-7}	0.003711	0.620888	0.023676	1.320363
t_{-6}	0.000672	0.112404	0.024348	1.288152
t_{-5}	-0.00115	-0.19183	0.023201	1.170366
t_{-4}	0.006503	1.087917	0.029704	1.434595
t_{-3}	0.011452 *	1.916	0.041156 *	1.909717
t_{-2}	0.007752	1.296877	0.048908 *	2.186854
t_{-1}	0.008893	1.487809	0.057801 *	2.496853
t_{0}	-0.00538	-0.89983	0.052422 *	2.19261
t_{+1}	0.001673	0.279824	0.054095 *	2.195011
t_{+2}	-0.01001 *	-1.67405	0.044089 *	1.73859
t_{+3}	-0.00546	-0.91397	0.038626	1.48254
t_{+4}	0.007865	1.315838	0.046491 *	1.739231
t_{+5}	0.000455	0.076161	0.046946 *	1.713935
t_{+6}	-0.0031	-0.51832	0.043848	1.564024
t_{+7}	-0.0079	-1.32149	0.035949	1.254095
t_{+8}	-0.01011	-1.69223	0.025834	0.882265
t_{+9}	-0.00468	-0.78328	0.021153	0.707783
t_{+10}	-0.0013	-0.21681	0.019857	0.651519
t_{+11}	0.00081	0.13558	0.020667	0.665432
t_{+12}	-0.00198	-0.33046	0.018692	0.59099
t_{+13}	-0.0045	-0.75338	0.014189	0.440811
t_{+14}	-0.00172	-0.28703	0.012473	0.380997
t_{+15}	0.00028	0.046853	0.012753	0.383217

*** Significant at 95% confidence degree.**
Source: the table prepared by the researcher.

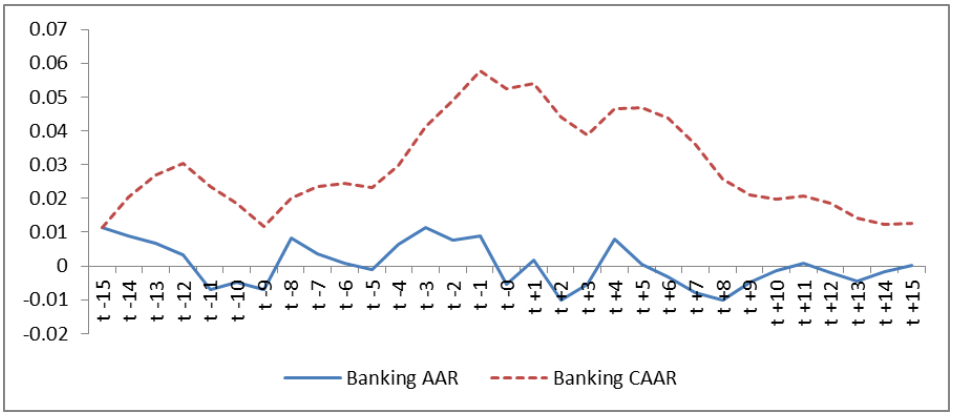

Figure 3. AAR and CAAR of banking sector during the event window.
Source: the figure prepared by the researcher depending on the table 2.

Table 2. and accompanying Figure 3. show that the banking sector is negatively affected by the event (earthquake), as the AAR decreased significantly during the post-event period, and this was clearly demonstrated by the decrease in CAAR value immediately after the day of the event.

Table 3. Average and cumulative average abnormal returns and the corresponding t-values during the event window for the entire insurance sector (N= 6).

Day	AAR	t_{AAR}	CAAR	t_{CAAR}
t_{-15}	-0.00179	-0.23117	-0.00179	-0.23117
t_{-14}	0.013338 *	1.721037	0.011546	1.053497
t_{-13}	-0.00522	-0.67387	0.006324	0.47112
t_{-12}	-0.00427	-0.55148	0.00205	0.13226
t_{-11}	-0.00382	-0.49276	-0.00177	-0.10207
t_{-10}	-0.00193	-0.24849	-0.00369	-0.19462
t_{-9}	0.004421	0.570513	0.000727	0.035447
t_{-8}	0.014291 *	1.844	0.015018	0.68511
t_{-7}	0.005972	0.770605	0.02099	0.902796
t_{-6}	-0.00436	-0.56297	0.016627	0.678441
t_{-5}	0.003373	0.435226	0.02	0.778093
t_{-4}	0.012806 *	1.652426	0.032806	1.221982
t_{-3}	-0.0128 *	-1.6519	0.020004	0.715888
t_{-2}	-0.01	-1.29085	0.01	0.344853
t_{-1}	-0.00918	-1.1845	0.00082	0.027324
t_{0}	-0.01278	-1.64938	-0.01196	-0.38589
t_{+1}	-0.00276	-0.35635	-0.01472	-0.46079
t_{+2}	-0.00303	-0.39087	-0.01775	-0.53994
t_{+3}	-0.00366	-0.47224	-0.02141	-0.63388
t_{+4}	-6.4E-05	-0.00831	-0.02148	-0.61968
t_{+5}	0.001313	0.169375	-0.02016	-0.56779
t_{+6}	0.000258	0.033272	-0.01991	-0.54764
t_{+7}	-0.00302	-0.38961	-0.02293	-0.61684
t_{+8}	-0.00156	-0.20129	-0.02449	-0.64494
t_{+9}	-0.00354	-0.45649	-0.02802	-0.72321

t_{+10}	-0.0028	-0.36189	-0.03083	-0.78014
t_{+11}	-0.00108	-0.13948	-0.03191	-0.7924
t_{+12}	-0.00277	-0.35702	-0.03468	-0.84559
t_{+13}	-0.00312	-0.40254	-0.0378	-0.90563
t_{+14}	-0.00279	-0.35997	-0.04059	-0.95613
t_{+15}	-0.00132	-0.17089	-0.04191	-0.97128

*** Significant at 95% confidence degree.**
Source: the table prepared by the researcher.

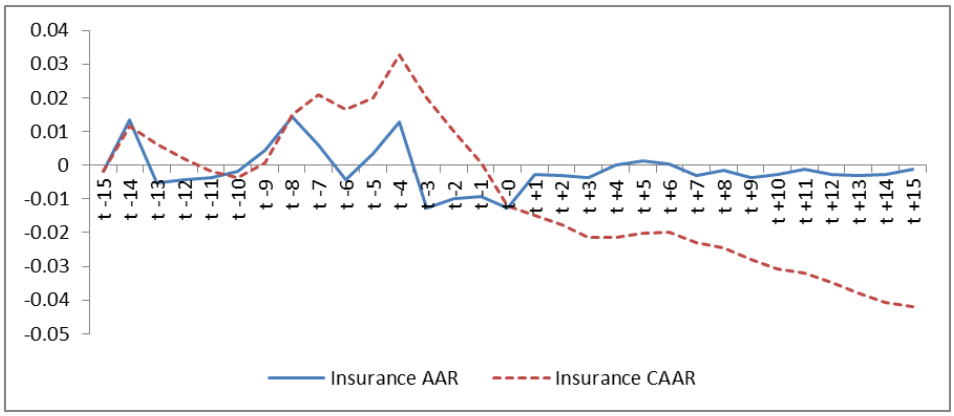

Figure 4. AAR and CAAR of insurance sector during the event window.
Source: the figure prepared by the researcher depending on the table 3.

Table 3. and accompanying Figure 4. show that the insurance sector is negatively affected by the event (earthquake), as the AAR decreased clearly during the post-event period, and this was clearly demonstrated by the sharp decline in CAAR value immediately after the day of the event.

Table 4. Average and cumulative average abnormal returns and the corresponding t-values during the event window for the entire services sector (N= 2).

Day	AAR	t_{AAR}	CAAR	t_{CAAR}
t_{-15}	-0.00208	-0.26227	-0.00208	-0.26227
t_{-14}	-0.00189	-0.238	-0.00397	-0.35374
t_{-13}	-0.00143	-0.17986	-0.0054	-0.39267
t_{-12}	-0.00161	-0.20264	-0.00701	-0.44138
t_{-11}	-0.0017	-0.21357	-0.00871	-0.49029
t_{-10}	-0.00206	-0.25904	-0.01077	-0.55333
t_{-9}	-0.00168	-0.21147	-0.01245	-0.59221
t_{-8}	-0.00201	-0.25328	-0.01446	-0.64351
t_{-7}	-0.00198	-0.24987	-0.01644	-0.69
t_{-6}	-0.00159	-0.2005	-0.01804	-0.718
t_{-5}	-0.00173	-0.21727	-0.01976	-0.75009
t_{-4}	-0.00179	-0.22545	-0.02155	-0.78324
t_{-3}	-0.00157	-0.19772	-0.02312	-0.80735
t_{-2}	-0.00165	-0.20809	-0.02478	-0.83359
t_{-1}	-0.00205	-0.25789	-0.02682	-0.87192
t_{0}	-0.00158	-0.19835	-0.0284	-0.89382

t_{+1}	-0.0019	-0.23896	-0.0303	-0.92509
t_{+2}	-0.00185	-0.23254	-0.03215	-0.95383
t_{+3}	-0.00173	-0.21739	-0.03387	-0.97826
t_{+4}	-0.00241	-0.30375	-0.03629	-1.02142
t_{+5}	0.022307 *	2.808182	-0.01398	-0.384
t_{+6}	-0.00247	-0.31149	-0.01645	-0.44159
t_{+7}	-0.00185	-0.23277	-0.0183	-0.48042
t_{+8}	-0.00213	-0.26783	-0.02043	-0.52497
t_{+9}	-0.00175	-0.22032	-0.02218	-0.55843
t_{+10}	-0.00189	-0.23793	-0.02407	-0.59425
t_{+11}	-0.00222	-0.27934	-0.02629	-0.6369
t_{+12}	-0.0019	-0.23884	-0.02819	-0.67056
t_{+13}	-0.00183	-0.23036	-0.03002	-0.70167
t_{+14}	-0.00189	-0.23829	-0.03191	-0.73338
t_{+15}	-0.00217	-0.27349	-0.03408	-0.77058

*** Significant at 95% confidence degree.**
Source: the table prepared by the researcher.

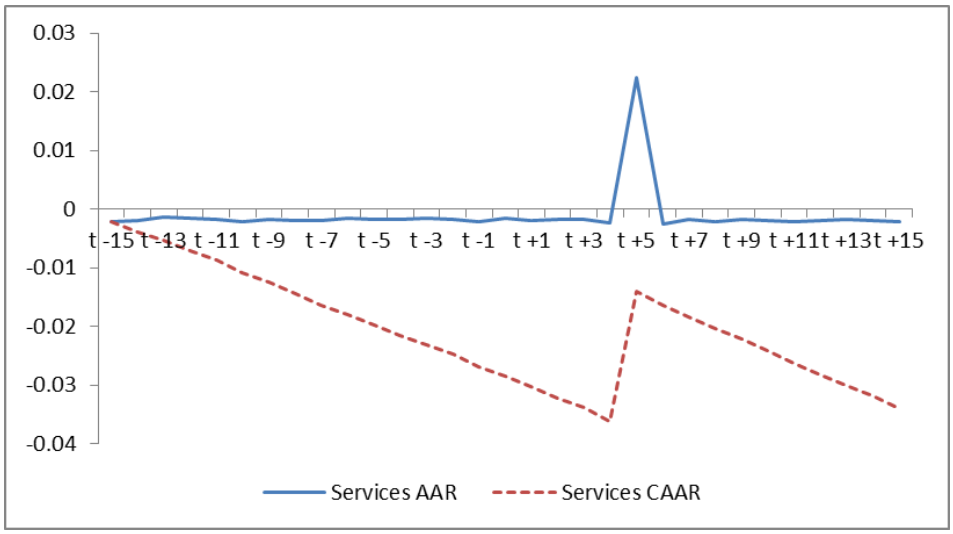

Figure 5. AAR and CAAR of services sector during the event window.
Source: the figure prepared by the researcher depending on the table 4.

Table 4. and accompanying Figure 5. show that the services sector is negatively affected slightly and temporarily by the event (earthquake) until the fourth day after the event, then it achieved positive abnormal returns for a short period, then it showed a negative impact after that, which led to a sharp decrease in CAAR value.

Table 5. Average and cumulative average abnormal returns and the corresponding t-values during the event window for the entire industry sector (N= 2).

Day	AAR	t_{AAR}	CAAR	t_{CAAR}
t_{-15}	-0.02261	-1.64358	-0.02261	-1.64358
t_{-14}	-0.01001	-0.72786	-0.03262 *	-1.67686
t_{-13}	-0.01208	-0.87847	-0.0447 *	-1.87633

t_{-12}	0.021844	1.588161	-0.02286	-0.83087
t_{-11}	0.009572	0.695941	-0.01328	-0.43192
t_{-10}	-0.00246	-0.17903	-0.01575	-0.46737
t_{-9}	-0.00446	-0.32451	-0.02021	-0.55536
t_{-8}	-0.02165	-1.57373	-0.04186	-1.07589
t_{-7}	-0.02438 *	-1.77277	-0.06624	-1.60528
t_{-6}	-0.01548	-1.12537	-0.08172 *	-1.87877
t_{-5}	-0.01714	-1.24631	-0.09886 *	-2.16711
t_{-4}	-0.01488	-1.08185	-0.11374 *	-2.38716
t_{-3}	-0.00187	-0.13579	-0.11561 *	-2.33117
t_{-2}	-0.01353	-0.98392	-0.12914 *	-2.50934
t_{-1}	0.001672	0.121554	-0.12747 *	-2.39286
t_{0}	-0.02346 *	-1.70564	-0.15093 *	-2.74329
t_{+1}	0.003019	0.219482	-0.14791 *	-2.60815
t_{+2}	0.010759	0.782231	-0.13715 *	-2.35029
t_{+3}	-0.00368	-0.2676	-0.14083 *	-2.349
t_{+4}	-0.01283	-0.93306	-0.15367 *	-2.49816
t_{+5}	-0.03752 *	-2.7277	-0.19119 *	-3.03319
t_{+6}	-0.01651	-1.2003	-0.20769 *	-3.21936
t_{+7}	0.035051 *	2.548327	-0.17264 *	-2.61723
t_{+8}	0.003987	0.2899	-0.16866 *	-2.50295
t_{+9}	0.026225 *	1.906655	-0.14243 *	-2.07105
t_{+10}	0.024244 *	1.762636	-0.11819 *	-1.68515
t_{+11}	-0.02046	-1.48727	-0.13864 *	-1.93987
t_{+12}	-0.02845 *	-2.0683	-0.16709 *	-2.29579
t_{+13}	-0.00099	-0.0723	-0.16809 *	-2.26928
t_{+14}	0.017311	1.258598	-0.15078 *	-2.00135
t_{+15}	-0.01944	-1.41318	-0.17021 *	-2.22262

*** Significant at 95% confidence degree.**
Source: the table prepared by the researcher.

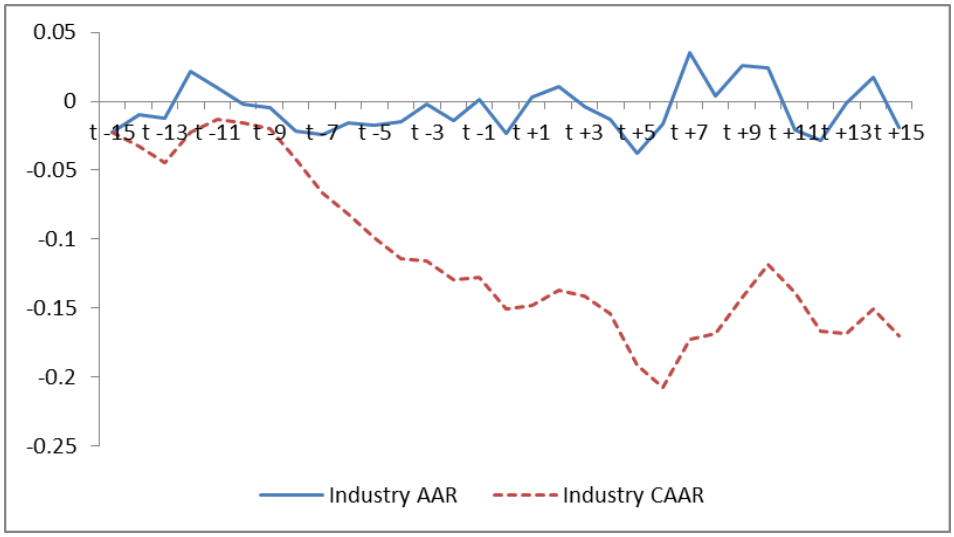

Figure 6. AAR and CAAR of industry sector during the event window.
Source: the figure prepared by the researcher depending on the table 5.

Table 5. and accompanying Figure 6. show that the industrial sector showed slight positive abnormal returns during the two trading days following the event day, then it was negatively affected for the next four trading days, then it gets better again for four trading days after which it was negatively affected, while the CAAR showed a continuous decline that intensified immediately after the event day.

Table 6. Average and cumulative average abnormal returns and the corresponding t-values during the event window for the entire communications sector (N= 1).

Day	AAR	t_{AAR}	CAAR	t_{CAAR}
t_{-15}	0.004121	0.567155	0.004121	0.567155
t_{-14}	0.001324	0.182188	0.005444	0.529865
t_{-13}	-0.00538	-0.74016	6.67E-05	0.0053
t_{-12}	0.001486	0.204524	0.001553	0.106852
t_{-11}	-0.00765	-1.05233	-0.00609	-0.37505
t_{-10}	0.003749	0.516009	-0.00234	-0.13171
t_{-9}	-0.00173	-0.23868	-0.00408	-0.21215
t_{-8}	0.003085	0.424637	-0.00099	-0.04832
t_{-7}	-0.01866 *	-2.56792	-0.01965	-0.90153
t_{-6}	-0.003	-0.41268	-0.02265	-0.98576
t_{-5}	-0.00107	-0.14669	-0.02371	-0.98412
t_{-4}	-0.00012	-0.01697	-0.02384	-0.94712
t_{-3}	-0.00332	-0.45685	-0.02716	-1.03667
t_{-2}	-0.00326	-0.44891	-0.03042	-1.11894
t_{-1}	0.003753	0.516542	-0.02667	-0.94763
t_{0}	-0.00325	-0.44679	-0.02991	-1.02923
t_{+1}	0.001435	0.197494	-0.02848	-0.9506
t_{+2}	0.000694	0.095555	-0.02778	-0.9013
t_{+3}	-0.00128	-0.1768	-0.02907	-0.91782
t_{+4}	0.008902	1.225257	-0.02016	-0.6206
t_{+5}	0.010699	1.472602	-0.00947	-0.2843
t_{+6}	0.009794	1.348058	0.000329	0.009644
t_{+7}	0.000721	0.099258	0.00105	0.030129
t_{+8}	0.004762	0.655368	0.005811	0.163271
t_{+9}	-0.00071	-0.09823	0.005098	0.140327
t_{+10}	0.001316	0.181133	0.006414	0.173125
t_{+11}	-0.03221 *	-4.43275	-0.02579	-0.6832
t_{+12}	0.00142	0.195497	-0.02437	-0.63394
t_{+13}	0.000444	0.061072	-0.02393	-0.61157
t_{+14}	0.001357	0.186779	-0.02257	-0.56719
t_{+15}	0.005414	0.745162	-0.01716	-0.42413

*** Significant at 95% confidence degree.**
Source: the table prepared by the researcher.

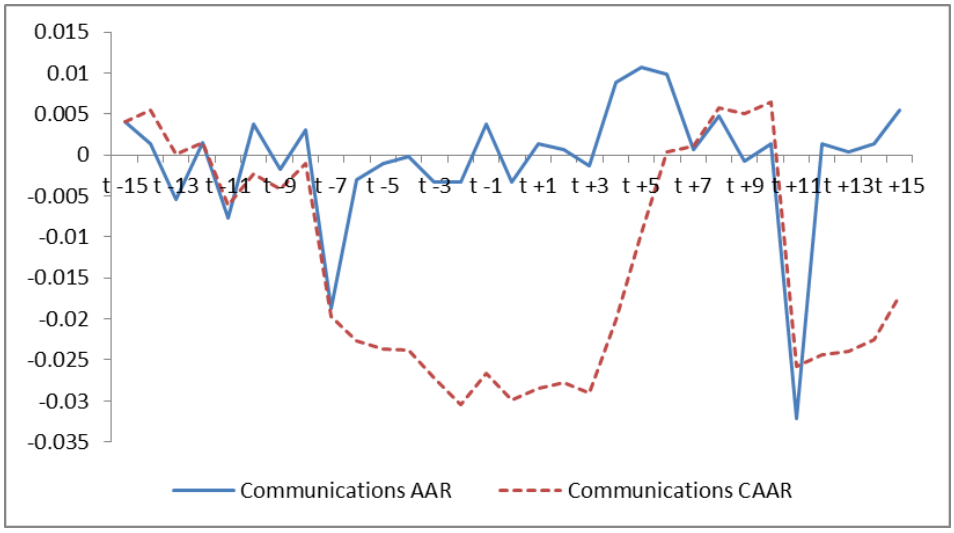

Figure 7. AAR and CAAR of communications sector during the event window.
Source: the figure prepared by the researcher depending on the table 6.

Table 6. and accompanying Figure 7. show that the communications sector, represented here by one firm (Syriatel), showed positive extraordinary returns immediately after the event day, which continued unevenly until the eighth day after the event day, then declined relatively for a short period, then turned into negative extraordinary returns, and began to gradually increase, but the CAAR values were affected negatively immediately after the event day, then relatively improved for a short period, and decreased sharply for a short period, then returned to gradual improvement.

8.5. Interpretation the results:

Since the 06.02.2023 earthquake in Syria was unexpected natural event, and the local stock market is an emerging and inefficient market, the researcher did not expect any price fluctuations due to this event during the pre-event period, so he kept it for comparison purposes and focused his study and analysis on the post-event period (06.02.2023 earthquake), and accordingly the CAARs was calculated for each economic sector in the post-event period, and the result was as shown in the following Table 7.

Table 7. cumulative average abnormal returns (CAARs) and the corresponding t-values during the post-event window for the all included economic sectors.

CAARs					
Day order	**Banking**	**Insurance**	**Services**	**Industrial**	**Communications**
t_0	-0.005	-0.013	-0.002	-0.023	-0.003
t_{+1}	-0.004	-0.016	-0.003	-0.020	-0.002
t_{+2}	-0.014	-0.019	-0.005	-0.010	-0.001
t_{+3}	-0.019	-0.022	-0.007	-0.013	-0.002
t_{+4}	-0.011	-0.022	-0.009	-0.026	0.007
t_{+5}	-0.011	-0.021	0.013	-0.064	0.017
t_{+6}	-0.014	-0.021	0.010	-0.080	0.027
t_{+7}	-0.022	-0.024	0.009	-0.045	0.028

t_{+8}	-0.032	-0.025	0.006	-0.041	0.032
t_{+9}	-0.037	-0.029	0.005	-0.015	0.032
t_{+10}	-0.038	-0.032	0.003	0.009	0.033
t_{+11}	-0.037	-0.033	0.001	-0.011	0.001
t_{+12}	-0.039	-0.035	-0.001	-0.040	0.002
t_{+13}	-0.044	-0.039	-0.003	-0.041	0.003
t_{+14}	-0.045	-0.041	-0.005	-0.023	0.004
t_{+15}	-0.045	-0.043	-0.007	-0.043	0.010

Source: the table prepared by the researcher.

The following figure 8. summarizes the evolution of CAARs values during the post-event period.

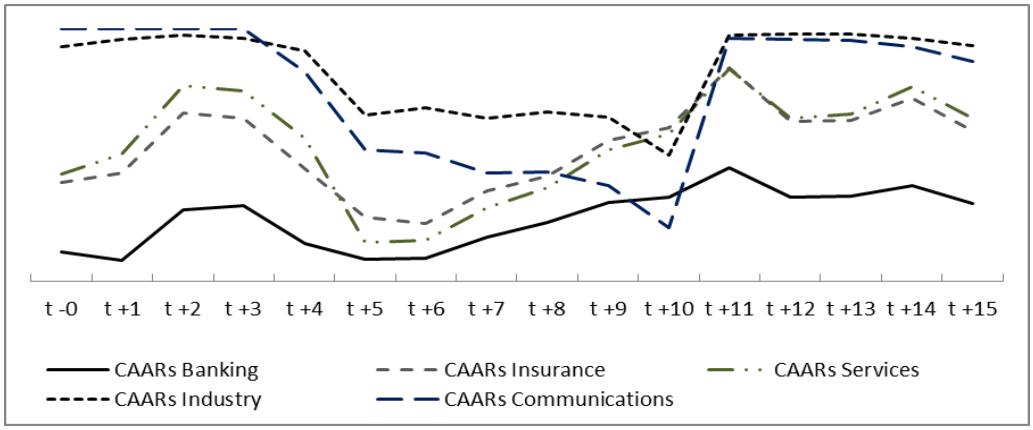

Figure 8. CAARs of all included economic sectors during the post-event window.
Source: the figure prepared by the researcher depending on the table 6.

Based on table.7 and figure 8. above, it became clear that the economic sectors represented by the companies listed in the Damascus Securities Exchange were affected to a different extent in the post-event period (earthquake), and the speed of response, severity and direction of effect differed according to the nature of each economic sector.

By monitoring the evolution of CAARs values for each included economic sector, the researcher found that the banking, insurance, and the industrial sectors were negatively affected by the event (earthquake), but the effect began to appear after the second day of the event, as the CAAR of these three sectors showed a clear decline that continued until the tenth day of the trading days following the event day, so that the intensity of the impact began to decline. The services and communications sectors were affected negatively, but to a lesser extent, for the four trading days following the event day, as the indices recorded a slight increase in the achieved CAAR.

In keeping with the foregoing, the researcher studied the daily trading turnover of the studied sectors during the event period as shown in table 8. and figure 8., he found that trading in the stocks of banking sector firms decreased significantly after the event day until the end of the event period, the insurance sector also showed a significant decrease in the trading rate during the post-event period. As for the services sector, the trading rate on the stocks of its subsidiaries decreased sharply since the day t_{-9} and continued until the end of the event window, the stocks of the industrial sector showed volatile trading rates and recorded a noticeable decrease after the day of the event, except for some temporary booms.

Table 8. Daily turnover as the ratio of trading volume to stocks outstanding during the event window.

Ratio of trading volume to stocks outstanding					
Day order	**Banking**	**Insurance**	**Services**	**Industrial**	**Communications**
t_{-15}	%0.0092	%0.0008	%0.0034	%0.0052	%0.0004
t_{-14}	%0.0193	%0.0060	%0.0016	%0.0030	%0.0002
t_{-13}	%0.0112	%0.0006	%0.0000	%0.0028	%0.0002
t_{-12}	%0.0089	%0.0005	%0.0000	%0.0023	%0.0147
t_{-11}	%0.0083	%0.0003	%0.0025	%0.0072	%0.0078
t_{-10}	%0.0143	%0.0014	%0.0025	%0.0009	%0.0002
t_{-9}	%0.0122	%0.0016	%0.0000	%0.0004	%0.0011
t_{-8}	%0.0057	%0.0058	%0.0000	%0.0112	%0.0003
t_{-7}	%0.0071	%0.0024	%0.0000	%0.0015	%0.0154
t_{-6}	%0.0072	%0.0008	%0.0000	%0.0021	%0.0002
t_{-5}	%0.0044	%0.0023	%0.0000	%0.0176	%0.0004
t_{-4}	%0.0084	%0.0036	%0.0000	%0.0364	%0.0001
t_{-3}	%0.0042	%0.0013	%0.0000	%0.0016	%0.0005
t_{-2}	%0.0057	%0.0024	%0.0000	%0.0023	%0.0230
t_{-1}	%0.0105	%0.0021	%0.0000	%0.0007	%0.0068
t_{0}	%0.0041	%0.0014	%0.0000	%0.0059	%0.0002
t_{+1}	%0.0026	%0.0004	%0.0000	%0.0038	%0.0091
t_{+2}	%0.0069	%0.0000	%0.0000	%0.0034	%0.0003
t_{+3}	%0.0049	%0.0002	%0.0000	%0.0001	%0.0022
t_{+4}	%0.0068	%0.0002	%0.0000	%0.0049	%0.0001
t_{+5}	%0.0068	%0.0000	%0.0000	%0.0125	%0.0039
t_{+6}	%0.0048	%0.0000	%0.0000	%0.0020	%0.0001
t_{+7}	%0.0032	%0.0001	%0.0000	%0.0043	%0.0001
t_{+8}	%0.0041	%0.0007	%0.0000	%0.0003	%0.0001
t_{+9}	%0.0020	%0.0000	%0.0000	%0.0038	%0.0003
t_{+10}	%0.0056	%0.0000	%0.0000	%0.0037	%0.0002
t_{+11}	%0.0019	%0.0000	%0.0000	%0.0031	%0.0016
t_{+12}	%0.0040	%0.0000	%0.0000	%0.0095	%0.0001
t_{+13}	%0.0030	%0.0000	%0.0000	%0.0282	%0.0001
t_{+14}	%0.0045	%0.0022	%0.0000	%0.0033	%0.0001
t_{+15}	%0.0026	%0.0004	%0.0000	%0.0063	%0.0009

Source: the table prepared by the researcher.

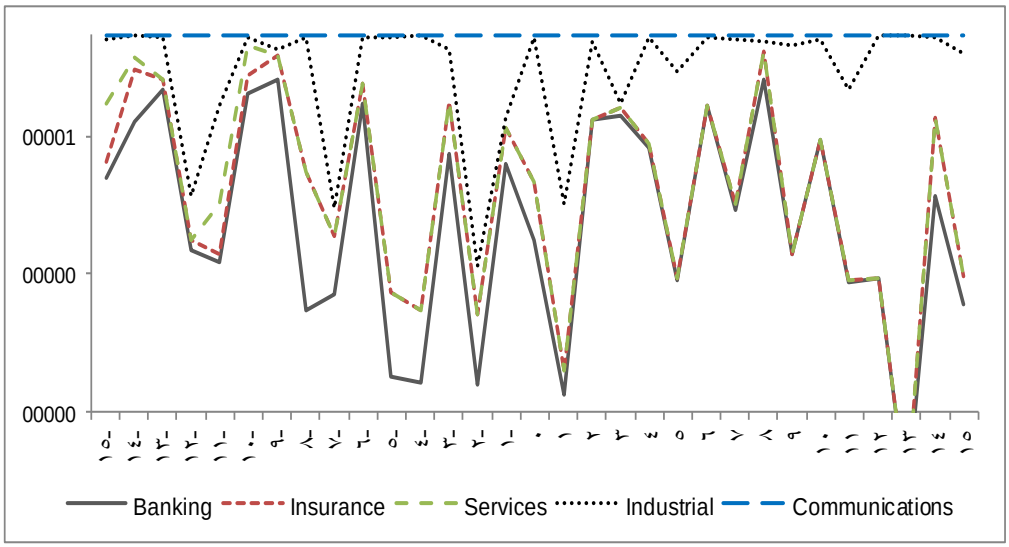

Figure 8. Ratio of trading volume to stocksoutstanding of economic sectors in DSE.
Source: the figure prepared by the researcher depending on the table 8.

9. Conclusion:

The current research examined the impact of 06 Feb. 2023 earthquake on the stock returns of firms listed in DSE, it found that there is a negative impact of earthquake on the stock prices/ returns of firms listed in DSE, and on market index prices in the post-event period, but its severity and time of occurrence differed for the sectors.

The banking and insurance sectors are negatively affected by the event, the services sector is negatively affected slightly and temporarily by the event until the fourth day after the event, then it achieved positive abnormal returns for a short period, then it showed a negative impact after that, which led to a sharp decrease in CAAR value.
The industrial sector showed slight positive abnormal returns during the two trading days following the event day, then it was negatively affected for the next four trading days, then it gets better again for four trading days after which it was negatively affected, the communications sector showed positive extraordinary returns immediately after the event day, which continued unevenly until the eighth day after the day of the event, when they declined relatively for a short period, then turned into negative extraordinary returns, then began to gradually increase.
The researcher points out that the results of this research were largely consistent with the results of another study (Gürsoy et. al, 2023) that studied the impact of the same event (06.02.2023 earthquake) on the stock market of the neighboring country (Turkey) that was subjected to the same devastating earthquake, and prove the validity of the research hypothesis.

10. Recommendations:

According to the conclusions reached in this research, the researcher recommends the managers of firms listed in capital market to focus on the risk management in order to

avoid the negative effects of sudden and unexpected event that may occur in the future, and strive to maintain their market value in such cases, as a researcher recommends to conduct other research to investigate the impact of such sudden natural events on other non-financial markets.

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