Analyzing Effect of Environmental Rating on Stock Return using Market Model

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Abstract

This paper examines the interplay between environmental rating and stock return. This is a novel attempt to measure the relation between sensitivity of Indian companies to environmental causes and its reward by Financial Market, thereby using financial market as a leverage by which environmental sensitivity can be promoted. In this paper an initiative is being made to see how capital market reward those firms whichhonors their environmental responsibility.Our study focuses on cement, steel, automobile and alkaline industries as these are one of the major polluter and emitters of GHG gases.

Key words: Environmental rating, stock return, Market Model, Event Study.

Introduction

The development of a diversified industrial sector, based on combination of large and small scale industries, along with growing population has contributed to growing incidence of air pollution (SoE Report-2009). Air borne emissions emitted from various industries are the cause of major concern.CSE –center for science and environment, a New Delhi based public interest research and advocacy organization, gives green rating which is an indicator of industrial friendliness of a unit with in an industrial sector. CSE gives green ratings based on environmental performance, the project is financed through United Nations Development Programme (UNDP) through central ministry of Environment and Forest (MoEF). GRP (Green Rating Process) relies heavily on voluntary disclosure by companies. Rating aims at encouraging companies with adopting better environmental management and risk liability policy. The final rating is green leaves award ranging from no award to five leaves.

A firm who understands the link between stock return and environmental initiatives gets a impetus to participate in environmental protection programmes (Alberni and Segerson ,2002). The present study explores this causal relationship between environmental ratings and stock return. The purpose is to analyze the Indian capital market environmental sensitivity which further may increase participation in voluntary environmental programmes. The linkages between the stock return and environmental initiatives can be studies using event study methodologies.

Economists are frequently asked to measure impact of economic

events on firms market values (Mckinlay, 1997). This task can be accomplished by financial data analysis using event study methods. The usefulness of event study comes from the fact that the effects of economic events are immediately reflected in stock prices (Dolley, 1933). Event studies provide insights concerning the degree of market efficiency. Applications of event studies can be evident in many accounting and financial research and has been applied to wide range of economic events including merger and acquisition; equity and debt issues; earning announcements; trade deficits and changes in regulatory environment (McQueen and Roley, 1993; Schwert, 1981; Dutta, 2001). One of the crucial assumptions for the reliability of event studies is that capital markets are sufficiently efficient to react to events (Heal, 2005). Study by Im et al. (2001) examined the transformation in the market value in form of the stock price in response to IT investment announcements.

With the current political and social pressure for ethical business practices, it is always important to examine the critical link between company ethical behavior and financial performance (Carr, 1968; Garvin, 1986). External pressure can come from many different stakeholders including environmental regulations, media attention to environmental CSR, and customers' sensitivity to environmental concerns. Many business practitioners believe that ethical actions make good economic sense and critical for financial success (Goodpaster& Matthews, 1982). A study by Rao(1996)on examining the connection between published reports of unethical behavior (regarding environmental pollution) and firms' performance of their stock prices, reported that the unethical conduct does impact on the shareholders by lowering the value of their stock for an appreciable period of time. Zetlin(1991) research of select Fortune 500 companies and Stoffman(1991) report on 60 Canadian companies concluded that firms that rate high on social responsibility and environment protection show profitability in long run. Study on United Kingdom companies concludes that the value of reputational capital is reflected in stock prices (Smith, 1992; Donaldson and Davis, 1990). Knowledge about the relationship between corporate social responsibility and financial performance is also important for public policy (Renneboog et al., 2008; Guenster et al., 2011). The high relevance of causality of this relation is also witnessed by increase of socially responsible investing (SRI) by United State firms from 1995 to 2007 (Social Investment Forum, 2007).

Most of former event studies in this aspect are related to specific corporate environmentally or ethically relevant information (Hamilton, 1995; Khanna et al., 1998; Dasgupta et al., 2001; Gupta and Goldar, 2005; Blancard and Laguna, 2010;Flammer, 2013; Singh and Makkar, 2014). These events can have the character of negative news about environmental pollution or, can have positive information

like winning environmental awards, points, member-ship in environmental programs. Rather a small group of event studies is conducted in developing counties whichanalyze the impact of inclusion of environment related news on firms' stock performance (Dasgupta et al., 2001; Oberndorfer et al., 2011).

In Indian context there is a dearth of studies to test the efficiency of the stock market with respect to environmental announcements, which cover a wide range of companies across different industries with different period. To provide one part of that answer, this study focuses on the effects of the external controls of ethical behavior exercised by the financial markets and more specifically by the stock market. Hence present study is an attempt to test the efficiency of the Indian stock market with respect to information announcements regarding companies' environmental points.

Research Methodology

With a backdrop of existing Literature, it is useful to briefly describe the procedure for conducting an event study. Each event study should follow a general steps for analysis. This flow is discussed in this section. One of the primary tasks is to first define the event of interest and time period over which stock prices will be examined, this duration is called event window. Traditionally it is expected to define the event window to be larger than the specific period of interest to examine the periods surrounding the event i.e. including days before and after the event.Along with the event window, estimation window needs to be defined. In an event study using daily data, estimation window could be estimated over the 120 days prior to the event excluding the event period, preventing its influence on the normal performance model parameter (Mckinlay, 1997).

After the decision on event window, it is required to decide on selection criteria for inclusion of firms for the study.These reasons may include availability of authenticated data from National Stock Exchange and the degree of impact of their activities on environment. Event impact also requires calculation of abnormal return which is the actual ex post return on security over the event window minus the normal return. A normal return is defined as the expected return without exposure of event news. There are two common methods for modeling the normal return. One is the *constant mean return model* which assumes that the mean return of a given security is constant through time and the other is *market model* where there is an assumption of stable linear relation between the market return and the security return. At last, the presentation of the empirical results follows the formulation of the econometric design will lead to develop insights relating to understanding the sources and causes of the effects of the event study. Following is the table showing details for companies and events included in present study.

Table 1 : Sector wise company rating with event details	
Sector: Cement (Sample: 9 companies)	**Sector: Automobile (Sample: 7 companies)**
Event Date: 16-Dec-2005	Declaration Event: October 29, 2001
Event window : 23- Jun 2005 to 31 Jan 2006]	Event window : 8 May 2001 to 12 Dec 2001
Sector: Steel (Sample: 8 companies)	**Sector: Alkali (Sample: 4 companies)**
Event date: December 10, 2012	Declaration Event: September 02, 2002
Event window : 15 Jun 2012 to 22 Jan 2013	Event window : 12 Mar 2002 to 17 Oct 2002

a. Hypothesis

This study will examine the effect of announcement of environmental rating an on shareholder wealth by examining the investor returns on and around the reported date of announcement. Therefore the null hypothesis to be tested is that the stock market acts quickly and in an efficient manner to environment rating announcements. If investors could consistently obtain abovenormal returns by trading after an announcement, the null hypothesis would be rejected.

b. Methodology

It is a commonly held perception that Financial Markets in developing country are either inefficient or semi efficient due various development related issues i.e. prices in such countries do not reflect that total publicly available information. Dasguptaet. al. (2001) has shown that market of developing countries are efficient.As per its report, MoEF (Ministry of Environment and Forest) tabled on June 4, 2012, Iron and Steel Industry in India is struggling to meet

environmental norms. Steel sector not only has the worst pollution compliance record, it is also found to be non-transparent and poor in information disclosure. Cement industry is also rated on similar basis, however performance of cement industry was found to be more satisfactory as compare to iron and steel. Mining of the resource is leading to huge environmental problems including depletion of ground water. Similar results are available for paper pulp and automobile industries. In this study an attempt has been made to show the effect of environmental rating on stock prices of cement, automobile, chlor alkali industries and to investigate whether markets in India are efficient or not.

Event Study Methodology –

There are various models available for studying the market behavior, our study is based on using Market Model. The market model assumes a linear relationship between return of a security,R_i and market return, R_m.

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

R_i – Return of security i at time t.

α_i –Intercept term |

β_i –Beta of security.

R_m –Market return at time t.

e_i –error term. The average value of the error term is assumed to be zero. E (e_{it}=0) and Var (e_{it}) = σ^2_{it}

The first task in hand is the estimation of the event window. It could be just one day after the event or more than one day after the event. Market model is typically estimated over a period of 120 days prior to the event. Intercept and Beta

terms are then calculated for each firm, given the intercept and beta the abnormal return for firm i in the period t in the event window is thus defined as

$$AR_i = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_m$$

Thus the abnormal term is the error or disturbance term calculated on out of the sample basis. The null hypothesis is conditional upon the market return, in event window the abnormal return will be jointly normally distributed with a zero conditional mean and conditional variance $\sigma^2(R_{it})$, if the period used for the estimation of the model is large $\sigma^2(R_{it}) \to \sigma^2_{it}$.

Whether abnormal returns are persistent or not can be tested by adding up abnormal return for the period

$$CAAR(T_1,T_2)=\frac{1}{N}\sum_{i=1}^{N}CAR_i(T_1,T_2)$$

And the variance is given by -

$$\sigma_i^2(T_1,T_2)=(T_2-T_1+1)\sigma_{e_i}^2$$

Once CAR and its variance null hypothesis can be tested that $N(0, \sigma_i^2(T_1, T_2))$.   CAR ~
These cumulative returns can also be aggregated can also be aggregated across N scripts and an average cumulative abnormal return can be calculated (CAAR).

$$CAAR(T_1,T_2)=\frac{1}{N}\sum_{i=1}^{N}CAR_i(T_1,T_2)$$

And its variance would be.

$$\text{var }(CAAR(T_1,T_2))=\frac{1}{N^2}\sum_{i=1}^{N}\sigma_i^2(T_1,T_2)$$

Again CAAR can be tested for null hypothesis-

$$Z=\frac{CAAR(T_1,T_2)}{(\text{var}(CAAR(T_1,T_2)))^{1/2}}\quad\sim\quad N(0,1)$$

Z test can be carried out for determination of statistical significance of CAAR across N scripts

Results

a. Cement Sector

Data of 9 cement companies have been used in this study. Environmental rating for the industry was declared on 16th December, 2005. Market return is taken from NSE-Nifty index from www.nse.org. Event window is defined as one day, five days, fifteen days and thirty days after the announcement. Data relating to companies and market (closing prices) 120 days prior to the event has been used to estimate the market model. Days prior to the event are not considered in event window as there are no significant reason to believe that the market would pre estimate such announcements. Ordinary Least Square method is used in estimating intercept and beta for the market model.

Table 2: Average Cumulative Ab normal Returns

Number of Days	0-1	0-5	0-15	0-30
CAAR	-0.00495	-0.00442	0.039211	0.061881
Var CAAR	0.000101	0.000503	0.00151	0.00302
STDV CAAR	0.010034	0.022437	0.038861	0.054958
Z ratio	-0.49354	-0.19685	1.008998	1.125966

Table(s) above shows the average abnormal return for the day following the announcement (event) and average cumulative abnormal returns (CAAR) for five, fifteen and thirty days after the event, for the cement sector. A cumulative abnormal returns averaged across the 9 firms (CAAR) are negative initially and turned positive after 15 and 30 days. These changes are statistically significant for the all trading days period (0-1), five trading day (0-5), the fifteen trading day's period (0-15) and the thirty trading day's period (0-30). For the 5-days period following the announcement, the cumulative abnormal return is negative on average, which is statistically significant at the two per cent level. Further this average improve over 30 days time

period and this may be interpreted as showing an average profit of about 6 percent in stock value (over and above the changes in the market portfolio) caused by the announcement of green ratings.

It seems the announcement of green rating gave the impression to investors and the public that the environmental performance of cement companies in India was not up to the mark. Though some plants were rated better than others even their performance was much below global standards. Majority of pants scored only one leaf in rating.

b. Automobile Sector

Table 3: Average Cumulative Abnormal Returns

Number of Days	0-1	0-5	0-15	0-30
CAAR	0.005804	0.049401	0.143447	0.117363
Var CAAR	0.000107	0.000537	0.00161	0.003219
STDV CAAR	0.010359	0.023164	0.040121	0.05674
Z ratio	0.560282	2.132658	3.575328	2.068428

The above table is showing that CAAR –cumulative average abnormal return is positive for the four phases i.e. for one, five, fifteen and thirty days past environmental declaration. Z ratio for all such period is checked at statistical significance level of 2 percent, all such values found to be statistically significant. From the result a clear interpretation

can be made that investors associate higher return with the companies who are environmentally sensitive in other words environmentally sensitive news does influence stock market return for Automobile companies.

c. Steel Sector

Table 4: Average Cumulative Abnormal Returns

Number of Days	0-1	0-5	0-15	0-30
CAAR	0.001502	0.021277	0.060782837	0.00462544
Var CAAR	4.15E-05	0.000426	0.000800226	0.00145134
STDV CAAR	0.00644	0.020635	0.028288275	0.0380964
Z ratio	0.233252	1.03109	2.148693666	0.12141412

Above statistics are for 8 steel companies, CAAR has been positive for all the time periods, from 0.1 percent to 2 percent, 6 percent and 0.4 percent for various time periods post declaration of environmental ratings. Z test is applied at 2 percent significance level and Z values are found to be statistically significant. Thus Investor does reward such

environmental declaration. Statistical results clearly amplify that investordoes associate higher return with such declaration.

d. Alkali Sector

Table 5: Average Cumulative Abnormal Returns

Number of Days	0-1	0-5	0-15	0-30
CAAR	-0.0036	-0.03839	-0.07268	-0.05499
Var CAAR	0.000793	0.003964	0.011893	0.023786
STDV CAAR	0.028158	0.062963	0.109055	0.154227
Z ratio	-0.1279	-0.60978	-0.6665	-0.35658

Above is the statistical result of four alkali companies, CAAR-cumulative average abnormal return is shown for one, five, fifteen and thirty days post declaration of environmental ratings. Results are negative it shows that investors does not associate a growth potential with such declaration. Z ratios also represents that the results are statistically significant at two percent level of significance. Thus it can be concluded that investors does approve or regard such declaration to be a profitable or rewarding phenomenon for the company.

Conclusion

To the best of our knowledge and literature review, the present study adds to the limited literature on interrelationship between environmental ratings and stock returns in Indian context. Our study affirms the view that capital market, acts as a pressure point along with other statutory measures for the protection and preservation of environment. Companies can also use such studies as an aid in their environmental policy formulation. Such study is categorically important for country like India where environmental norms are not stringently followed. This study is the clear linkage between environmental ratings and stock performance. Environment related issues plays a prominent role in corporate decisions. It is an apparent analogy to the given issue that every major company in India, is showcasing its environmental consciousness in broadest manner. Right from annual reports, to corporate updates, environmental sensitivity is everywhere which further augments the reason for study, that environmental issue plays a major role in forming corporate image. Every corporate is conscious about its brand image, such environmental rating has the strength to either create or destroy corporate image.

The contribution of present event study is three-fold. First of all, our analysis is one of few studies on developing countries like India since by far the most studies refer to developed economies. Second, we compare the effects of inclusion of environmental rating announcements on economic rewards for different industries having different visibility and importance on the stock market. Third, our empirical analysis tests the relationship between the two competing theoretical perspectives namely environmental protection initiatives and business economic growth. However, our study have certain basic limitations that it uses a simple market model for calculating abnormal returns and implicitly assumes that the security residuals are uncorrelated with a variance that is constant through both the estimation and event period. Under normality, independence and stationarity assumption, the test statistics is 'Z distributed' that is used to assess the significance of the study. A number of studies have shown that such study impart a bias towards detecting event related effects. A

further improvisation of the present study can be done using a time varing beta, auto correlated return terms using ARCH (Auto Regressive Conditional Heteroskedasticity) or GARCH (Generalised Auto Regressive Conditional Heteroskedasticity) models.

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