Industry Premiums and Systematic Risk under Terror: Empirical Evidence from Pakistan

Ahmad, Tanveer and Shahzad, Syed Jawad Hussain and Rehman, Mobeen ur

COMSATS Institute of Information Technology, Islamabad Pakistan

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Tanveer Ahmad
Lecturer, COMSATS Institute of Information Technology, Islamabad Pakistan
Tanveerah87@gmail.com

Syed Jawad Hussain Shahzad
Lecturer, COMSATS Institute of Information Technology, Islamabad Pakistan
Jawad.kazmi5@gmail.com

Mobeen ur Rehman
Lecturer, COMSATS Institute of Information Technology, Islamabad Pakistan
mobeenrehman@live.com

Abstract

This study aims to investigate the impact of terrorism on Pakistani industry excess returns and systematic risk. Value weighted monthly returns for non-financial firms listed at Karachi Stock Exchange, from January 2001 to December 2010, are used for this study. A multiplicative term to study the change in systematic risk and a dummy variable to examine the industry wise impact on excess returns was introduced in the standard CAPM framework. Terrorism as a phenomenon, not an event in Pakistan, has a significant negative impact on the excess returns of twelve out of twenty seven industries. The evidence suggests a mixed effect of terrorism on the systematic risk of some industries. Transportation, Tobacco and Automobiles industries appear to be most affected sectors of the economy.

Key words: Terrorism; Equity market; Systematic risk; Pakistan.

JEL classification: G1; G11; H56

1 Introduction

The implications of terrorism acts are directed toward a target population with an objective to hinder economy of the country as a whole. The economic consequences are not always consistent or straightforward in instilling fear and uncertainty in the beleaguered population. Widely used indicators of fear following to terrorism attacks are investors'

confidence and instability in the financial market (Arin, Ciferri, & Spagnolo, 2008; Shahbaz, Shabbir, Malik, & Wolters, 2013).

Every investor seeks to earn a positive return on his/her investment. Past research has mostly focused on the investor choices along with the discussion on factors driving high returns with risk adjustments. The stock prices are sensitive to unforeseen events particularly the adverse shocks generated in stock prices due to the occurrence of a terrorist event. Carter, Rogers, and Simkins (2006) studied the impact of 9/11 terrorist attack on airline stock prices and found significant increase in systematic risk. Similarly, the study of Drakos (2004) suggests that in addition to systematic risk, a substantial increase has also been noted for the airline stocks in post 9/11 scenario. The study of Gulley and Sultan (2006) examined the effects of terrorist events on stock, bond, and the currency markets and found that returns are reduced as a result of the terrorist attacks along with the increasing level of risks in the market. Additionally, Charles and Darné (2006) investigated the effects of the September 11 attack on international stock markets and identified that terrorist attacks generates both permanent and temporary shocks in international stock markets.

Different businesses are perceived to have varying risk level depending on the degree to which they are exposed to terrorist attacks. Business exposure to terrorism depends on the activities and nature of its operations. The impact of terrorist attacks depends on many parameters like geographic location, raw material used, import and export orientation, product classification etc. Firms with the plants or factories in an area that is influenced by terrorism will be perceived to have more operation risk than a firm located in safer zones. Similarly the nature of business i.e. transportation, agricultural products and technology oriented companies can have different reasons for terrorism impacts. For instance, 11 September, Bali, Madrid, and London attacks indicate that terrorist continuously used transportation utilities to reach their targets. Therefore, transportation appeared to be particularly exposed to terrorism. Drakos (2004) has confirmed the impact of terrorism event on industry. Terrorism may also have different effects on industries due to the nature/features of a terrorist attacks. If the terrorist attacks are perceived to be quasi-war like scenario e.g. 11 September it is quite possible that it would energize the industries like the defense sector. However the industry perceived to be safe heaven i.e. precious metals may not have any impact of such attacks. On the other hand, the level of uncertainty

caused by insecurity can challenge the confidence level and causes delays in the consumption of non-essential goods and services.

It is quite difficult to theorize terrorist attacks of homogenous nature on activities of economic nature i.e. shareholders will react to a terrorist attack only under the perception if it is to have an impact on the equity expected returns. Cam (2008) studied the impact of Madrid, September 11 and Bali through the analysis of 135 equity indexes of various industries and documented positive returns in telecommunications, water and defense industries whereas Leisure, airline and hotel industry exhibited strong negative returns. Ramiah et al (2010) also identified increasing level of systematic risk in some sectors suggesting that within a single economy, risk and return may have significant level of variations across different industries. Terrorist events should induce response in the financial markets resulting in the demand of higher level of compensations due to security holdings that exhibit higher risk thereby putting pressure on risky business due to terrorism activities. These investors also have an option to shift towards less risky equities thereby increasing these securities asset prices.

The paper makes unique contribution to the literature. Previous researches conducted at international level have focused on selected major terrorist acts, however, in case of Pakistan, terrorism in not an act rather it's a phenomenon, therefore this study tests the effect of overall terrorist activity on stock returns. It unveils the impact of terrorism on systematic risk and industry premium of different industries listed at Karachi Stock Exchange of Pakistan. This study has important implications for portfolio managers, mutual fund managers, investment bankers and corporate managers. Investors are willing to know when and where to invest, therefore the presence of terrorism effect on industry returns will help investors in their decision making.

2 Literature Review

There are evidences in the literature that discusses the reactions relevant to the industries in response to military conflicts and risks. According to Bradford and Robinson (1997), there had been negative returns with abnormality at the time of war in Iraq. The firms which showed resistance were involved in the oil industries and defense sectors. According to McDonald and Kendall (1994), defense sectors was the only one of its nature that exhibited abnormal returns during the activities of political nature. According to Berrebi and Klor (2006), there were lot of movements in the prices of the stocks listed on the US stock exchange during the attacks of

terrorism and Palestine Israeli conflicts. It was also observed that defense sector was the only one with the positive impact on returns in the stock market as compared to all the remaining sectors which recorded negative returns. While conducting the empirical tests and quantitative analysis on the stock of insurance companies in US after the incidence of 9-11, Starks et al (2003) reported that the stocks experienced price drop of sudden nature followed by the recovery in quick succession in few months period. Cummins and Lewis (2003) also confirmed the findings of Starks et al (2003) regarding the price drop in insurance companies stocks after 9-11.

According to some of the models of investment strategy, terrorism exhibits the effect of industrial differential in nature. According to these models, changes in the optimal portfolios are induced by events risks (Liu et al., 2002). According to them, whenever an event causes a price jump in the stocks, investors quickly do rebalancing in their portfolios by reducing their holdings in more risky assets against the increase in the holdings of less risky assets. As far as the activities of terrorism are concerned, a shift to sectors with less risks from industries of the terror sensitive nature is implied by this theory. Marlett et al (2003) presented a practical example of this approach as the recognition of utility industry with much risks by the US government and its identification as high risk targets.

To conclude with, there is an industry specific effect of the terrorist activities on the economy. According to Becker and Murphy (2001), during events like natural disasters and acts of terrorism, this effect has the capability of preserving its efficiency by reallocating its resources to the remaining efficient industries from the ones with less efficiency. According to Enders and Sandler (2006), a substitution effect is generated by the activities of terrorism due to which economic activities shift from the sectors more prone to terrorism to the sectors which are more immune to such activities. These reorganizations of economic activities and resources should be reflected by the financial markets at the first place.

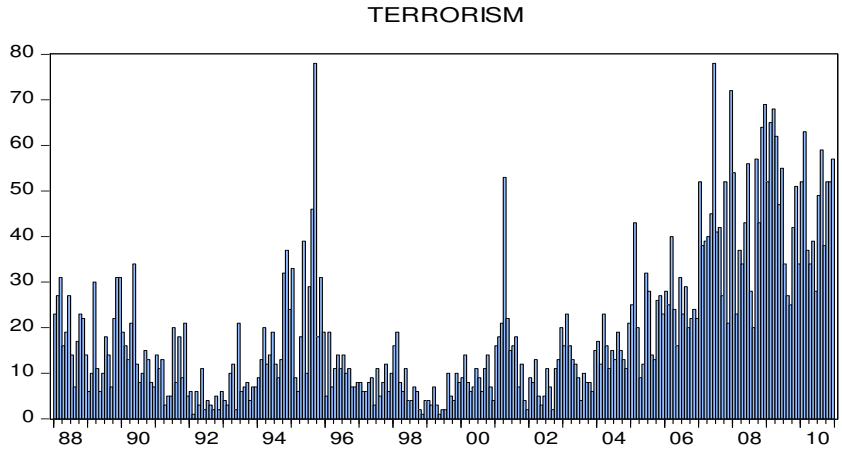
On the overall basis, terrorism has a negative impact on the returns in stock markets for example Chen and Siems (2004) reported that on September 17th 2001, DJ industrial index reported a -7.15% loss of abnormal nature of. Considering the fact that all of the stocks underperformed as a result of such terrorist attack, that impact was not the same across all the sectors and industries. According to Bruck and Wickstrom (2004), some sectors and activities are more prone to attacks of terrorist nature than the rest. There are lot of industries that experienced a rise in demand due to war state unlike the rest which suffered much due to such

activities. According to the past available literature, lot of industries suffered losses during the military conflicts. According to Pan et al (2003), optimal portfolio investment strategy suggests that during uncertain times and conditions, investors switch from more risky funds to the ones with lower risk. In the end, it is reasonable to conclude that a differential effect could be expected as the economies have the tendency to reorganize their activities and required resources by absorbing the external shocks (Enders and Sandler, 2006).

Research Question: Does Terrorism Have an Industry Differential Effect?

3 Data and Methodology

The present study cover monthly stock returns of firms listed at Karachi Stock Exchange for the year starting from January 2001 to December 2010. Stock prices are collected from www.Brecorder.com. The reason for limiting the study on post 200 data is that the terrorism events kept on increasing in Pakistan after the incident of 9/11 (Fig 1).



Mean	19.26
Std. Dev.	16.38
Skewness	1.42
Kurtosis	4.53
Jarque-Bera	119.65
Probability	0.0000
Observations	276

Table 1 includes the number of companies in sample for each year. On average there were 309 companies.

Table 1: Total number of Companies

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
No. of Companies	316	289	296	306	316	335	308	316	298	307

We have extracted the terrorism data from BFRS political violence data set compiled by Empirical Studies of Conflict (ESCO) project by Princeton University. The database on terrorist

events other than BFRS may under or overstate events based on international interest or potential impact and may provide a dramatically incomplete picture of true situation ((Bueno de Mesquita et. al, 2014). BFRS has defined terrorism as "premeditated, politically motivated violence against *noncombatant* target by subnational groups of clandestine agents" (Bueno de Mesquita et. al, 2014 p.5). The "significance" of terrorism events has then been ascertained according to the U.S. Department of State definition: "An International Terrorist Incident is judged significant if it results in *loss of life or serious injury to persons*, abduction or kidnapping of persons, major property damage, and/or is an act or attempted act that could reasonably be expected to create the conditions noted". We will make use of a dummy variable to check either a terrorist attack is significant at an international level by calculating the monthly median value for all terrorist activities for the sample period. The months in which numbers of terrorist attacks were more than the median value were categorized as high terrorist activity months and low if otherwise. To calculate industry returns, all stocks in sample are divided into portfolios formed on the bases of industries. Monthly value weighted returns are then calculated for each industry.

Asset pricing model provides the basis of the theoretical model developed in Engel et al (1987). For simplicity we assume the case of two assets one of which is risky yielding a random return q and other being the risk free with return r. The expression for the investor's initial wealth is given below.

$$W = ps + zx$$

p gives the expression for the price of the risky assets, s represents the risky assets present in the portfolio, whereas x shows the number of shares of risk free assets along with z presenting the risk free assets price which is normalized at 1. For now, we have the assumption that the returns of the assets are distributed with θ mean and φ variance.

$$y = \frac{q}{p} - r \qquad (2)$$

The expression given below presents the initial two moments with excess returns

$$E(y) = \mu = \frac{\theta}{p} - r \qquad (3)$$

$$V((y) = \sigma^2 = \frac{\emptyset}{p^2} \qquad (4)$$

The equation given below presents the expected utility function

$$EU = 2E(qs + rx) - bV(qs + rx) \qquad (5)$$

The following first order condition represents the maximization w.r.t. the yields:

$$\theta = bs\emptyset \qquad (6)$$

Putting the value of equations (3) and (4) into (6) results in the following mathematical expression

$$p(\mu + r) = bs\, \sigma^2 p^2 \qquad (7)$$

Dividing both sides of (7) by p yields:

$$\mu + r = bs\, \sigma^2 p \qquad (8)$$

Stock return data have the time varying variance (see Akgiray, 1989; Hamao, Masulis and Ng, 1990; and Schwert, 1990). Unfortunately, Ordinary least Square (OLS) method does not cater for Conditional Heteroskedasticity (CH) issue in estimation process. According to Robins et al (1987), asset prices in the time series models tap both, risk and the associated movements over time and are included as a determinant of price. This can be represented by multiplying both sides with μ that results in

$$\mu_t^2 + \mu_t r = bs\sigma_t^2 p\mu_t \qquad (9)$$

Use of equation (3) results in pμ= θ-pr. Putting pμ= θ-pr into (9) results in:

$$\mu_t^2 + \mu_t r - bs\sigma_t^2(\theta - pr) = \qquad (10)$$

This can be rewritten as:

$$\mu_t = \frac{\left[-r + \sqrt{r^2 + 4bs\sigma_t^2(\theta - pr)}\right]}{2} \qquad (11)$$

Next, the ARCH (1), Breusch Pagan Godfrey (BPG), White (with white cross term) tests have been used to ascertain whether OLS estimation is appropriate for the given data set or not[1]. The test results report the presence of volatility clustering and ARCH effect in the time series

[1] Result of these test are available from the authors on demand.

data thus OLS methodology is inadequate. Therefore, following Ramiah et al. (2010), this study estimates the mean equation of GARCH (1, 1) process proposed by Bollerslev (1986) by including a simple terrorism dummy variable to examine the impact of terrorism on industry excess returns and an interaction term to evaluate the sensitivity of systematic risk due to terrorism, in the standard CAPM with following specification:

$$\widetilde{r_{it}} - \widetilde{r_{ft}} = \emptyset_i + \beta_i^1\left[\widetilde{r_{Mt}} - \widetilde{r_{ft}}\right] + \beta_i^2\left[\widetilde{r_{Mt}} - \widetilde{r_{ft}}\right] * D + \beta_i^3 D + \varepsilon\widetilde{r_{it}} \qquad (12)$$

Where, $\widetilde{r_{it}}$ is the i's return of the industry, $\widetilde{r_{ft}}$ is the return on risk free asset, $\widetilde{r_{Mt}}$ is the market return at time t. Terrorism events are denoted by the dummy variables D taking value of 1 to show high terrorism activities occurring in the month and 0 otherwise. The purpose of this variable is to capture the effects on systematic risks due to terrorist attacks and excess industry returns. β_i^1 , β_i^2 and β_i^3 present co-efficients of market risk premium, sensitivity of industry systematic risk to terrorism and impact of terrorism on excess industry returns, respectively. $\emptyset_i$ is the intercept of the regression equation (E(ϕi) = 0) and $\varepsilon\widetilde{r_{it}}$ is the error term.

4 Results and Discussion

The analysis has been performed independently on 27 industries. The hypothesis of testing the phenomena that terrorist activity impacts the excess returns of the industry and the related sensitivity is attempted by the multiplicative regression analysis presented through equation 12. The increase in the systematic risk is presented by the positive coefficient of the associated multiplicative dummy variable (β_i^2) and vice versa. The excess returns on the industry are presented by the positive/negative coefficients of the dummy variable presented by (β_i^3). A significant change in the systematic risk of the industry is implied by the coefficient of the multiplicative dummy variable that is statistically different from zero. The explain power of the model measured through adjusted R-square indicates that variables are able to explain 50% of the excess industry return, on average. Serial correlation issue was examined by Durbin–Watson statistic. All the values are close to 2 and hence, no serial correlation is detected.

The sign of the coefficient (β_i^2) appears to be negative for seven out of the twenty seven industries. The p values (indicated by *'s) results show that systematic risk statistically decreased in seven sectors namely Transport, Tobacco, Automobile Assembler, Technology & communication, Paper and board, Oil & gas marketing companies, and chemicals. For example,

the systematic risk of Automobile Assembler is 0.8574 without incorporating the terrorist activities and it decreases by -0.3751 when the terrorist activities are added in the analysis. The findings of our analysis of in contrast to the Chan and Wei (1996) and Vikash et. al (2010) as they found an increase in the systematic risk in response to political news and a particular terrorism event, respectively. A major difference here is that we have used terrorism activities as a phenomenon rather an event. The systematic risk of three industries i.e. Jute, Fertilizer and Power generation and distribution companies, increased during the months of higher terrorism activity. Besides from that, evidence of change in systematic risk based on any statistical nature is hard to be found in the remaining seventy industries. The conclusion can be drawn that systematic risk is not always led by the terrorists nature and that impact of terrorism is significantly different across the industries depending on the nature its operations. This finding is similar to the results of Vikash et. al (2010) and Drakos (2004).

Table 2: The impact of terrorism on Pakistani industries - regression analysis.

Industries	$\emptyset_i$	β_i^1	β_i^2	β_i^3	**Adj. R-sq.**	**DW Stat**
Transport	0.018 (2.993)	1.359* (8.934)	-0.936* (-4.638)	-0.088* (-3.914)	0.410	1.953
Tobacco	0.003 (0.588)	0.813* (4.459)	-0.449* (-2.169)	-0.069* (-146.4)	0.361	1.923
Automobile Assembler	0.006 (0.7813)	0.857* (9.242)	-0.375* (-2.691)	-0.060* (-4.266)	0.523	2.288
Technology & Communication	-0.011 (-1.071)	0.918* (9.537)	-0.387* (-2.910)	-0.049* (-2.600)	0.527	2.301
Pharmaceuticals	-0.025* (-2.889)	0.440* (6.026)	-0.113 (-0.868)	-0.047* (-2.435)	0.337	2.060
Engineering	-0.011 (1.598)	0.702* (7.421)	-0.125 (-0.926)	-0.039** (-2.056)	0.433	1.998
Paper & Board	-0.024** (-3.501)	0.622* (6.625)	-0.187** (-1.840)	-0.036** (-146.8)	0.333	2.080
Jute	-0.009 (-0.739)	0.440* (4.320)	0.181* (73.23)	-0.030*** (-1.614)	0.254	2.175
Sugar & Allied Industries	-0.025* (-3.677)	0.402* (5.020)	0.006 (0.069)	-0.029* (-2.640)	0.405	1.607
Food & Personal Care Products	-0.027* (-4.256)	0.366* (5.945)	0.001 (0.019)	-0.027** (-2.293)	0.234	2.122
Glass & Ceramics	-0.039* (-4.412)	0.345* (2.988)	0.056 (0.404)	-0.022* (-350.9)	0.253	2.050
Oil & Gas Marketing Companies	-0.005 (-0.920)	1.026* (15.86)	-0.178* (-1.991)	-0.020** (-2.331)	0.863	2.064
Chemical	-0.020 (-2.840)	0.800* (11.13)	-0.538** (-0.549)	-0.019 (-0.600)	0.058	1.995

Fertilizer	-0.017* (-3.314)	0.697* (11.72)	0.226** (2.147)	0.001 (0.168)	0.409	2.066
Power Generation & Distribution	-0.020** (-3.302)	0.667* (9.833)	0.208*** (1.877)	0.004 (-0.303)	0.602	2.330
Cable & Electrical Goods	-0.014 (-1.473)	0.615* (4.898)	0.035 (0.638)	-0.015 (-0.846)	0.413	2.059
Cement	0.001 (-1.425)	1.095* (11.91)	-0.108 (1.068)	-0.002 (1.698)	0.636	1.889
Leather & Tanneries	-0.032* (-2.187)	0.306** (2.845)	0.018 (0.113)	0.014 (0.725)	0.088	1.754
Miscellaneous	-0.039 (-3.331)	0.402* (2.528)	-0.062 (-0.440)	-0.019 (-1.177)	0.126	1.422
Oil & Gas Exploration Companies	-0.000 (0.043)	1.190* (18.04)	-0.014 (-0.167)	0.012 (0.779)	0.535	2.159
Refinery	-0.001 (-0.073)	0.986* (9.159)	0.024 (-0.168)	0.008 (0.408)	0.548	2.299
Synthetic & Rayon	-0.028* (-3.829)	0.914* (11.19)	-0.078 (-0.587)	0.001 (0.097)	0.549	2.217
Textile Composite	-0.014 (-1.362)	0.904* (9.252)	-0.046 (-0.366)	-0.005 (-0.527)	0.645	1.786
Textile Spinning	-0.034* (-3.648)	0.5415* (5.061)	-0.072 (-0.723)	-0.006 (-0.464)	0.253	1.249
Textile Weaving	-0.037* (-3.165)	0.626* (5.773)	0.006 (0.039)	-0.003 (-0.202)	0.433	2.053
Vanaspati & Allied Industries	-0.009 (-0.893)	0.697* (3.051)	-0.092 (-0.169)	-0.010 (-0.166)	0.148	2.006
Automobile Parts & Accessories	-0.022 (-3.378)	0.818* (6.558)	-0.139 (0.845)	-0.002 (0.542)	0.381	2.200
No. of industries significant cases	*9/27*	*27/27*	*10/27*	*12/27*		
Note: *'** & *** indicate significance at 1%, 5% and 10% level, respectively.						

Columns 5 of Table 2 present the findings of the regression Eq. (12) to estimates the long term impact of the terrorism phenomenon on the excess returns of different Pakistani industrial sectors. The results show that there is on average 3 to 4 percent decrease in the excess return of twelve out of twenty seven industries. Twelve industries have shown a negative relation between excess returns and terrorism activities. All five industries, which show a decrease in systematic risk, are also negatively impacted by the terrorism. These findings are in accordance with the mean variance efficiency framework, as one would expect a decrease in returns as a result of decrease in systematic risk. These findings are unique as no study in literature, according to the author's best knowledge, so far has analyzed the impact of terrorism as a variable on the returns of industries.

The decrease in the excess returns of transport industry during the periods of higher attacks could reflect the uncertainty generated by these attacks and resulting fear to travel. The perceived higher risk of traveling can decrease the demand of transportation product as well as services leading to a decrease in their prices. The longer term impact of terrorism is known to have implication for the travelling within the country and travel of foreigners to a terrorism effected country (Lenain, Bonturi and and Koen, 2002). Similar impact on the demand of transportation and tourism industries was found by Drakos (2004) and Zycher (2003) in their analysis of post-11 September analysis of terrorism. The third most effected industry is Automobile Assemblers which have a 6% decrease in the excess returns during the higher terrorism months. Transportations and automobile assembling industry are similar in nature and thus have similar effect with a slight difference in the magnitude. Bradford and Robinson (1997) identified that the transportation sector is under pressure, traditionally, during wartimes.

Tobacco and technology sectors are the second and fourth most affected industries with as decrease of 6.9% and 4.9%, respectively. The drop in demand of these industries may be as the share market reaction to the leisure facilities and securities of luxury products. The price fall for the tobacco and technology products may reflect the investors' expectation regarding delay in consumption of non-essential products. During the periods of high terrorism and resulting uncertainty, consumers may wait until uncertainty decreases before they buy non-essential goods.

Oil & gas marketing industry also shows a negative impact of terrorism with a decrease of 2% in excess returns due to terrorism. War like situations results in increase of international oil prices (Rigobon and Sack, 2005) and thus higher uncertainty may have induced a shift in investment strategy (Liu et al., 2002) where the investors may shift their investment from high risk investment to less risky asset during the periods of high uncertainty.

5 Conclusion

This study unveils the impact of terrorism on different industries in Pakistan. The impact of terrorism on Pakistani industries is studied by introducing a multiplicative term to study the change in systematic risk and a dummy variable to examine the industry wise impact on excess returns. Only a few industries showed a decrease in systematic risk during the months of high terrorism activities. The results show that there is on average 3 to 4 percent decrease in the

excess return of half of the industries. Terrorism attacks were seen to be a contributing factor to the general level of economic activity.

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