

Measuring Volatility Among Green Stock Prices

Dinesh K^a, Dr. Janet JyothiD'souza^b

^aResearch Scholar, Department of Management Studies, Ballari Institute of Technology & Management, Ballari (Karnataka), India.

^bAssociate Professor, Department of Management Studies, Ballari Institute of Technology & Management, Ballari (Karnataka), India.

Abstract

Socially accountable investments has gain more significance among market participants globally, particularly India too has associated itself with the global trend, becoming more sensitive towards the environmental aspect of doing green business. Investors in developed markets are more conscious about investments in stocks which not only create value for shareholders but also able to manage risk exposure associated with climate change over the long term. The purpose of this paper is to unveil the volatility performance of stocks of BSE Greenex Index which is composed of 25 environmental sensitive companies. The analysis is carried out for sample period of March 2012-March 2019 using monthly stock returns series. To analyze the data, statistical tools, viz, one way ANOVA were tested. The results unveil the performance of stocks of BSE-GREENEX Index and shows that stocks of greenex index are majority weak positively correlated with the BSE SENSEX. However, the impact is found to be statistically significant. Further from the results of F-statistics states that, 85% of the stocks of BSE Greenex Index have no significant difference on the stock returns and indicate no variations the returns for all the days in the month.

JEL classification: G11,G14,Q54,Q56

Keywords: VOLATILITY, GREENEX, BSE SENSEX

Introduction

Environmental issues have become attracting for progressive investors around the world as the world is witnessing the adverse effects of climate change and global warming and those

Investors looking for investment in stock market are looking for stock which utilize environment-friendly technologies and business practices to reduce their carbon footprint and have environmental concerns built into their vision and mission. In 1999 Dow Jones Sustainability Indexes (DJSI) was first to launch global benchmark for sustainability assessment which employ several criteria as climate change, energy spending, and stakeholder concern, corporate governance and green practices across all the capital markets in the world at large. India has also joined the world by initiation its own benchmark index as Bombay Stock Exchange has made easy for investors to recognize most environment friendly companies as they are categorized under Sustainability indices named as S&P BSE-GREENEX in February, 2012. It is the 25th dynamic index hosted on the Bombay Stock Exchange which assesses the 'carbon performance' of stocks using publicly disclosed energy and financial data .BSE-GREENEX is the first benchmark index which assess the carbon emission performance of the stocks in India.

The interest of investors is gradually shifting to those stocks which environment concern and adopt green business practices. This gives an importance to know risk and return relationship usually measured with volatility. Measurement of volatility plays an important role in financial decision making.

The present research paper aim to examine volatility of BSE GREENEX INDEX which is composed of 25 environmentally sensible companies with benchmark index as BSE indices are compared and highlight by identifying the major green stocks in India and their performance over a period of time.

Literature Review

It was noted that environmental performance improves the portfolio performance significantly was observed by Diltz (1995) .While White (1996) examined the performance of brown and green equity portfolios and demonstrated that the green portfolio provided a significantly positive Jensen's alpha. Scheuth (2003) emphasized on sustainable practices. Yamashita, Sen, and Roberts (1999) found that their environmentally highest-ranked stocks performed significantly better than the lowest-ranked stocks. Daniel (2002) discussed the potential usefulness of eco-efficiency scores in making investment decisions. . Blank and Daniel (2001) reported that eco-efficiency portfolio delivered higher Sharpe ratios than the S&P 500 Index .Derwall et.al (2005) observed that equity portfolios differed in eco-efficiency portfolio performance. Dunn (2009) found that firms with better environmental efficiency may result into better earnings .Interestingly, Tripathi and Bhandari (2012) found

that green portfolio significantly outperformed non green stocks portfolio and market portfolio during crisis period. Kaur(2018) found that , innovative steps aiming at environment protection and setting up of indices like BSE GREENEX has resulted into positive results both for the environment sustainability and those investing for it and have surpassed BSE SENSEX on a yearly returns.

In contrast, Lewis and Mackenzie (2000) argued that investors, while constructing the portfolio would be willing to sacrifice on returns part if the firm is consistent in ethical practices. Konar and Cohen (2001) concluded negative relationship between bad environmental performance and value of the firms. Brammer et al. (2006) found negative relationship between corporate sustainable performance and stock returns. Lopez et al. (2007) found negative correlation between sustainable performance and financial performance. Jones et al. (2007) based their study on sustainable reporting with stock returns. They found that most of the results were statistically insignificant. Chih et al. (2010) also had similar finding where they found that financial performance and is not related with corporate social responsibility. Bammi (2013) investigate investors' reaction to the announcement of stock being included in BSE Greenex and found negative returns during the study window.

Objective of the Study

- ✓ To evaluate the stock price performance of BSE GREENEX stocks since its inception.
- ✓ To assess the performance of BSE GREENEX Index stocks against major index BSE SENSEX.
- ✓ To measure the volatility of stocks of BSE GREENEX sustainable indices with S&P BSE SENSEX India.

Research Methodology

Monthly closing values of all the 25 listed companies under BSE GREENEX were taken along with those of BSE SENSEX from <http://www.yahoofinance.com>. To facilitate the present study, the period under the study covers from March 2012 to March 2019 monthly closing values for all the 25 listed companies and indices were observed. Month wise returns have been calculated by using formula $r_t = ((r_t - r_{t-1})/r_{t-1}) * 100$

Where r_t is the current monthly basis and r_{t-1} are the previous monthly returns values of the selected stocks of given indices respectively. In order to determine the volatility of the returns for the given sample, we need to test whether the variables for all months are jointly zero. following Kiyamaz and Berument (2003), the month of the year effect if any months daily return (or volatility) is different from any other months (here January), rather than every single month's return (or volatility) being equal to that of the others have been tested.

The ordinary least regression model is applied for resulted output;

The equation is as $Y_t = \alpha + \beta x_i + \varepsilon_i$

Where ε_i the error is term, while α and β , are the true parameters of the regression output. The parameter α represents the intercept component, β represents the variation of the dependent variable for the given independent variable.

Research Hypothesis

The null hypotheses are

H_0 : The R Square of stocks of BSE Greenex Index is not significantly different from zero.

H_0 : The variability of stock returns is not significantly different among the stocks.

H_0 : Intercept (Alpha) and the slope (beta co-efficient) is not significantly different from zero.

Empirical Results & Discussion

Table: 01 Summarization of Regression statistics for the Monthly effect of Stocks of BSE GREENEX INDEX on BSE SENSEX INDEX

SN	Greenex stocks	R	R Square	Adjusted R Square	Standard Error of estimate	P-value
1	KOTAKBANK	0.40163	0.1613063	0.151201602	8.992724918	0.00014
2	SUNPHARMA	0.25128	0.0631428	0.051855403	10.06134052	0.02035
3	BHARTIARTL	0.52771	0.2784817	0.269788695	7.239368275	2.1E-07
4	DLF	0.57885	0.3350696	0.327058341	11.07671745	6.5E-09
5	GRASIM	0.24403	0.0595511	0.048220357	18.56256513	0.02441
6	M&M	0.34604	0.1197411	0.109135554	9.163202688	0.00118
7	HCLTECH	0.08571	0.0073462	-0.004613462	10.41792275	0.43542
8	BIOCON	0.17523	0.0307053	0.01902708	13.9692593	0.1087
9	ICICIBANK	0.46457	0.2158207	0.206372769	17.40106407	7.5E-06
10	UPL	0.56004	0.3136486	0.3053793	7.435246582	2.5E-08
11	LUPIN	0.19274	0.0371481	0.025547475	8.092748507	0.07718
12	TATAMOTORS	0.65222	0.4253951	0.418472172	7.985038767	1.4E-11
13	CIPLA	0.31791	0.1010658	0.090235218	6.711689667	0.00303
14	EICHERMOT	0.41169	0.1694865	0.159480321	7.987552548	9.1E-05
15	ASIANPAINT	0.1538	0.0236531	0.011889931	24.96416577	0.15993
16	PIDILITIND	0.37658	0.1418138	0.131474225	6.578018458	0.00038
17	ITC	0.34652	0.1200739	0.109472413	6.397845861	0.00116
18	HINDALCO	0.50449	0.2545139	0.245532131	9.262850182	8.5E-07
19	TITAN	0.45837	0.210106	0.200589189	8.126496252	1E-05
20	PNB	0.50597	0.2560103	0.24704654	19.81307197	7.8E-07
21	MARUTI	0.71643	0.5132685	0.507404274	6.338092654	1.3E-14
22	GAIL	0.4577	0.2094929	0.199968674	8.075825856	1.1E-05
23	ADANI PORTS	0.58286	0.3397292	0.331774138	7.304946529	4.8E-09
24	POWERGRID	0.53098	0.281941	0.273289668	4.817497576	1.7E-07
25	LT	0.5546	0.3075824	0.299240046	8.702562291	3.6E-08

From the table 01 ,A Spearman correlation coefficient reveals all the 25 Greenex index stocks with BSE SENSEX, For MARUTI we observe R Square (82) = 0.5132685, $P < 0.05$, are moderately positive correlation and statistically significant and for TATAMOTORS, R Square (82) = 0.4253951, $P > 0.05$, or 42.53951 % can be inferred as moderately positive correlation with statistically insignificant. While for KOTAKBANK(R Square (82) = 0.1613063, $P < 0.05$), BHARTIARTL(R Square (82) = 0.2784817, $P < 0.05$),DLF (R Square (82) = 0.3350696, $P < 0.05$), M&M (R Square (82) = 0.1197411, $P < 0.05$), ICICIBANK,(R Square (82) = 0.2158207, $P < 0.05$), UPL(R Square (82) = 0.3136486, $P < 0.05$), CIPLA(R Square (82) = 0.1010658, $P < 0.05$),EICHERMOT (R Square (82) = 0.1694865, $P < 0.05$), PIDILITIND (R Square (82) = 0.1418138, $P < 0.05$),ITC(R Square (82) = 0.1200739, $P < 0.05$), HINDALCO(R Square (82) = 0.2545139, $P < 0.05$), TITAN(R Square (82) = 0.210106, $P < 0.05$), PNB (R Square (82) = 0.2560103, $P < 0.05$), GAIL(R Square (82) = 0.2094929, $P < 0.05$), ADANIPTS (R Square (82) = 0.3397292, $P < 0.05$), POWERGRID (R Square (82) = 0.281941, $P < 0.05$), LT (R Square (82) = 0.3075824, $P < 0.05$) are having weak positive correlation and statistically significant. For the stocks of SUNPHARMA (R Square (82) = 0.0631428, $P < 0.05$), GRASIM (R Square (82) = 0.0595511, $P < 0.05$), the correlation value found to be less than ($r < 0.11$) and this can be infer can no relationship exist and statistically significant ,In case of other stocks of BIOCON (R Square (82) = 0.0307053, $P > 0.05$), LUPIN (R Square (82) = 0.0371481, $P > 0.05$), ASIANPAINT (R Square (82) = 0.0236531, $P > 0.05$) can also be infer as no relationship and observed to be statistically not significant.

Table 02: One way ANOVA Results for the Monthly effect of Stocks of BSE GREENEX INDEX on BSE SENSEX INDEX

SN	Greenex companies	variables	df	SS	MS	F	Significance F
1	KOTAKBANK	Regression	1	1290.95	1290.95	15.9634	0.00014
		Residual	83	6712.14	80.8691		
2	SUNPHARMA	Regression	1	566.292	566.292	5.59408	0.02035
		Residual	83	8402.14	101.231		
3	BHARTIARTL	Regression	1	1678.92	1678.92	32.0352	2.1E-07
		Residual	83	4349.9	52.4085		
4	DLF	Regression	1	5131.67	5131.67	41.8251	6.5E-09
		Residual	83	10183.6	122.694		
5	GRASIM	Regression	1	1810.96	1810.96	5.25572	0.02441
		Residual	83	28599.2	344.569		
6	M&M	Regression	1	947.994	947.994	11.2904	0.00118
		Residual	83	6969.04	83.9643		
7	HCLTECH	Regression	1	66.6663	66.6663	0.61425	0.43542
		Residual	83	9008.25	108.533		
8	BIOCON	Regression	1	513.077	513.077	2.62928	0.1087
		Residual	83	16196.6	195.14		
9	ICICIBANK	Regression	1	6916.84	6916.84	22.8431	7.5E-06
		Residual	83	25132.2	302.797		
10	UPL	Regression	1	2096.84	2096.84	37.9293	2.5E-08
		Residual	83	4588.48	55.2829		
11	LUPIN	Regression	1	209.724	209.724	3.20225	0.07718
		Residual	83	5435.88	65.4926		
12	TATAMOTORS	Regression	1	3917.92	3917.92	61.4471	1.4E-11
		Residual	83	5292.15	63.7608		
13	CIPLA	Regression	1	420.357	420.357	9.33156	0.00303

		Residual	83	3738.88	45.0468		
14	EICHERMOT	Regression	1	1080.67	1080.67	16.9382	9.1E-05
		Residual	83	5295.48	63.801		
15	ASIANPAINT	Regression	1	1253.13	1253.13	2.01077	0.15993
		Residual	83	51726.4	623.21		
16	PIDILITIND	Regression	1	593.479	593.479	13.7156	0.00038
		Residual	83	3591.44	43.2703		
17	ITC	Regression	1	463.605	463.605	11.3261	0.00116
		Residual	83	3397.39	40.9324		
18	HINDALCO	Regression	1	2431.3	2431.3	28.3367	8.5E-07
		Residual	83	7121.43	85.8004		
19	TITAN	Regression	1	1457.99	1457.99	22.0774	1E-05
		Residual	83	5481.32	66.0399		
20	PNB	Regression	1	11211.7	11211.7	28.5607	7.8E-07
		Residual	83	32582.3	392.558		
21	MARUTI	Regression	1	3516.01	3516.01	87.5252	1.3E-14
		Residual	83	3334.23	40.1714		
22	GAIL	Regression	1	1434.55	1434.55	21.9959	1.1E-05
		Residual	83	5413.17	65.219		
23	ADANI PORTS	Regression	1	2278.89	2278.89	42.706	4.8E-09
		Residual	83	4429.07	53.3622		
24	POWERGRID	Regression	1	7563.44	7563.44	32.5894	1.7E-07
		Residual	83	1926.29	23.2083		
25	LT	Regression	1	2792.32	2792.32	36.8699	3.6E-08
		Residual	83	6285.97	75.7346		

The results of the table 02 reflect the analysis of variance generated by regression reflects the calculated F value and F Significant values for all the 25 stocks. The results indicate that, out of 25 stocks of Greenex index, only four stocks (HCLTECH (0.43542), BIOCON (0.1087), LUPIN (0.07718 and ASIANPAINT (0.15993) are having F significant value greater than ($\alpha=0.05$). This shows that there is no significant difference on the stock returns and indicate no variations the returns for all the days in the month. In case of other 21 stocks shows the value of F significant below the criteria of significance ($\alpha=0.05$). This means that significant difference exists in average stock returns accordingly. We can accept the alternative hypothesis that, stock returns are significantly different and differ depending on the trading days of the month.

Table 3: Coefficients results for the Monthly effect of Stocks of BSE GREENEX INDEX on BSE SENSEX INDEX

SN	Greenex Companies	Variables	Coefficients	Standard Error	t Stat	P-value
1	KOTAKBANK	Alpha	0.355225	0.993263	0.35763	0.72152
		Beta	0.9444939	0.236393797	3.99543	0.00014
2	SUNPHARMA	Alpha	-0.755309	1.111293558	-0.6797	0.49861
		Beta	0.6255543	0.264484737	2.36518	0.02035
3	BHARTIARTL	Alpha	-0.913785	0.799601536	-1.1428	0.25641
		Beta	1.0771077	0.190302914	5.65996	2.1E-07

4	DLF	Alpha	-1.6743436	1.223443807	-1.3685	0.17483
		Beta	1.8831038	0.291176181	6.46723	6.5E-09
5	GRASIM	Alpha	-2.1430162	2.050269446	-1.0452	0.29895
		Beta	1.1186622	0.487958355	2.29254	0.02441
6	M&M	Alpha	-0.7323227	1.012092584	-0.7236	0.47136
		Beta	0.8093707	0.240875185	3.36012	0.00118
7	HCLTECH	Alpha	0.8855311	1.150678722	0.76957	0.44374
		Beta	0.2146338	0.273858296	0.78374	0.43542
8	BIOCON	Alpha	0.6012068	1.542930373	0.38965	0.69779
		Beta	0.5954375	0.367213084	1.6215	0.1087
9	ICICIBANK	Alpha	-2.6490757	1.921979519	-1.3783	0.17181
		Beta	2.1862433	0.457425713	4.77945	7.5E-06
10	UPL	Alpha	1.4064432	0.821236655	1.71259	0.09052
		Beta	1.2037259	0.195452011	6.15868	2.5E-08
11	LUPIN	Alpha	0.2827924	0.893858951	0.31637	0.75251
		Beta	0.3806873	0.212735913	1.78948	0.07718
12	TATAMOTORS	Alpha	-1.6022852	0.881962212	-1.8167	0.07287
		Beta	1.6454036	0.209904523	7.83882	1.4E-11
13	CIPLA	Alpha	0.297917	0.741318463	0.40187	0.68881
		Beta	0.5389565	0.176431707	3.05476	0.00303
14	EICHERMOT	Alpha	2.0515339	0.882239864	2.32537	0.02249
		Beta	0.8641552	0.209970603	4.1156	9.1E-05
15	ASIANPAINT	Alpha	-1.6728108	2.757338007	-0.6067	0.54572
		Beta	0.9305576	0.656238681	1.41802	0.15993
16	PIDILITIND	Alpha	1.7740489	0.726554232	2.44173	0.01674
		Beta	0.6403942	0.172917861	3.70346	0.00038
17	ITC	Alpha	-0.114146	0.706653838	-0.1615	0.87207
		Beta	0.5660032	0.168181624	3.36543	0.00116
18	HINDALCO	Alpha	-0.4825808	1.023098832	-0.4717	0.63839
		Beta	1.2961773	0.243494641	5.32323	8.5E-07
19	TITAN	Alpha	1.1106205	0.897586452	1.23734	0.21945
		Beta	1.0037417	0.213623048	4.69866	1E-05
20	PNB	Alpha	-5.0206773	2.188390226	-2.2942	0.0243
		Beta	2.7834335	0.520830711	5.34422	7.8E-07
21	MARUTI	Alpha	0.6416421	0.700053986	0.91656	0.36203
		Beta	1.5587267	0.166610877	9.35549	1.3E-14
22	GAIL	Alpha	-0.8520379	0.891989813	-0.9552	0.34225
		Beta	0.9956403	0.212291064	4.68998	1.1E-05
23	ADANI PORTS	Alpha	0.3115943	0.806844774	0.38619	0.70035
		Beta	1.2548917	0.192026784	6.53498	4.8E-09
24	POWERGRID	Alpha	0.0690041	0.532101464	0.12968	0.89713
		Beta	0.7229435	0.12663865	5.70871	1.7E-07
25	LT	Alpha	-1.0657382	0.961214005	-1.1087	0.27074
		Beta	1.3890813	0.228766226	6.07206	3.6E-08

Table 03 reflects the exactly the significant difference in the returns of the stocks .In case of HCLTECH $F(1,83)=0.61425, P \text{ value } (0.43542) > (\alpha=0.05)$, BIOCON $F(1,83)=2.62928$,P value $(0.1087) > (\alpha=0.05)$, LUPIN $F(1,83)=3.20225, P \text{ value } (0.07718) > (\alpha=0.05)$ and ASIANPAINT

$F(1,83)=2.01077, P \text{ value } (0.15993) > (\alpha=0.05)$ we can observe that P value is greater than the standard value of 0.05. Therefore we can interpret that this four stocks has no significant difference in the returns for a given sample period. In case of rest twenty one stocks

;KOTAKBANK, SUNPHARMA , BHARTIARTL, DLF , GRASIM, M&M , ICICIBANK, UPL , TATAMOTORS, CIPLA, EICHERMOT, PIDILITIND ,ITC, HINDALCO , TITAN , PNB , MARUTI , GAIL, ADANI PORTS, POWERGRID , LT having the F significant value less than the 0.05 hence , these stocks having returns significantly different .

Conclusion

The study unveils interesting insights in the performance of socially accountable investment stocks .As noted in literature review, studies for this research presented has considerably diverse inferences. Hence, inferences of this study are also in line with some studies Lewis and Mackenzie (2000), Jones et al. (2007).However, the results unveil the performance of stocks of BSE-GREENEX Index and shows that stocks of greenex index are majority weak positively correlated with the BSE SENSEX. However, the impact is found to be statistically significant. Further from the results of F-statistics states that, 85% of the stocks of BSE Greenex Index have no significant difference on the stock returns and indicate no variations the returns for all the days in the month.

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