

PHYSICAL, CHEMICAL SCIENCES AND ENGINEERING

Manuscript info:

Received June 12, 2018., Accepted July 17, 2018., Published August 20, 2019.

IMPACT OF NATURAL DISASTER ON STOCK MARKETS PRICES, IN CASE CEMENT SECTOR OF PAKISTAN

Muhammad Hafeez ullah

Riphah international university, Islamabad
Email: hafeezyasir007@gmail.com

Najam ul sabeeh

International Islamic university, Islamabad
Najamulsabeeh@gmail.com

Arshad Mehmood

university of Sargodha, Sargodha
Email: arshad6854@gmail.com



<http://dx.doi.org/10.26739/2573-5616-2019-8-21>

Abstract: The purpose of this study is to find out impact of natural disaster or rare events on stock market in case cement sector of Pakistan. The study uses an exploratory approach in order to obtain a deeper insight in the phenomena, and to capture any price changes within an index and event study methodology has been conducted. Stock markets react differently from certain natural disaster events. The natural events, flood, earthquake, extreme temperature, land sliding, has significant effect on stock prices and its effect on share price volatility. All evidence provide from Pakistan stock exchange.

Key word: stock markets share price, natural disaster, event study, abnormal returns.

Recommended citation: Muhammad Hafeez ullah, Najam ul sabeeh, Arshad Mehmood. IMPACT OF NATURAL DISASTER ON STOCK MARKETS PRICES, IN CASE CEMENT SECTOR OF PAKISTAN. 7-6. American Journal of Research P. 222-231 (2019).

Introduction:

The intention of this study is to discover the impact of natural disaster or rare event on stock market. This is long standing problem in macroeconomic and financial economic, why aggregate stock market returns have volatility? Question elevated by (Emil Sriwardane, 2015). Rietz and

thomsan (1988) and barro (2006) argued that rare events disturb the stock markets. The stock market movement have been deeply studied by many researchers (e.g. cutler et al. , 1989; fair, 2002; Kim, 2003).

Nakamura et al. (2013) the few natural unexpected events can affect the stock market performance even if disasters unfold over a number of

years and are followed by economic recoveries. On the other hand, many argued that rare disaster models are not supported by equity or options data Julliard and Ghosh (2012), Backus et al. (2011), and that more normally; the probability of a disaster may not be identifiable Chen et al. (2015).

Pakistan was also badly affected by natural disaster like earthquakes in 2005 and floods in 2007 and 2010 (NDMA, 2010). The role of stability is implying importance to economic development and growth (Shaikh & Memon, 2011). It is important to understand how natural disaster events have affected the returns of Karachi Stock Exchange (KSE), which is the largest stock exchange of the country). Pakistan was also badly affected by natural disaster including earthquakes in 2005 and floods in 2007 and 2010 (NDMA, 2010). The study contributes to the Literature as it uses a more expanded time frame considering all the major (flood, earth quack, land sliding, storm, high temperature) events. It observes the impact using four different event windows to get better results. It even observes the impact of favorable and unfavorable events individually. The impact of natural disaster events is observed only on after and before 11 days window.

The effort of this study is to find out the impact of natural disaster (flood, storm, earth quack, high temperature) that have an impact on stock returns. The factors introduced by many researchers are economic factors (announcements

about interest rates, foreign exchange rate, dividend policy etc.), and political events and disastrous events along with many others (Suleiman, 2012). Many studies on natural unexpected events explain that these events affect stock markets.

Literature Review:

Skidmore and Toya(2002) explain the effect of natural disasters in normality felt first in the loss of capital stocks markets , according to past studies financial impact of natural disaster have tended to employ a single event study. Disaster is an event that occurs in brutal catastrophe and suddenly (Dictionary, 2011). Disaster can also be described as a national economic catastrophe or leading the catastrophic world. Catastrophe can be categories as "natural catastrophe" and "man-made". According to Swiss Re (2011), natural forces will cause a natural catastrophe event. This event usually causes a large number of damage and losses that cover huge areas. Geok Hui (2012) there is numerous types of natural disasters including floods, tsunami, earthquake, hurricane, tornado, volcanic eruption and others.

In a world where natural disasters are becoming more repeated & destructive, improving our understanding of which factors have a say to the resilience of economies to real shocks is vital important. There is a huge literature on the impact of disasters on fatalities and Economic growth (Cavallo and Noy, 2011). Earthquakes tend to have a negative

impact on economic growth (Fomby et al. 2013).

To discuss the impact of natural disaster event on stock markets, Worthington and Valadkhani (2004) expressed the impact of natural disasters on the Australian exchange by learning the impact of forty two natural disasters together with storms, floods, earthquakes, cyclones etc on the all Ordinances Index from the day, 1982 to Jan 1, 2002 by applying ARMA model and ended that bushfires. Cyclones'. Earthquakes had a significant impact on market returns as compared to brutal storms and floods. In another study, Worthington and Valadkhani (2005) compared the consequences of natural, industrial and terrorist disasters on the national capital Markets by applying Box and Tiao Intervention analysis on ten market sectors and also the sectors most sensitive to disaster of any kind within the shopper discretionary, money services and material sectors.

The most significant singling event during the past eight years would appear to be the September (9) 11 terrorist attacks. Shelor et al (1990) investigated the impact of California Earthquake on the fine value dealing in Real Estate industry. They found that this event had negative impact on the fun's stock returns that were operating in the area hit by the earthquake. To sum up, various studies discuss in the literature related to different countries support the argument that news has a significant impact on the stock markets.

There is a large variation across all emerging markets as small islands are much more susceptible to natural disasters. For example, the average cost of natural disasters in the five largest countries by land area from 1980 to 2015 is 0.4% of GDP per year, compared to 7.7% of GDP per year for the five smallest countries. The literature on the economic costs of natural disasters (see, for example, the summary by Cavallo and Noy (2010)) suggests several factors that affect a country's susceptibility to disasters. Geography and geographical location are critical determinants of the physical vulnerability of certain countries or regions to different types of natural disasters. For example, the presence of multiple river basins and large floodplains increases susceptibility to floods. Hurricane-prone area increases susceptibility to storm damage. The small islands in the Caribbean and Pacific regions, for example, are particularly vulnerable to this dimension. Country size is another factor affecting vulnerability to natural disasters. Larger countries in terms of land area or population size have more assets or people exposed to direct damages from natural disasters. However, larger countries may also be more diversified and better able to enact inter-sectoral or inter-regional transfers that helps mitigate the economic impact of natural disasters. Therefore, while the direct losses may be high in large countries, the greater capacity to absorb shocks implies lower indirect

losses and / or that the size of the damage may be lower relative to the size of the country.

Taylor and Francis (2004) examine the financial costs natural disasters have on the economy with consideration of various aspects and the productivity is directly and indirectly affected by the natural's disaster. Albia Bertrand(1993) disasters do not affect the inflation and ramie(2013) discuss the effect of tsunami on world stock markets and she find that no significant impact on market returns of the equity portfolios(eg, tsunami had a minimal effect, tsunami and market share movement did not have any direct link between each other). Ramiah (2013) point out that by measuring five days after the vent in order to await market delays, there were still minimal changes in returns. Thus any significant impact on portfolios was not identified whatsoever.

Methodology:

Since we are interested to investigate natural disaster event has an impact on stock markets, an event study methodology has been conducted according to the procedure of (Mackinlay, 1997).

The approach plays a vital role in capturing any abnormal or residual (a significant deviation from average) value changes in index prices, underlying explanation from market efficiency hypothesis, behavior finance perspective or other scholars, , however the study follows te notion that prices will immediately be reflected by an event(Fama, 1969).

To test the hypotheses secondary data has been used. It required three kinds of data, one about stock prices 2nd about cement sector while the other dataset about catastrophic events. Data about KSE stock returns and cement sector share prices has been obtained from Yahoo Finance. It consists of a cement sector all companies observations from 2012 to 2016(five year) and KSE stock return 2012 to 2016. Data about Catastrophic events has been obtained from website of data stream. We have been selecting events that not necessarily need to be considered as an extreme but selecting those, at least that has been followed by an extensive media exposure. Natural disaster events selected in this study and with further divided in to 4 type of occurrence. One is flood 2nd is land sliding 3rd is extreme temperature and 4th is earth quack and we consider natural disaster as negative event.

Event Study design:

The event window will take place $t=0=24$ hour event date. If the event day of interest takes place at holiday or other reasons for the stock market to be closed, the next opened day will be accounted as the event day "0". Moreover the estimations window contains of 10 days prior to the event, and 10 days post to the event. In order to be able to significant cumulative abnormal returns (CAR) for one sample period, the benchmark we selected those event that have more than 40 deaths. Hence our hypothesis testing framework.

$$H_0: u = CAR(t_1, t_2) = 0$$

$$H_0: u = CAR(t_1, t_2) = 0$$

The primary idea of an event study is to capture abnormal returns of the overall return on the market, approximated by an index. However, as we are interested in stock market indexes. 1st off all we calculate the adjusted return of cement sector stock return and all indexes return, then we find the slope, standard error, R square, Intercept by using the excel formals, then find the expected return , then we find the abnormal returns by use the actual return minus expected return.

The calculation is:

$$AR_{m,t} = R_{m,t} - \bar{R}_m$$

Where $A_{R_{m,t}}$ is the excess return for stock market index m at time t, $R_{m,t}$ is the actual observed market return for stock market index m at time t and \bar{R}_m is average of stock market index m's daily return in the estimations window. \bar{R}_m is computed from added the slope and intercept and multiply with event window.

In addition, in order to draw relevant and overall inferences for the event of interest, the abnormal return observations must be aggregated (Mackinlay 1997). The aggregation (i.e. CAR) will take on all natural disaster events in consideration. We defined CAR $(t_1, t_2)_m$

We computed:

$$CAR(t_1, t_2)_m = \sum_{m=t_1}^{t_2} \bar{R}_{m,t}$$

T stat applied before CAR_m that

deviated from zero with equal to or less the -1.95 and equal to or more than +1.95 will designed as a significant impact. T statistics compute from division of abnormal return and standard error.

Limitation of study:

The data of the events in the study is verified through reliable sources. Still, we acknowledge the potential risk of some eventual inaccuracies regarding the data. Certain major events does rarely "come alone", but is often followed by other events which may occur as a reaction to the main event or other independent reasons. Therefore, we cannot exclude the fact that our measurements done in the study is not solemnly related to the main event.

In addition, we accept the fact that virtually, it is the exact time of when the information of the occurrence of an event is released that is the matter to be studied in order to be the most accurate.

Hence, our Ten day event window. We estimate that we will be able to capture both aspects of the event, both the actual occurrence of it, and when the news of it reaches the market.

Finally, there are certain drawbacks associated with our choice of using few amount of days in the estimation window, and to our approach to determine the average variance. It has been argued that the short time estimation window do not fully provide accurate average market return and in the case of the variance approach, it

may lead to downward bias in the standard deviation and thus overstate the t-statics, as discussed by Kothari and Warner (2007, p. 11). However, previous studies (Chen and Siems, 2004; Brounen and Derwall, 2010) have followed similar methodology approach to examine excess returns as our study with success, therefore we are confident to be able to carry out liable results.

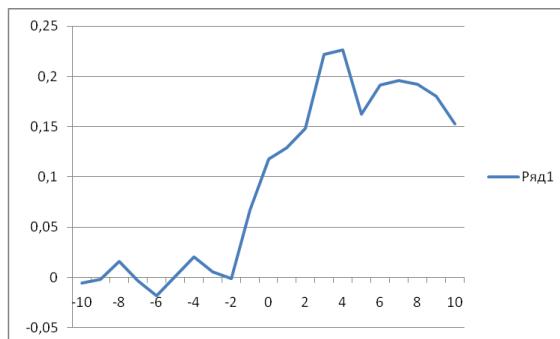
Result analysis

Frame 1: flood



Flood show the negative curve in events days. Before event window the accumulated abnormal return is higher when day by day the trend goes down and stops on -0.16. Trend show the effect of flood on stock returns is negative and significant related.

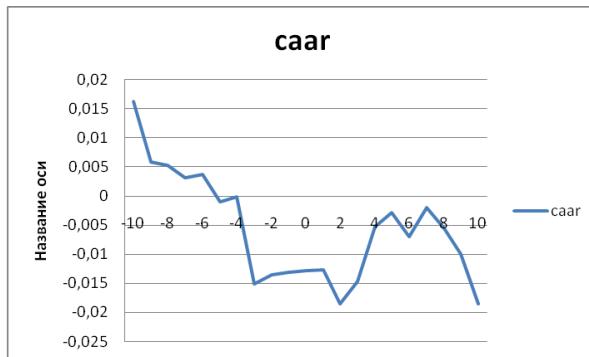
Frame 2: land sliding



Before land sliding market is down and shows the negative average abnormal return but before event date trend going on positive after event

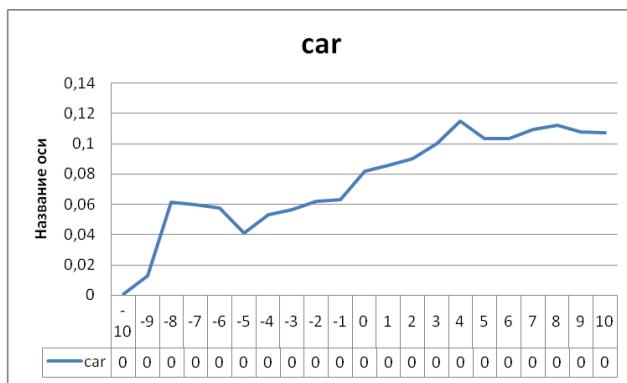
day market goes higher before last day of event window the curve show negative slop but this is normal. So here curve show the positive but the land sliding does not affect the cement sector price or return.

Frame 3: Earth quack



In event of earth quack the caar going down, the graph show that before event cement sale is high and after event the growth of return will be down so this portion is effect by earth quack.

Frame 4: Extreme Temperature.



Extreme temperature does not affect the cement sector returns this event show positive trends of returns. Extreme temperature cannot decrease the return of cement sector. Over analysis graph show the positive trends.

Table 1: Average t-stat and averages of abnormal return

Events days	Flood		Land sliding		Earth quack		Extreme temperature	
	CAAR	tstat	CAAR	tstat	CAAR	tstat	Caar	tstat
-10	-0.0103	-0.3051	-0.005	-0.078	0.016	0.666	0.0009	0.013
-9	-0.0201	-0.3460	-0.002	0.087	0.006	-0.337	0.0132	0.526
-8	-0.0231	-0.0845	0.016	0.641	0.005	-0.316	0.062**	2.215
-7	-0.0256	-0.0532	-0.003	-0.134	0.003	-0.022	0.0599	-0.185
-6	-0.0282	-0.0009	-0.018	-0.397	0.004	-0.012	0.0578	-0.241
-5	-0.0395	-0.5582	0.001	0.560	-0.001	-0.206	0.0413	-0.791
-4	-0.0458	-0.2999	0.021	0.408	0.000	-0.104	0.0532	0.533
-3	-0.0557	-0.4830	0.006	-0.411	-0.015	-0.598	0.0563	0.119
-2	-0.0568	-0.1458	-0.001	0.042	-0.013	-0.063	0.0621	0.244
-1	-0.0684	-0.3759	0.068	1.241	-0.013	-0.082	0.0631	-0.099
0	-0.0784	-0.4252	0.118	1.007	-0.013	0.048	0.0819	0.612
1	-0.0840	-0.2021	0.129	0.250	-0.013	0.023	0.0857	0.171
2	-0.0948	-0.4387	0.148	0.413	-0.018	-0.172	0.0902	0.142
3	-0.1027	-0.3044	0.222	1.232	-0.015	-0.110	0.1000	0.429
4	-0.1104	-0.3724	0.226	-0.325	-0.005	0.219	0.1149	0.642
5	-0.1219	-0.4862	0.163	-1.132	-0.003	0.006	0.1036	-0.499
6	-0.1280	-0.3696	0.191	0.732	-0.007	-0.187	0.1036	-0.053
7	-0.1392	-0.4756	0.196	0.213	-0.002	0.192	0.1096	0.167
8	-0.1490	-0.4053	0.192	0.164	-0.005	-0.175	0.1121	0.149
9	-0.1513	-0.3114	0.180	-0.117	-0.010	-0.288	0.1077	-0.251
10	-0.1514	-0.0423	0.153	-0.409	-0.018	-0.223	0.1072	0.149

This table shows the result of event study in flood trend is negative before event the value is -.068 and after event going more negative side and the ending value is -.1514. caar value show the negative value in table 1 and the t stat values al show the negative and insignificant effect on flood, last value of t stat is -.0423, we set the parameter $\alpha = 2.96$, if value on 2.96 then the result show significant so according to this parameter all values is insignificant. Second event is land sliding before event that shows the negative caar values -.411 after this value event is occur and after event values going positive side. Mean event effect to return of cement sector these effects is positive, positive trend end on .153

values after 10 days of event. And t stat have no significant value, all value is insignificant bus some value are negative and some are positive t stat according to our parameter of tstat we check not any one figure greater from $\alpha = 2.96$. third event is earth quack, before this event value is positive after event values going down negative so here event have negative effect of return of cement sector prices, starting value of caar is .016 after event ending value is -.018 and tstat have all values are insignificant, last event who discuss in our paper is extreme temperature cannot effect of return of cement sector because caar value increasing continuously trend show positive value in same and the ending value

is .1072 and tstat before event have significant one value 0.062** but this value dose not effect because this value before event after event all values show insignificant result .

Conclusion:

This study presents an analysis of impact of natural disaster events on the Pakistani stock markets. We use event study method for analysis. The most important result of this study is that the stocks provided by natural disaster have an influence on markets returns or effect to stocks markets. All other things being equal, earth quack, flood, extreme temperature, lands sliding all have influence on stock markets prices and returns. But those events are rare happening in Pakistan and those events are badly effect to all markets.

We are analysis before the event and after the event days of occurrence.

Of course there is several ways in which this work is could be extended. One way is to take greater account of the fact that the financial impact of natural events or disasters will clearly vary according to their precise economic impact. In this manner a focus on a smaller number of major disasters and catastrophes may indicate more significant financial influence. That markets are less liquid markets, as in USA, Australia, you will find the ability to impact upon major global Economics. Finally, while it is now the case that better forecasting and emergency management is helping to investor about those adverse affects of some natural disaster events.

Reference

- Albala-Bertrand, J. M. (1993). Natural disaster situations and growth: A macroeconomic model for sudden disaster impacts. *World Development*, 21, 1417-1434.
- Brounen, D. and Derwall, J. 2010. "The Impact of Terrorist Attacks on International Stock Markets", *European Financial Management*, Vol. 16, No. 4, pp. 585-598
- Cutler, D. M., Poterba, J. M., & Summers, L. H. (1989). What moves stock prices? *Journal of Portfolio Management* , 15 (03), 8-12.
- Christian Julliard and Anisha Ghosh. Can rare events explain the equity premium puzzle? *Review of Financial Studies*, 25(10):3037-3076, 2012.
- Cavallo, E. And I. Noy. 2011. "Natural Disasters and the Economy. A Survey." *International Review of Environment and Resource Economics* 5 (1): 63?102.
- Chen, A.H and Siems, T.F. 2004. "The effect of terrorism on global capital markets", *European Journal of Political Economy*, Vol.20, No. 2, pp. 349-366.\
- David Backus,Mikhail Chernov, and iannmartin. Disasters implied by equity index options. *The Journal of Finance*, 66(6):1969-2012, 2011.
- Emi Nakamura, Jon Steinsson, Robert Barro, and Jose Ursua. Crises and recoveries in an empirical model of consumption disasters. *American Economic Journal: Macroeconomics*, 5(3): 35-74, 2013
- Fair, R. C. (2002). Events that shook the market. *Journal of Business* , 75 (4).
- Fomby, T., Y. Ikeda, and N. V. Loayza. 2013. "The Growth Aftermath of Natural Disasters." *Journal of Applied Econometrics* 28 (3): 312-434.

-
- Kim, k.-h. (2003). Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model. *Review of Financial Economics*, 301-313.
- Kothari, S.P. and Warner, J.B. 2007. "Econometrics of Event Studies", in B. Espen Eckbo (eds), *Handbook of Corporate Finance: Empirical Corporate Finance*, Vol. 1. Amsterdam: Elsevier, pp. 3-32.
- Skidmore M. And Toya H. (2002) Do natural disasters promote long-run economic growth?, *Economic Inquiry*, 40(4), 664-87.
- Ramiah, V. 2013. "Effects of the Boxing Day tsunami on the world capital markets". *Review of Quantitative Finance and Accounting*, Vol. 40, No. 2 pp. 383-401.
- Robert J. Barro. Rare disasters and asset markets in the twentieth century. *The Quarterly Journal of Economics*, 121(3):823-866, 2006. Doi: 10.1162/qjec.121.3.823.
- Shelor, R., Anderson, D., & Cross, M. (1990). The impact of the California earthquake on real estate firms' stock value. *Journal of Real Estate Research*, 5, 335-340.
- Thomas A. Rietz. The equity risk premium: A solution. *Journal of Monetary Economics*, 22(1): 117-131, July 1988.
- Valadkhani, A., & Worthington, A. (2005). Catastrophic Shocks and Capital markets: A Comparative Analysis by Disaster and Sector. *Global Economic Review*, 34(3), 331-344