An Empirical Analysis of Environmental and Financial Performance of BSE 100 Companies

** Ruchika Bammi*

Abstract

India is one of the largest and fastest growing economies in the world; the large-scale growth of Indian industries resulted in placing India as the third biggest greenhouse gas emitter in 2011, behind only China and USA. Thus, with India's this growth came the international pressure to mitigate the greenhouse gas emissions. Indian companies are taking a cue from global competition and are demonstrating an increased awareness and understanding with regards to the risks and opportunities climate change presents to their businesses. The present study examines the differences in the financial and market performance of BSE 100 companies with a difference in the emission levels. The study uses greenhouse gas emissions' data in capturing the effect of environmental performance and constructs two industry balanced portfolios of low and high emission levels. The environmental performance is measured in terms of emission intensity, and the financial performance is measured in terms of PBDITA and ROCE, while market performance is measured as average market return.

Keywords: **environmental performance, financial performance, greenhouse gases, low and high emission portfolios, BSE 100 companies, firm behavior**

JEL Classification: G39, M14, Q52

India is one of the largest and fastest-growing economies in the world; the large-scale growth of Indian industries resulted in placing India as the third biggest greenhouse-gas emitter in 2011, behind only China and USA. Thus, with India's this growth came the international pressure to mitigate the greenhouse gas emissions. Though India, being a developing country is under no legal obligation to cut down on carbon emission under the Kyoto Protocol, but it has announced a voluntary plan to reduce emissions by 20-25% by the year 2020. In order to ensure that energy does not become a constraint on India's economic growth, it was necessary to participate in this voluntary plan.

Indian corporations are taking cue from global competition, and are demonstrating an increased awareness and understanding with regards to the risks and opportunities climate change presents to their businesses. Issues like investment in clean technology, energy conservation and savings, environmental management systems, etc. are gaining huge significance. It is against this backdrop that BSE has launched a first of its kind benchmark index, which assesses not only the financial performance, but also the environmental performance of companies , and the index is known as BSE-GREENEX, which is formed by ranking companies in the BSE 100 index on the financial and environmental front.

It is important to understand that economic activities are not isolated in nature. Every economic activity has an impact on the resources of the environment - be it in the form of use of raw material resources or generation of wastes or effluents. It is assumed that environmental preservation comes with some cost attached, and it is important to analyze whether both environmental and financial performance can be pursued simultaneously. Historically, a lot of firms believed that complying with environmental regulations will negatively impact the firm's profits as it will act as an extra burden for the firms. But certain environmentally proactive firms are of the thought that spending on environmental regulations or environment management systems will result in efficiency among firms, thus resulting in better financial performance. However, it is also important to analyze as to whether spending on environmental efficiency equipments results in profitability among firms or the truth is that only those firms which are profitable enough can afford to spend on cleaner technologies.

Research to devise a link between financial and environmental performance has been limited. The reasons for this may be many, the main being that until recently, not much emphasis was paid towards environmental reporting measures, which resulted in lack of data on environmental performance of firms. The situation of environmental reporting has improved in the developed countries with data on toxic release inventory (TRI) being available for public access. Various multinationals are now publishing separate annual environmental performance reports. Indian

* *Research Fellow*, Indian Institute of Forest Management, Po Box 357, Nehru Nagar, Bhopal - 462003, Madhya Pradesh.
E-mail : ruchikabammi@gmail.com

companies, however, have been found to shy away from environmental reporting responsibilities. Barring a few firms, who mention the exact amount of carbon emissions of the company in their annual reports, a majority of the Indian firms mention only the steps undertaken by the firms towards environmental upgradation. The onus, however, has been undertaken by various public domains like CSE (Center for Science & Environment) in the form of Green Ratings of Indian companies, carbon disclosure project (CDP) in the form of carbon emissions and recently, by Gtrade Carbon Ex-rating Services Private Limited in the form of carbon intensity measures of BSE 100 companies.

Prior research suggests contradictory results for the above-mentioned research questions. The reason for contradictory results lies in the fact that although there are certain well accepted criteria for judging the financial performance of a firm, but there is a lack of defined environmental performance parameters. The various criteria used to measure the environmental performance by various researchers include :

- Rankings and ratings by various organizations ;
- Expenditure on clean technologies;
- Material recyclability;
- Reducing raw material requirement;
- Media reports on Environment ;
- TRI (toxic release inventory) data;
- Environment related litigation etc.

Literature review suggests that the link between environmental and financial performance is two-fold, a company performing well on the financial front has resources to invest in clean technology, environmental systems, and thus can benefit environmentally by reducing emissions. Another side of the same coin is that investing in environmental practices will enable firms not only to improve short-term profitability through reduced energy and material consumption, but also aid in creating long-term value for the firm. The current paper is focused to study the impact of environmental performance on the financial and market performance of the examined companies. The paper focuses on the study of environmental and financial performance of BSE 100 companies. The study is conducted by constructing two portfolios of high and low polluter firms. In order to account for industry-related differences in emission, efforts have been made to construct industry balanced portfolios and then try to understand differences in the low and high polluter firms (Portfolio construction methodology adopted from Cohen, Fenn, & Konar, 1997).

It is a common understanding that financial results matter more than sustainability or corporate responsibility. Thus, it becomes important to study the relationship between environmental and financial performance, as a positive link between environmental and financial performance will legitimize being green on economic grounds, thus giving companies a motivation to invest in greener and cleaner technologies.

Literature Review

The UN conference on Human Environment, 1972, turned out to be the turning point in the development of international environmental politics. It was the UN sponsored Brundtland Commission Report "Our Common Future," 1987 which popularized the term sustainable development with the aim to pursue environment and development as one single issue. The commission aimed to examine the issues of environment and development and create a level of understanding among governments, voluntary organizations, and corporates.

In the corporate context , however, the whole idea of environmental performance in the past was based on pollution prevention measures. The logic of pollution prevention was analogous to the principal of quality management (Imai, 1986). The understanding being that pollution is a sign of inefficiency and wastage in the manufacturing process (Shrivastava & Hart, 1992), whereas less waste means a better utilization of inputs resulting in lower raw material using the concepts of reuse and reduce (Young, 1991). This reduction in the use of raw material will ultimately result in lowering the costs of production and reducing wastages, thus providing a financial benefit to the firm.

Later on, emphasis was laid on having a resource based view of the firm, which theorized that competitive advantage will be based on the differing environmental management capabilities of firms. The firm should not only focus on pollution prevention, but product stewardship and sustainable development will act as the basis of competition (Hart, 1995). Dowell, Hart, and Yeung (2000) found that firms that adopted global environmental

standards by going beyond legal requirements have higher market values than firms which adopt standards as prescribed legally. Also Feldman, Soyka, and Ameer (1997) found that firms which improve their environmental performance by adopting EMS and lowering toxic emission levels reduced financial risks for firms, thus realizing lower capital costs by examining the systematic risk (Beta) of firms.

With the coming up of environmental management systems (EMS), researchers started talking about enhanced corporate and environmental performance. Research suggests that the presence of a formal EMS strongly influences the corporate performance (in terms of overall costs, reduced waste etc.). One of the explanation suggested by Melnyk, Sroufe, and Calantone (2002) is that EMS provides the organization with specialized information about its critical functions, which helps its personnel to reduce pollution and to improve the overall performance. This improvement in performance is due to the elimination of waste discovered when examining the various processes.

These days, a lot of talk takes place regarding investment in "clean technology". Shrivastava and Hart (1995) suggested that environmental technologies provide a way of fundamentally altering the profitability dynamics of industries. They affect basic cost parameters of resource use, energy use, manufacturing efficiency, waste disposal, and pollution abatement. Thus, suggesting that investment in clean technologies or environmental technologies provide a competitive advantage to firms. It is important to consider that there is generally a lag between pollution prevention efforts and realization of bottom line benefits, as pollution prevention requires upfront investment in equipment and training. The efforts of pollution prevention appear to impact the bottom line within 1 or 2 years of initiation, and the firms with the highest emissions gained the most from emission reduction (Hart and Ahuja, 1996). Savings from emission reduction takes some time as renegotiation of supply and waste disposal may be required (White et al., 1993). Research conducted by Cohen, Fenn, and Konar (1995) divided S&P 500 companies into "low polluting" and " high polluting" companies. The researchers used a number of criteria for judging the environmental performance of firms such as the no of environmental litigation proceedings, superfund sites, dollar value of non compliance penalties, TRI, no. of oil spills, etc. The financial performance was measured in terms of ROA and ROE, and stock market performance was measured in terms of total risk adjusted return to shareholders. The findings suggested that firms either get no penalty for investing in the "green" portfolio, or a positive return from green investing. The research found that investors who chose environmental leaders in an industry balanced portfolio were doing as well or better than choosing environmental laggards.

A study conducted by Darnall et al. (2005) aimed to learn whether a difference existed between financial gains earned by facilities in the "clean" sector vis –a –vis the "dirty" sectors suggested that no significant differences in positive profits associated with reduced impacts to the environment existed between the two sectors. The authors also studied the comparison in late and early movers operating in the dirty sector alone, and here also, no significant differences in positive profits earned existed between the early and the late movers. However, a further analysis of the facilities operating in low versus high growth industries revealed that modest differences existed between low growth sectors that accrued positive profits, reduced their use of natural resources and global pollutants more than companies in the same sector that did not accrue positive profits.

However, certain research suggested contradictory results stating that firms that donate more resources to environmental regulations have a negative impact on productivity and market growth (Wayne & Shadbegian, 1993). Liu, Garcia, and Vredenburg (2011) studied the green house gas mitigation efforts of three Chinese state oil companies and the impact on the financial performance of these companies. The study measured the financial performance of the companies in terms of ROA, ROE, ROI, ROS, and EBITDA, and studied the various corporate environmental strategies adopted by the company in terms of management, research, technology, environment, and information disclosure to the public. The research shows a convergence in the type of strategy adopted by the three firms as all the three firms adopted environmental protection measures under regulatory requirements - were involved in planting trees, and were involved in financing various research projects of various universities. The findings of the study showed a decrease in the net income, return on assets, and return to shareholders. The reason for this may be that all the three Chinese companies were in the early stage of addressing environmental problems, and the results of such a strategy may be visible in years to come.

The Table 1 presents a summary of research studies that act as a link between environmental and financial performance, explaining the measures undertaken and the relationship devised in the study.

Table 1: Summary of Research Studies on Links between Environmental and Financial Performance

Study	Financial Performance Measures	Environmental Performance Measures	Relationship
Cohen, Fenn, & Konar, 1995 Constructed two Industry balanced portfolio's (1)" High Polluter" (2) " Low Polluter"	ROA ROE Total risk adjusted return to shareholder	No. of environmental litigation proceedings Superfund sites No. of non compliance penalties Dollar value of non compliance penalties Toxic Release Inventory No. of oil spills Volume of oil spills No. of chemical spills	Firms either get no penalty for investing in the "green" portfolio, or get a positive return from green investing. Investors who choose environmental leaders in an industry balanced portfolio were doing as well or better than choosing environmental laggards.
Liu, Garcia, & Vredenburg, 2011 Studied the green house gas mitigation efforts of three Chinese state oil companies and the impact on financial Performance.	ROA ROE ROI ROS EBDITA	Environmental Strategies: Management Research Technology Public Information	The study showed that the management initiative at the 3 Chinese oil companies was mainly regulation driven. The findings suggest a decrease in the net income, return on assets and to shareholders.
Hart & Ahuja, 1996 : Sample of firms drawn from S&P 500 - Firms involved in manufacturing, mining, or production were only considered.	ROS ROA ROE	Emission Reduction (Drawn from TRI Data)	The research showed that it paid to be green to the firms concerned. However, there is a lag between the emission reduction of the firm and the operating and financial benefits earned by the firm. The research also suggested that the biggest bottom line - the benefits accrued to firms considered being in the higher pollution category as it enables them to attain a lot of benefits through small investments.
Konar & Cohen, 2000 : The research was conducted to examine the extent to which a firm's	Tobin's Q Other variables: Sales growth Market share Import consumption R&D Exp. Advertisement	Aggregate pounds of toxic chemicals emitted per dollar revenue of the firm No. of environmental law suits pending	The study found that poor environmental performance has a significant negative effect on the intangible asset value of the firms.

environmental reputation is valued in the market place. For this purpose, the firm value was disintegrated into tangible and intangible.			
Melnyk, Sroufe, & Calantone, 2002 : The study was conducted to assess the impact of EMS on corporate & environmental performance	Overall costs Other variables: Sales Reduced lead time Improved product Improved market position Reduced waste	Existence of EMS Formal Not formal	The study found that the presence of a formal EMS strongly influences the corporate performance (in terms of overall costs, reduced waste, improved productivity etc.).
Shrivastava & Hart, 1995 : The study was conducted to find out the impact of investing in "Environmental technology" on competitive advantage	Cost reduction Revenue Enhancement Other variables: Quality Improvement Competitive edge Public image	Investment in environmental technologies	Environmental technologies provide a way of fundamentally altering the profitability dynamics of industries, thus providing a competitive advantage.
Source : Literature Review			

Objectives of the Study

The basic objective of the study is to understand if there are any differences in the financial and market performance of the firms with different emission levels. For this purpose, companies in the BSE 100 have been divided into "high emission" and "low emission" companies (see Appendices 2(a) and 2(b)). The basic hypothesis considered for the study is whether firms performing well on the environmental front also perform well financially or not. So, basically, I wanted to test the differences in the financial and market performance of the two portfolios constructed.

- $H_0: \mu_{low} = \mu_{High}$
- $H_1: \mu_{low} \neq \mu_{High}$

The basic objectives of the study are:

- To test whether the financial performance (ROCE and PBDITA) differs for the two portfolios – low emitting and high emitting firms.
- To test whether the market return differs for the two groups- low emitting and high emitting firms.

Data and Methodology

The objective of the study is to determine whether the financial and market performance of firms differ on the basis of

their environmental performance. For this, BSE 100 companies were considered for the study. The study had been undertaken by constructing two portfolios – one containing firms with low emission levels, while the other contained firms with high emission levels.

❖ **Data Collection:** Hundred companies forming a part of the BSE 100 have been included for analysis in the study. The data pertaining to environmental performance of the companies was taken in the form of emission intensity from a report published by gTrade, IMER (India Markets and Environment Report), Vol. I. Since the index was launched in the year 2012, this is a first of its kind initiative to publically disclose emission related information of the companies ; thus, the data available for research is restricted to emission intensity pertaining to one year only (i.e. for the year 2011). The financial data related to PBDITA and ROCE was collected from CMIE, Prowess. The market performance data was taken from the website of the Bombay Stock Exchange (BSE).

❖ **Measures:** The environmental performance for the study is measured in terms of emission intensity data. The emission intensity data was acquired from IMER (India Markets and Environment Report), Vol. I; the report was prepared taking into account emission data of companies; the emission of companies took into consideration Scope 1 (emissions from direct fuel combustion), Scope 2 (indirect emissions due to electricity consumption), and Scope 3 (other indirect emissions have not been included). The greenhouse gases sequestered by a company were also not "adjusted" against the company's greenhouse-gas emissions. It is assumed that companies that are bigger in size are likely to have higher levels of emissions than companies that are smaller in size. In order to take this difference into account, emission intensity measures were calculated. The emission intensity has been calculated as a measure of the firm's total GHG emissions per unit of revenue. It is important to understand here that lower emission intensity means a better environmental performance. The financial performance for the study considers the profitability of the company and returns to the capital employed as the measures of financial performance. The profitability of the company has various measures like NOPAT (net operating profit after tax), PAT (profit after tax), PBDITA (profit before depreciation, interest, taxes, and amortization) etc. The study uses PBDITA as a measure of profitability of the firm as it serves a better purpose than PAT or any other profit level as it does not depend on various accounting policies adopted by different firms and nullifies the effects of various capital structures and tax rates, thus making PBDITA a better tool than PAT for cross company comparisons.

The second part of the research considers ROCE as a measure of financial performance, wherein I measured the returns that a business is achieving from the capital employed, expressed in percentage terms. ROCE indicates the efficiency and profitability of a company's capital investments. The market performance of the study considers market returns of the 100 companies selected as sample, and the returns of companies were calculated by using the formula:

$$r_t = Ln(P_t/P_{t-1})$$

The returns for each company pertaining to the financial year 2010-11 were considered for the analysis.

Methodology

As discussed earlier, there are two facets to the linkage between environmental and financial performance of firms. A company performing well on the financial front has resources to invest in clean technology, environmental systems, and thus can benefit environmentally by reducing emissions. Another side of the same coin is that investing in environmental practices will enable firms not only to improve short-term profitability through reduced energy and material consumption, but would also create long-term value for the firm. The current paper is focused to study the impact of environmental performance on financial performance and market performance of companies. For the same purpose, two industry balanced portfolios were constructed based on emission levels of the companies.

❖ **Portfolio Construction:** In order to understand the differences in financial and market performance of low and high emitting firms, two portfolios were designed to contain a matched group of firms, where the matching was based on industry category. This approach helped in controlling the level of pollution activity inherent in specific industrial processes (e.g. banks and financial institutions have low emissions inherent in their processes as compared to some other manufacturing companies). For the purpose of portfolio construction, the methodology adopted by Cohen, Fenn, and Konar (1997) was adopted.

The methodology for designing the portfolio involved:

❖ Sorting BSE 100 companies into various industry groups, as defined by the Bombay Stock Exchange (BSE).

❖ Thus, 100 companies were sorted into 41 groups.

❖ The next step involved ranking of companies based on emission levels within these 41 groups. Industries with only one company falling under the group were excluded from the study.

❖ Median of the emission intensity within the group was found, and all companies above this were taken as high emission and others were taken as low emission companies.

The advantage of the above process is the control it provides regarding the level of polluting activity inherent in the specific industrial processes of various types of industries. Thus, the portfolio so constructed is a balanced one on account of both industry types (as both portfolios have heavy machinery industries as well as banks and financial institutions) as well as size (as the emission intensity data available from IMER, Vol.1 was calculated taking into account the firm size). Based on the above methodology, 75 companies were included in the study, with 40 companies in the low portfolio, while 35 companies came in the high emission portfolio.

❖ **Data Preparation:** The first step taken in data preparation was identification and deletion of outliers. In the process, some five outliers were deleted, and the final analysis was undertaken for 70 companies. The next step in the methodology involved checking up the data assumptions for parametric tests. The data was collected on a metric scale, the normality plots and tests of emission intensity, PBDITA, and ROCE suggested that they were not following normality, hence a log transformation was taken and the data was found to be following normality. The homogeneity of variances was checked using Levene's test and was found to be homogeneous. The market return data consisted of the logarithm of the daily returns at BSE. The reason for taking the log differences was to account for non-stationarity. Logarithmic returns were calculated as :

$$rt = Ln (Pt/Pt-1)$$

❖ **Statistical Analysis :** As discussed earlier, the data of 100 companies was divided into two independent portfolios – low and high emitting firms. The 100 companies were first divided into various industry groups based on industry categories used by BSE and then, the companies were allotted to the two portfolios based on emission ranking of companies within groups. A dummy variable was allotted for firms with higher than median emission (1) and lower than median emission (0). Industry groups having only one company under them were omitted from the analysis. Firms belonging to the "high" portfolio indicated that they are not good performers, while "low" portfolio indicated that the firms were good performers. The financial and market return data was acquired for the said portfolios. Operationally, I wanted to test whether the "low pollution" portfolio performed differently from the "high pollution" portfolio or not. As the objective of the study is to identify differences in the market and financial returns of the two portfolios, the independent t-test was used for analysis. However, as the sample size was unequal, I used the unequal sample- equal variance test for analysis (checked through Levene's Test). The emission data pertains to the year ending 2011, similarly, the accounting returns and market returns also pertain to the year ended 2011. Since the emission data was available for only one year (as this is the first-time emission data pertaining to Indian companies is available in the public domain), the analysis could be carried out for only one-year data, which is a limitation of the study.

Results and Analysis

This section deals with reporting the results and analysis of the tests conducted to test the hypothesis that financial and market returns differ for low and high emission firms. The Table 2 compares the performance of financial (ROCE and PBDITA) and market return of "low" and "high" emission portfolios. The table suggests that there is not much of a difference between low and high emission portfolios in terms of mean market returns – which was slightly higher in case of high polluting firms than low polluting firms. Similar results were found in case of ROCE and PBDITA wherein, high polluting firms gave better financial returns in terms of returns and profits. Hence, it can be said that on an average, the market and financial returns are higher in case of "high" emission firms as compared to "low" emission firms. However, in order to actually understand the differences in the "low" and "high" emission portfolios, I calculated the student's t-statistic to compare the two portfolios. As mentioned in Table 3, the accounting returns for the two portfolios – low and high emitting firms in the form of return on capital employed and PBDITA - were

Table: 2 Descriptive Statistics - Low and High Emission Firms						
Descriptive Statistics						
Portfolio		**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Low	MR	37	.25	1.52	.9580	.29268
	ROCE	37	1.80	43.00	13.8649	9.56052
	PBDITA	37	2657.80	147172.00	43710.53	36587.15867
	Valid N (listwise)	37				
HIgh	MR	33	.24	1.61	.9845	.39709
	ROCE	33	1.80	51.80	15.6515	13.97590
	PBDITA	33	4058.10	593238.10	67233.80	108863.86154
	Valid N (listwise)					
Source: Derived output - Descriptive statistic (Author's analysis)						

compared. In case of Market return, t = 0.320 and p = 0.750 ≥ 0.05, I found no statistically significant differences between the two portfolios. Similar is the case with return on capital employed (t = -0.235, p= 0.815 ≥ 0.05) and PBDITA (t = 0.475, p = 0.637≥0.05). Thus, it can be said that although the high emission portfolio seems to provide slightly higher average returns than the low emission portfolio, still, the results are not statistically significant. Thus, it can be said that there is no empirical support to suggest differences in profitability between high and low emitting firms, as I could not find a significant difference in the returns earned by the two portfolios, which other studies have shown to exist. A few research papers have suggested that the investors in environmentally active companies may face penalty in the form of lower returns due to a company's investment either in low emission technology or processes; however, the present study suggests that no such penalty applies in case of "low emission" firms which were considered for the research.

Table 3: Student's T- Statistic										
Independent Samples Test										
		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence intervalof the difference**	
									Lower	**Upper**
MR	Equal variances assumed	3.781	.056	.320	68	750	.02652	.08279	-.13868	.19172
	Equal variances not assumed			.315	58.346	.754	.02652	.08422	-.14205	.19509
Lg_ROCE	Equal variances assumed	2.778	.100	-.235	68	.815	-.02142	.9127	-.20354	.16071
	Equal variances not assumed			-.231	59.431	.818	-.02142	.09270	-.20688	.16405
Lg_PBDITA	Equal variances assumed	1.019	.316	.475	68	.637	.05482	.11552	-.17569	.28533
	Equal variances not assumed			.471	63.925	.639	.05482	.11644	-.17781	.28744
Source: Derived as output for Independent sample test (Author's Analysis)										

Findings and Conclusion

Environmental performance is getting increased attention in recent years, as the world is busy discussing about green

house gases and global warming. Indian corporations are also taking cue from global competition and are demonstrating an increased awareness and understanding with regards to the risks and opportunities climate change presents to their businesses.

The present paper examines the differences in the accounting and market returns of companies performing well environmentally with low emission levels and those with high emission levels. The study constructs two industry balanced portfolios in order to account for emission differences inherent to the type of industries and processes. The study could not find any significant differences in the financial and market performance of the firms belonging to two different portfolios of high and low emission levels. There could be various reasons for the same; one could be that Indian investors do not pay much heed to the green image or green background of the company, thus, I was unable to find significant differences in the market return of the two portfolios. Furthermore, the concept of environmental performance of companies is relatively new to the Indian business environment ; thus, little or no information about environmental performance of Indian companies was available until recently. As the issue will gain more importance due to global pressures, we may expect the relationship between financial and environmental performance of companies to become stronger in the future, however, how much this expectation will turn out to be correct remains to be seen.

Limitations of the Study and Scope for Future Research

The present study takes into account the emission intensity data of BSE 100 companies. Emission intensity is calculated as total GHG emissions divided by the total revenue of the companies to account for differences in firm size. There is a limitation to the study regarding the time span of the study which is only one year, as the emission data of Indian companies is not readily available in the public domain, and this is only the first time that information related to environmental performance has been made public. Future research that collects data on a longitudinal basis may offer more evidence towards the relationship studied. As discussed earlier, if it gets established that better environmental performance results in good financial performance also, it will legitimize companies to go in for greening their processes.

Availability of emission-related data in the future can provide immense opportunity to study the subject of link between environmental and financial performance in a great detail. One way to do so would be to look at industry specific differences in the environmental and financial performance of companies.

References

Cohen, M., Fenn, S., & Konar, S. (1995). *"Environmental and Financial Performance: Are they Related?"* Washington DC: Investor Responsibility Research Center , Working Paper, ISBN 1-879775-26-3.

Dowell, G., Hart, S., & Yeung, B. (2000) . "Do Corpoate Environmental Standards Create or Destroy Market Value?" *Management Science , 46* (8), pp. 1058 - 1074.

Feldmen, S., Soyka, P., & Ameer, S. (1997). "Does Improving Firms Environmental Management Systems and Environmental Performance Result in Higher Stock Price?" *Journal of Investing , 6* (4), pp. 87-97.

gTrade. (2012). *"IMER, India Market and Environment Report. "* gTrade.

Halkos, G., & Sepetis, A. (2007). "Can Capital Markets Respond to Environmental Policy of firms? Evidence from Greece". *Ecological Economics , 63* (2-3), pp. 578 - 587.

Hart, S. (1995) . "A Natural Resource Based View of the Firm." *Academy of Management Review , 20* (4), pp. 986 - 1014.

Hart, S., & Ahuja, G. (1996). " Does it Pay to be Green? An Empirical Examination of the Relationship between Emission Reduction and Firm Performance." *Business Strategy and Environment , 5* (1), pp.30-37.

Horvathova, E. (2010). "Does Environmental Performance Affect Financial Performance? A Metaanalysis." *Ecological Economics , 70* (1), pp. 52 - 59.

Iwata, H., & Okada, K. (2011). " How Does Environmental Performance Affect Financial Performance? Evidence from Japanese Manufacturing Firms." *Ecological Economics , 70* (9), pp.1691-1700.

King, A., & Lenox, M. (2001). "Does it Really Pay to be Green? An Empirical Study of Firm Performance and Environmental Performance." *Journal of Industry Ecology , 5* (1), pp.105 - 116.

Klassen, R., & McLaughlin, C. (1996). "The Impact of Environmental Management on Firm Performance." *Management Science , 42* (8), pp. 1199-1214.

Konar, S., & Cohen, M. (2000) . "Does the Market Value Environmental Performance?" *The Review of Economics and Statistics, 83* (2), pp. 281 -289.

Lanoie, P., Laplante, B., & Roy, M. (1998) . "Can Capital Markets Create Incentives for Pollution Control?" *Ecological Economics , 26* (1), pp. 31 - 41.

Liu, X., Garcia, P., & Vredenburg, H. (2011). "Greenhouse Gas Mitigation Efforts of Chinese State Oil Companies and the Impacts on Their Financial Performance." *Journal of International Business and Economics , 11* (4), pp. 121-134.

Melnyk, S., Sroufe, R., & Calantone, R. (2002). "Assessing the Impact of Environmental Management Systems on Corporate and Environmental Performance." *Journal of Operations Management , 21* (3), pp. 329 - 351.

Shrivastava, P., & Hart, S. (1995) "Creating Sustainable Corporations." *Business Strategy and Environment , 4* (3), pp. 154-165.

Shrivastava, P., & Hart, S. (1994). "Greening Organizations 2000." *International Journal of Public Administration, 17* (3-4), pp. 607-635.

Wayne, G., & Shadbegian, R. (1993) . *"Environmental Regulation and Manufacturing Productivity at the Plant Level."* NBER Working Paper No. 4321 , Retrieved from http://www.nber.org/papers/w4321.pdf

White, A., Becker, M., & Savage, D. (1993). " Environmentally Smart Accounting: Using Total Cost Assessment to Advance Pollution Prevention." *Pollution Prevention Review , 3* (3) , pp. 247 - 259.

Young, J. (1991) . "Reducing Waste, Saving Material." in Brown, L. *"State of the World: A World Watch Institute Report on Progress Towards Sustainable Society."* W.W. Norton , New York, pp. 39 - 55.

Ministry of Environment and Forests, Government of India (2013). *"India and UNFCCC."* Retrieved from http://moef.nic.in/cc/india_unfccc.htm

BSE (2013). *"BSE 100 Stock Price Historical Data."* Retrieved from http://www.bseindia.com/markets/equity/EQReports/StockPrcHistori.aspx?flag=0&expandable=7

Appendices

Appendix 1: Data Definition

Data Definition & Sources		
Variable	**Description**	**Source**
Emission data	Emission data of companies taking into consideration Scope 1 - emission from direct fuel combustion, and Scope 2 - indirect emissions due to electricity consumption. Other emissions have not been included.	India Markets & Environment Report (IMER), Vol.1
Emission Intensity	Emission Data divided by Company Turnover	India Markets & Environment Report (IMER), Vol.1
ROCE	Return on Capital Employed	Center for Monitoring Indian Economy, Prowess
PBDITA	Profit before Depreciation, Interest, Taxes and Amortization	Center for Monitoring Indian Economy, Prowess
Market Return	Average Daily return of company stock on BSE	www.bseindia.com

Source : Author's Research

Appendix 2(a):

Portfolios - High Emission (Methodology Adopted from Cohen et al., 1997)

S.No.	Name	Portfolio
1	State Bank of India	High
2	ICICI Bank Ltd	High
3	Tata Motors Ltd.	High
4	NTPC Ltd.	High
5	Dr. Reddy's Laboratories Ltd.	High
6	Bharat Heavy Electricals Ltd.	High
7	Lupin Ltd.	High
8	ACC Ltd.	High
9	Adani Power Ltd.	High
10	Axis Bank Ltd.	High
11	Bajaj Auto Ltd.	High
12	Crompton Greaves Ltd.	High
13	Dabur India Ltd.	High
14	Divi's Laboratories Ltd.	High
15	Federal Bank Ltd.	High
16	HCL Technologies Ltd.	High
17	HDFC Bank Ltd.	High
18	Hindustan Petroleum corporation Ltd.	High
19	Idea Cellular Ltd.	High
20	IndusInd Bank	High
21	Jaiprakash Associates	High
22	Jindal Steel and Power Ltd.	High
23	LIC Housing Finance Ltd.	High
24	Mahindra & Mahindra Ltd.	High
25	National Aluminium Company Ltd.	High
26	Oil and Natural Gas Corporation Ltd.	High
27	Power Grid Corporation of India Ltd.	High
28	Ranbaxy Laboratories Ltd.	High
29	Reliance Capital Ltd.	High
30	Reliance Power Ltd.	High
31	Shriram Transport Finance Company Ltd.	High
32	Steel Authority of India	High
33	Tata Consultancy Services Ltd.	High
34	Unitech Ltd.	High
35	Yes Bank Ltd.	High

Appendix 2(b):

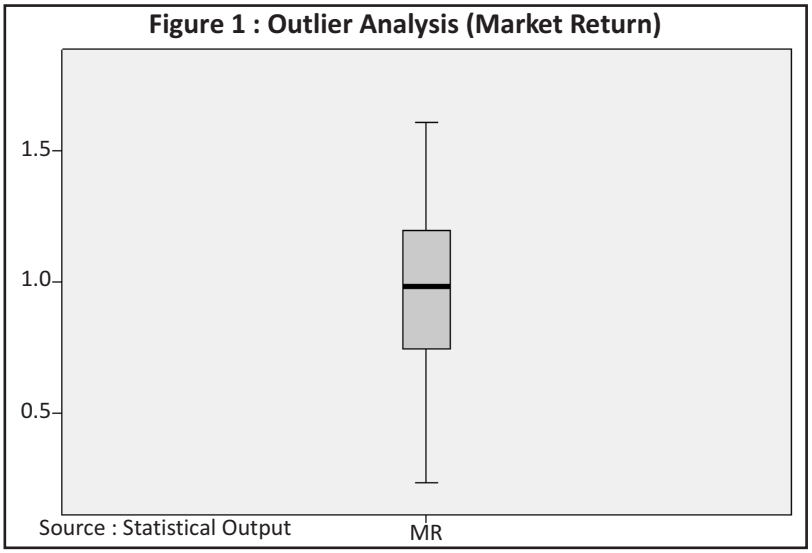
Portfolios - Low Emission (Methodology Adopted from Cohen et al., 1997)

S.No.	Name	Portfolio
1	Tata Steel Ltd.	Low
2	Larsen & Toubro Ltd.	Low
3	Sun Pharmaceuticals Inds. Ltd	low
4	Housing Development Finance Corporation Ltd.	Low
5	Hindustan Unilever Ltd.	Low
6	Cipla Ltd.	low
7	Ambuja Cements Ltd.	Low
8	DLF Ltd.	Low
9	Glaxosmithkline Pharmaceuticals Ltd.	low
10	Reliance Infrastructure Ltd.	Low
11	ABB Ltd.	Low
12	Ashok Leyland Ltd.	Low
13	Bank of Baroda Ltd.	Low
14	Bank of India	Low
15	Bharat Petroleum Corporation Ltd.	Low
16	Bharti Airtel	Low
17	Cairn India Ltd.	Low
18	Canara Bank Ltd.	Low
19	Glenmark Pharmaceuticals	Low
20	GMR Infrastructure Ltd.	Low
21	Hero Motocorp Ltd.	Low
22	Hindalco Industries Ltd.	Low
23	Housing Development & Infrastructure Ltd.	Low
24	IDBI Bank Ltd.	Low
25	Infosys Ltd.	Low
26	Infrastructure Development Finance Corporation Ltd.	Low
27	JSW Steel Limited	Low
28	Kotak Mahindra Bank Ltd.	Low
29	Maruti Suzuki India Ltd.	Low
30	NHPC Ltd.	Low
31	Power Finance Corporation Ltd.	low
32	Punjab National Bank Ltd.	Low
33	Rural Electrification Corporation Ltd.	low
34	Sesa Goa Ltd.	low
35	Siemens Ltd.	Low
36	Suzlon Energy Ltd.	Low
37	Tata Communications Ltd.	Low
38	Ultratech Cement Ltd.	Low
39	Union Bank of India Ltd.	Low
40	Wipro Ltd.	Low

Source: Prepared by the Author (Using sorting methodology described in the paper)

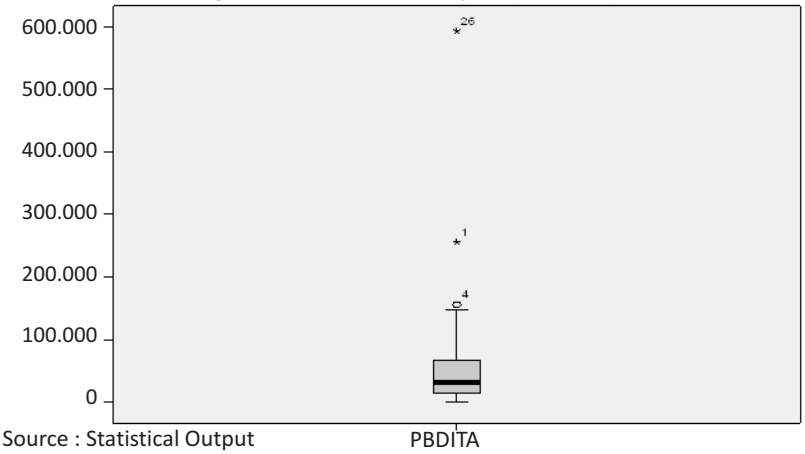
Appendix 3 : Data Analysis

Figure 1 : Outlier Analysis (Market Return)



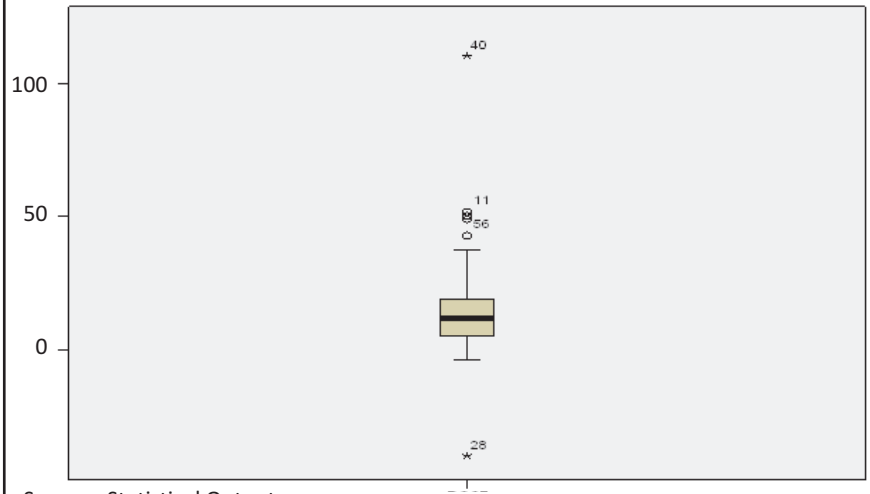
Source : Statistical Output

Figure 2 : Outlier Analysis (PBDITA)



Source : Statistical Output

Figure 3 : Outlier Analysis (ROCE)



Source : Statistical Output

Data Assumptions:Tests of Normality

Table 1 : Testing for Normality

	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
MR	.087	70	.200(*)	.964	70	.042
lg_ROCE	.099	70	.089	.965	70	.048
Lg_PBDITA	.095	70	.193	.985	70	.595

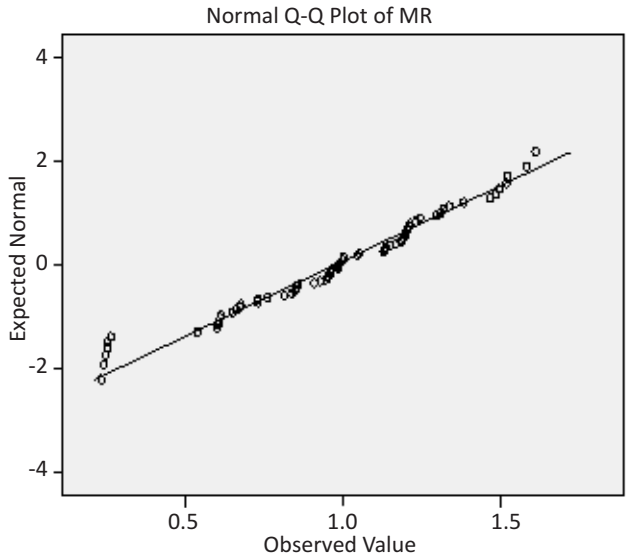
* This is a lower bound of the true significance.

a Lilliefors Significance Correction

As (p>0.05) we can say that the Variables are approximately following normality.

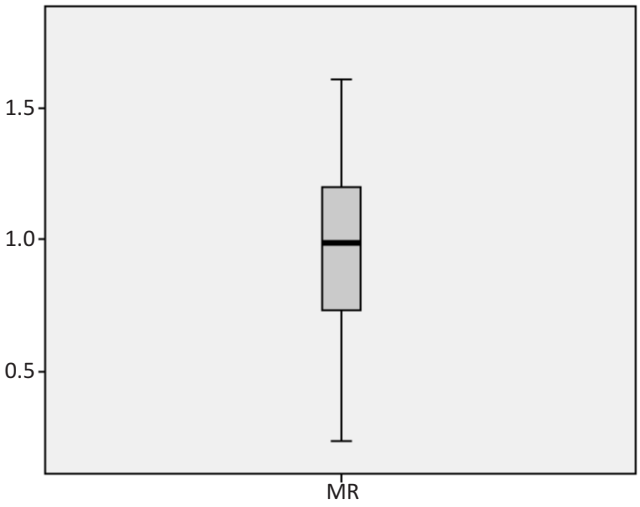
Source : Statistical Output

Figure 4 : Normal Q-Q Plot for Market Return



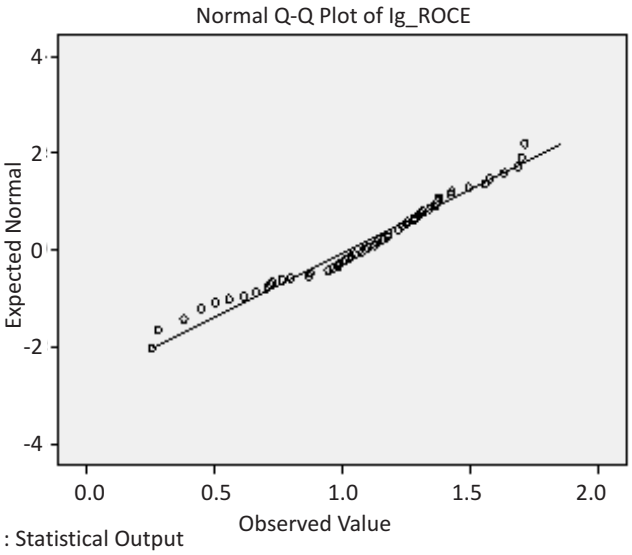
Source : Statistical Output

Figure 5 : Box Plot for Market Return



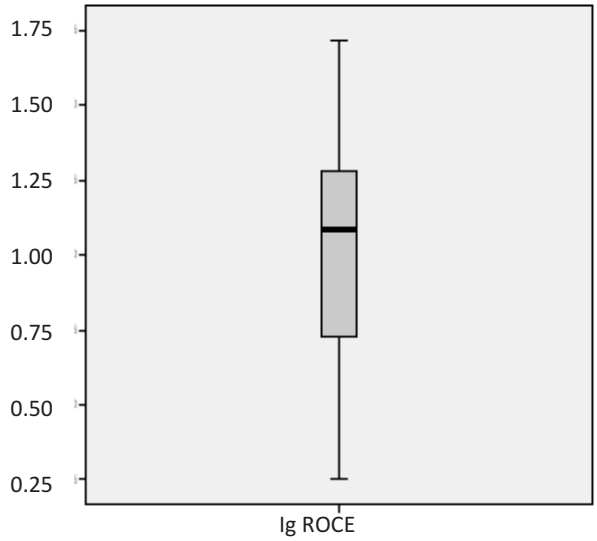
Source : Statistical Output

Figure 6 : Normal Q-Q Plot for Return on Capital Employed



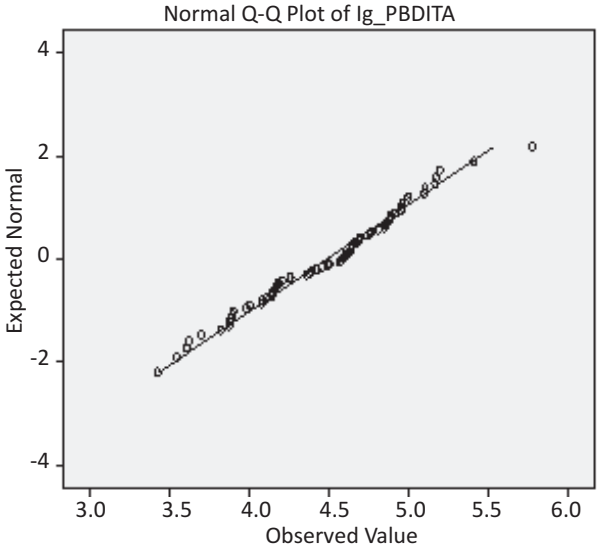
Source : Statistical Output

Figure 7 : Box Plot for Return on Capital Employed



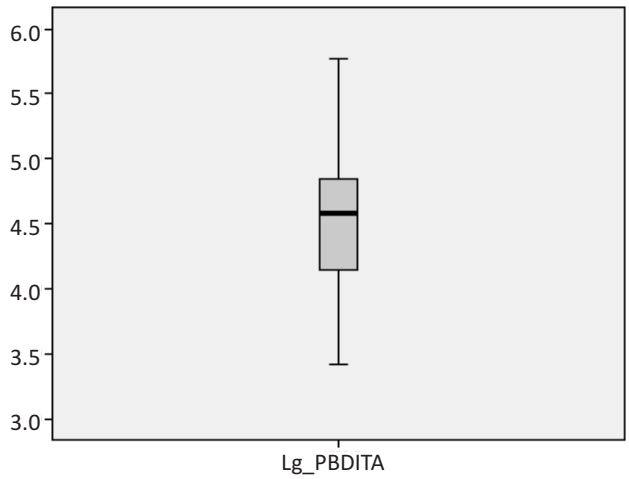
Source : Statistical Output

Figure 8: Normal Q-Q Plot PBDITA



Source : Statistical Output

Figure 9 : Box Plot PBDITA



Source : Statistical Output

Test of Homogeneity:

Table 2 : Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Lg_ROCE	2.776	1	68	.100
Lg_PBDITA	1.019	1	68	.316
MR	3.781	1	68	.056

As the significance ($p \geq 0.05$) is greater than 0.05, we can say that the variances are equal

Source : Statistical Output