A Study of Volatility of Major Green Stocks and their Relative Risk Return profiles

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Introduction:

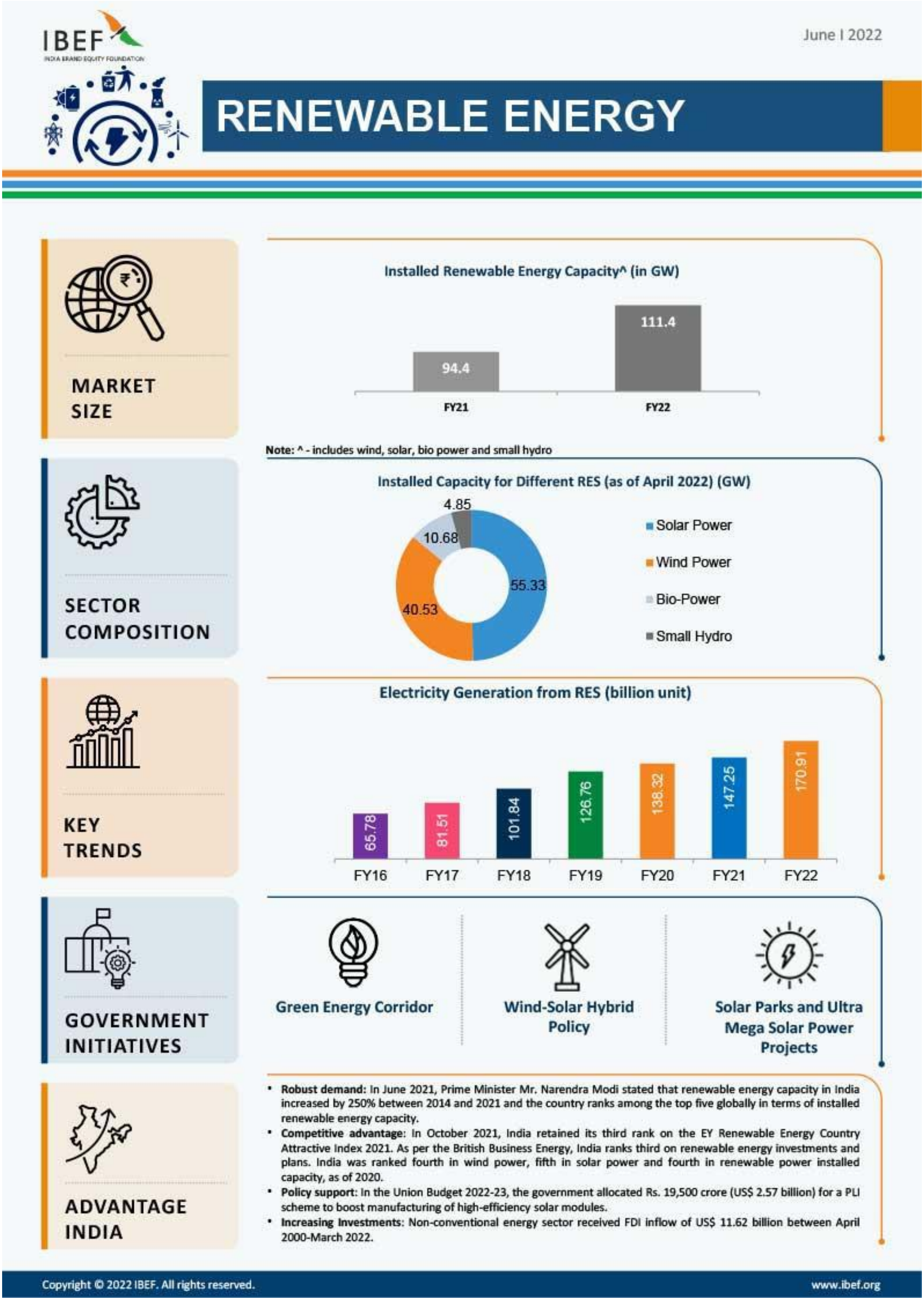
The never ending demand for energy and the limitations of traditional sources of energy, have created a worldwide movement of the major economies to the renewable sources of energy. As of 2020, India ranks third amongst nations for renewable energy investments and plans (As per British Business Energy). The sector has received an investment of $42 Billion and hence with so much stress, it is worthwhile to study the major players in the market.As of 2020, India is ranked 4th in wind power, 5th in solar power and 4th in renewable power installed capacity. India has 152.36 GW of capacity for renewable energy which makes up 38.56% of the total installed power capacity.

The Indian Government has targeted to achieve 227 GW of renewable energy capacity by the end of 2022, thereby surpassing the target of 175 GW set as per the Paris Agreement. The government aims to establish a renewable energy capacity of 523 GW by 2030, which will consist of 60% of solar energy and 14% of hydel energy capacity.

The study will study the movement of stocks of five major players in the Indian Green Market. Also, it will study these stocks with reference to the Greenex Index of BSE. The five major players in the Indian Green market include Adani Green Energy Ltd, Tata Power Co. Ltd, JSW Energy Ltd, Sterling and Wilson Solar Ltd and INOX Wind Ltd.

The market capitalization of the major players in the sectors can be illustrated as follows:

Now let us look into some infographics on the sector of renewable energy:


IBEF
INDIA BRAND EQUITY FOUNDATION
June I 2022
RENEWABLE ENERGY
MARKET SIZE
Installed Renewable Energy Capacity^ (in GW)
94.4
111.4
FY21
FY22
Note: ^ - includes wind, solar, bio power and small hydro
SECTOR COMPOSITION
Installed Capacity for Different RES (as of April 2022) (GW)
4.85
10.68
55.33
40.53
Solar Power
Wind Power
Bio-Power
Small Hydro
KEY TRENDS
Electricity Generation from RES (billion unit)
65.78
81.51
101.84
126.76
138.32
147.25
170.91
FY16
FY17
FY18
FY19
FY20
FY21
FY22
GOVERNMENT INITIATIVES
Green Energy Corridor
Wind-Solar Hybrid Policy
Solar Parks and Ultra Mega Solar Power Projects
ADVANTAGE INDIA
• Robust demand: In June 2021, Prime Minister Mr. Narendra Modi stated that renewable energy capacity in India increased by 250% between 2014 and 2021 and the country ranks among the top five globally in terms of installed renewable energy capacity.
• Competitive advantage: In October 2021, India retained its third rank on the EY Renewable Energy Country Attractive Index 2021. As per the British Business Energy, India ranks third on renewable energy investments and plans. India was ranked fourth in wind power, fifth in solar power and fourth in renewable power installed capacity, as of 2020.
• Policy support: In the Union Budget 2022-23, the government allocated Rs. 19,500 crore (US$ 2.57 billion) for a PLI scheme to boost manufacturing of high-efficiency solar modules.
• Increasing Investments: Non-conventional energy sector received FDI inflow of US$ 11.62 billion between April 2000-March 2022.
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Literature Review

In the bond market, green bonds have a co-activity relationship with other traditional bonds, and green bonds also have a co-activity relationship with other financial markets, such as the stock market. (Research on the Correlation of Green Bond Market Junru Wang1, Weiyi Zhang2,Wenye Zhao3). The volatility transfer between the Green Bond Market and Equity market is not asymmetric (Daehyeon Park, Jiyeon Park and Doojin Ryu).

Climate change has become a key issue in the last few years, and individuals are increasingly developing climate-oriented needs when searching for investment opportunities. (Green Bond: A Systematic Literature Review for Future Research Agendas Giuseppe Cortellini and Ida Claudia Panetta).

The YTM showed that the yield of Government bonds is less than S&P500 bond and Green Bond. This is in line with the annual return measure. Thus, in turn is one of the confirmations that government bonds (global Developed bond and EU developed bond) have lower expected returns. The comparison goes far about Green Bond and corporate bond (S&P500 bond), it leads to the same outcome except for some period of time. This outcome is the same as the risk and return analysis (with total return data) using different data set (YTM). The systematic risk of Green Bond was the same as the risk of the bond benchmark (S&P500 bond) in both CAPM and ARDL models. Green Bond and S&P500 bond has gone together.(Risk and Return of Green Bonds, Habtu Nigus Deribew, Master Thesis).

The results of an illustrative portfolio construction exercise suggest that adding both green and conventional bonds can help generate diversification benefits and, hence, improve the risk-adjusted returns of traditional government bond portfolios. To the extent that central bank involvement helps to establish minimum standards and practices in a still developing market, this would tend to confer additional benefits: for example, by guarding against greenwashing. (Green bonds: the reserve management perspective, Ingo Fender, Mike McMorrow, Vahe Sahakyan, Omar Zulaica)

The finding of a positive relationship between GB and green energy stocks suggests that there is no hedging between long positions in GBs clean energy stocks. The GB market has made significant progress, but there are still prospects for development and improvement. Green bonds are negatively linked to world gold prices, indicating that gold is safe for green bonds in harsh market situations. (Driving green bond market through energy prices, gold prices and green energy stocks: evidence from a non-linear approach, Lei Yan, Haiyan Wang, Seyed Alireza Athari & Faraz Atif).

Research Gap

The research fills the gap in the existing literature by studying the risk return profile of all the major green stocks in the Indian market. It also studies the relative risk return profile of the top five green stocks.

Research Objective:

1. To study and compare the volatility of green stocks in the Indian Market.
2. To study about the relative risk-return profiles of the green stocks.
3. To analyze the correlation of volatility between stocks.
4. To study the relative correlation of green stocks volatility with the Greenex Index.

Relevance of Study:

The study is relevant to understand the volatility of green stocks in the Indian market. Also, the study will help to understand the relationship between volatilities of various green stocks. It will also correlate the green stocks price movements with the Greenex Index.

Hypothesis:

H1: The return of stocks of the five major green stocks do not necessarily move in the same direction.

H2: The green stocks and the Greenex do not necessarily move in the same direction.

H3: The stocks of the five major green stocks share the same risk-return profile.

H4: The movement of green stocks is exactly proportional to the movement of Greenex.

Sampling:

The research is based on secondary data. The research focuses on the five major green energy players in the Indian Stock Market.

1. Adani Green Energy Ltd
2. Tata Power Co. Ltd
3. JSW Energy Ltd
4. Sterling and Wilson Solar Ltd
5. INOX Wind Ltd

The historical stock price considered for the study is from 1st August 2021 to 31st July 2022. The source of stock price is yahoo finance and investing.com. NSE stock price has been taken for the study.

Also, the study of the above mentioned stocks have been done with reference to the S&P BSE Greenex Index.

Research Methodology:

The research methodology used in this study involves the use of the Value at Risk (VaR) concept to measure the volatility of the stocks. The study uses VaR at 95% confidence level with 5% tolerance level. The correlation coefficient method is used to find out the relative movements between stocks and also the index.

Descriptive statistical analysis has been done using Jamovi software.

The study all uses financial tools like Sharpe Ratio, Beta coefficient, SAPM Model to analyze the risk-return profile of the various green stocks and the composite index greenex.

Factsheet of the Sample Stocks:

S.N	Particulars	Adani Green Energy Ltd	Tata Power	JSW Energy	Sterling and Wilson	INOX Wind
1	Volume	519,179	23,294,298	1,346,533	1,257,278	533,591
2	1 Year Change	136.75%	75.33%	33.47%	2.31%	-12.58%
3	Market Cap	3.45 T	742.6 Bn	524.3 Bn	53.05 Bn	31.07 Bn
4	Beta	1.04	0.751	0.369	2.75	1.21
5	P/E Ratio	926.81	27.44	18.68	-4.26	-4.03
6.	Revenue	51.33 Bn	471.79 Bn	81.67 Bn	51.99 Bn	6.25 Bn
7.	EPS	2.38	6.75	12.72	-67.80	-19.37

➢ As per the data above, Tata Power is the highest traded stock in NSE, volume wise, amongst all the major green stocks.

➢ Adani Power has seen a high upswing of 136.75% in its price in the last one year. At the same time, INOX Wind has seen a reduction in its price by 12.58% over the last one year.

➢ Adnani outpowers all the other players as far as market capitalization is considered.

- If we observe beta of the stocks, except JSW Energy, other four stocks show strong positive correlation with the index. The systematic risk for Adani, Sterling and Wilson and INOX Wind is more than other two stocks.
- Revenue wise, Tata Power outshines with the total revenue of 471.79 Bn, which is more than the combined revenue of other four players.
- EPS is highest for JSW energy. Though Adani, Tata and JSW have positive EPS, the EPS of Sterling and Wilson & Inox Wind are negative.

Data Analysis:

The risk free rate of return has been taken as 6.31% which is yield on Indian Government bonds for the residual maturity of one year.

Descriptives

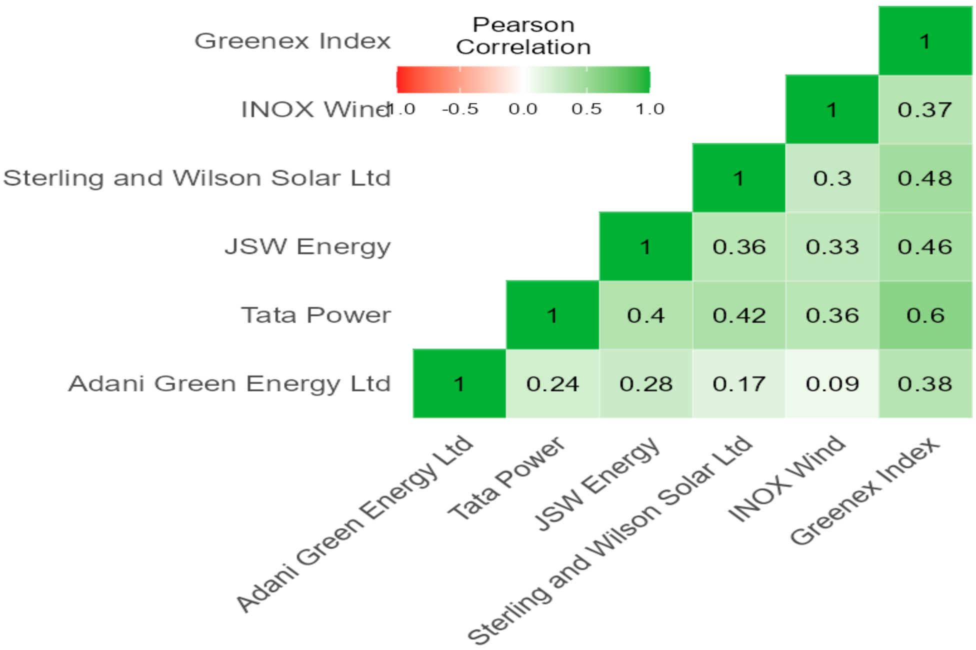
	Adani Green Energy Ltd	Tata Power	JSW Energy	Sterling and Wilson Solar Ltd	INOX Wind	Greenex Index
N	248	248	248	248	248	248
Mean	-0.00314	-0.00161	5.48e-4	4.24e-4	0.00232	-3.64e−4
Std. error mean	0.00205	0.00187	0.00195	0.00175	0.00218	7.76e-4
Median	-0.00442	-0.00258	0.00235	0.00149	-2.44e−4	-5.33e−4
Standard deviation	0.0323	0.0294	0.0307	0.0276	0.0343	0.0122
Variance	0.00104	8.65e-4	9.40e-4	7.59e-4	0.00118	1.49e-4
Range	0.269	0.255	0.170	0.188	0.238	0.0809
Minimum	-0.130	-0.135	-0.0898	-0.0880	-0.127	-0.0295
Maximum	0.139	0.120	0.0803	0.100	0.111	0.0514
Skewness	0.324	-0.260	-0.0559	-0.255	0.0532	0.658
Std. error skewness	0.155	0.155	0.155	0.155	0.155	0.155
Kurtosis	3.70	3.90	-0.125	0.849	1.62	1.40
Std. error kurtosis	0.308	0.308	0.308	0.308	0.308	0.308

Item Reliability Statistics					
				if item dropped	
	mean	**sd**	**item-rest correlation**	**Cronbach's α**	**McDonald's ω**
Adani Green Energy Ltd	-0.00314	0.0323	0.292	0.725	0.778
Tata Power	-0.00161	0.0294	0.561	0.634	0.715
JSW Energy	5.48e-4	0.0307	0.520	0.647	0.738
Sterling and Wilson Solar Ltd	4.24e-4	0.0276	0.475	0.664	0.742
INOX Wind	0.00232	0.0343	0.396	0.694	0.763
Greenex Index	-3.64e−4	0.0122	0.688	0.668	0.684

Value at Risk:

	Adani	Tata	JW	S&W	Inox	Greenex
Average Daily Return	-0.31%	-0.16%	0.05%	0.04%	0.23%	-0.04%
Mean Annual Return	-114.58%	-58.89%	20.01%	15.49%	84.54%	-13.28%
Standard Deviation	0.0323	0.0294	0.0306	0.0275	0.0342	0.0122
VAR at 95% Confidence Level	4.76%	4.73%	4.76%	4.77%	5.31%	1.85%
Correlation of Stocks with Greenex	0.38	0.60	0.46	0.48	0.37	

Correlation Heatmap



Hypothesis Acceptance/ Rejection:

H1	The return of stocks of the five major green stocks do not necessarily move in the same direction.	**Rejected**	All the major green stocks share positive correlation with Greenex.
H2	The return of green stocks and the Greenex do not necessarily move in the same direction.	**Rejected**	All the major green stocks share positive correlation with Greenex.
H3	The stocks of the five major green stocks share the same risk-return profile.	**Rejected**	The risk-return profile of all the five stocks are different
H4	The movement of green stocks is exactly proportional to the movement of Greenex.	**Rejected**	The correlation between the return of all the five stocks and Greenex is positive but not 1.

Limitation of Study and Future scope of work:

The study focuses on the analysis of stock prices of five major green stocks. The horizon of research can be extended to other green stocks.

The study mainly studies the risk return profile of the top five green stocks using VaR technique. However, the same study can be carried out using various other techniques of risk and return measurement.

The time period of the study of stock prices has been taken from 1st August 2021 to 31st July 2022. There can be further study carried out with a broader time horizon and more variables in place.

Conclusion:

The Value at Risk calculation shows that INOX Wind is the most risky stock with a probability of loss of 5.31%. However, it is evident from the VaR calculation that the probable loss from the five major green stocks ranges 4.73% to 5.31%, which shows that the green stocks are not very volatile in nature and thus the probability of loss is limited.

The correlation calculation shows that all the green stocks are positively correlated with the Greenex Index but except Tata Power which shows a correlation of 0.6, all others stocks are mildly correlated with the Greenex. Also, the correlation heat map shows that their mutual correlation, though it is positive, is very mild (below 0.5).

References:

- Green Bond: A Systematic Literature Review for Future Research Agendas, Giuseppe Cortellini and Ida Claudia Panetta , Journal of Risk and Financial Management.
- Market efficiency and Volatility persistence of green investments before and during COVID-19 pandemic by Yaya, OlaOluwa S and Akano, Rafiu O and Adekoya, Oluwasegun B.MPRA Paper No. 113706, posted 09 Jul 2022.
- The Dynamic Correlation and Volatility Spillover among Green Bonds, Clean Energy Stock, and Fossil Fuel Market by Chaofeng Tang, Kentaka Aruga
- Banga, J., 2018. The green bond market: a potential source of climate finance for developing countries. Journal of Sustainable Finance & Investment 9, 17-32.
- Yaya, O. S., Ogbonna, A. E., Mudida, R. and Abu, N. (2021). Market Efficiency and Volatility Persistence of Cryptocurrency during Pre- and Post-Crash Periods of Bitcoin: Evidence based on Fractional Integration. International Journal of Finance and Economics, 26: 1318–1335.
- Reserve currency and the volatility of clean energy stocks: The role of uncertainty by Baris Kocaarslan, Ugur Soytas
- Syed Kumail Abbas Rizvi, Bushra Naqvi & Nawazish Mirza; Is green investment different from grey? Return and volatility spillovers between green and grey energy ETFs
- https://www.ibef.org/industry/renewable-energy-presentation
- https://about.bnef.com/blog/energy-transition-investment-hit-500-billion-in-2020-for-first-time/