

A Comparative Study of Stock Performance and Risk-Return Analysis of Tata Power and Adani Green Energy in India

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Abstract : This study presents a comparative analysis of the stock performance and risk-return characteristics of Tata Power and Adani Green Energy Limited in the Indian sustainable energy sector. Using secondary data from the National Stock Exchange and Bombay Stock Exchange for the period 2018–2024, the study evaluates key financial metrics such as returns, standard deviation, beta, and risk-adjusted performance measures including Sharpe Ratio, Treynor Ratio, and Jensen's Alpha. The findings reveal that both companies generated higher returns than the BSE Sensex, but with significantly higher risk and volatility. The portfolio analysis indicates high returns accompanied by high risk, reflecting aggressive investment behavior. The study highlights the importance of balancing risk and return in sustainable investments and provides insights for investors and analysts in making informed decisions.

Index Terms - Generation Z, Saving Habits, Financial Awareness, Demographic Factors, Income, Budgeting Behaviour, Young Adults.

I. INTRODUCTION

Tata Power Company Limited is a leading power generation company based in Mumbai and is a part of the well-known Tata Group. It is one of India's largest integrated power companies, with a total installed capacity of 14,707 MW. A significant portion of this capacity, about 5,847 MW, comes from renewable or green energy sources, while the rest is generated from thermal power. The company was originally established in 1910 as the Tata Hydroelectric Power Supply Company and later merged with the Andhra Valley Power Supply Company in 1916. Over the years, it developed some of India's early hydroelectric projects in places like Khopoli, Bhivpuri, and Bhira. In 2017, Tata Power achieved a major milestone by becoming the first Indian company to ship more than one gigawatt of solar modules. Adani Electricity Limited is a major private power company and part of the Adani Group. The company has a total power generation capacity of 15,250 MW. Most of this capacity comes from thermal power plants located in different states across India, including Gujarat, Maharashtra, Karnataka, Rajasthan, Chhattisgarh, Madhya Pradesh, and Jharkhand. In addition to thermal power, the company also operates a 40 MW solar power project in Gujarat. The energy sector in India is changing rapidly as the country moves toward cleaner and more sustainable sources of power. Growing concerns about climate change, environmental protection, and energy security have encouraged both the government and private companies to invest heavily in renewable energy such as solar and wind power. As a result, companies operating in the sustainable energy sector have gained strong attention from investors, and their stock prices have shown significant movement in the stock market. Among the leading companies in this sector are Tata Power and Adani Green Energy Limited. Tata Power is a well-established and diversified power company that operates in both conventional and renewable energy segments. On the other hand, Adani Green Energy Limited mainly focuses on renewable energy projects, especially solar and wind power generation. Because of these differences in business structure and operational focus, comparing their stock performance becomes interesting and meaningful. Stock performance shows how a company's shares are performing in the market over a period of time. Investors usually look at returns to understand how much profit they can earn, but they also consider risk factors such as price fluctuations, volatility, and sensitivity to market changes. In the renewable energy sector, stock prices can be influenced by government policies, project announcements, technological developments, and overall market conditions. Therefore, studying both return and risk together gives a clearer picture of investment quality. This study aims to compare the stock performance and risk-return characteristics of Tata Power and Adani Green Energy Limited in a simple and practical way. By analyzing their returns, volatility, and overall market behavior, the research tries to understand which company provides better performance and how much risk is involved. The findings of this study will help investors, researchers, and financial analysts make better decisions while investing in sustainable energy companies. Overall, as India continues to expand its renewable energy capacity, understanding how major sustainable power

companies perform in the stock market becomes very important. A comparative analysis of these two companies will provide useful insights into investment opportunities and risk patterns within the Indian sustainable energy sector.

1.1. RESEARCH GAP

The existing studies on the sustainable energy sector mainly focus on individual company performance rather than comparative analysis. Most research emphasizes financial or ESG aspects, with limited attention to stock performance comparison. There is a lack of studies combining both return and risk-adjusted measures like Sharpe, Treynor, and Jensen's Alpha. Recent stock market trends, especially after 2018, are not adequately covered. Limited research is available on the comparative performance of Tata Power and Adani Green Energy. Thus, this study fills the gap by providing a comparative risk-return analysis over the period 2018–2024.

1.2. SCOPE OF THE STUDY

- The study focuses on analysing the stock performance of Tata Power and Adani Green Energy Limited.
- It covers a period of seven years from 2018 to 2024.
- The analysis is based on secondary data collected from NSE, BSE, and company reports.
- The study evaluates both return and risk using tools like standard deviation, beta, and risk-adjusted measures.
- It is limited to the Indian sustainable energy sector and selected companies only.
- The findings are useful for investors, researchers, and financial analysts for decision-making.

1.3. Research Questions

- Is there a significant difference in the stock returns of Tata Power and Adani Green Energy?
- Which company has higher risk and volatility during the study period?
- Which stock provides better risk-adjusted returns to investors?

1.4. RESEARCH OBJECTIVE

1. To analyse the stock returns of Tata Power and Adani Green Energy using statistical tools.
2. To compare the risk (volatility) of both companies using standard deviation and beta.
3. To evaluate the risk-adjusted performance using Sharpe Ratio, Treynor Ratio, and Jensen's Alpha.

1.5. RESEARCH HYPOTHESES

1. H_0 - There is no significant difference in the volatility of returns between Tata Power and Adani Green Energy.
2. H_0 - There is no significant relationship between the stock returns and market returns (beta = 1 or no sensitivity).
3. H_0 - The stocks do not provide significant excess return over the risk-free rate.
4. H_0 - The stocks do not provide significant excess return per unit of systematic risk.
5. H_0 - The stocks do not outperform the expected market return (alpha = 0).

1.6. RESEARCH METHODOLOGY

The study will employ a secondary data collection method, sourcing data from reputable and reliable sources. Specifically, the data is gathered from the websites of the National Stock Exchange (NSE) and Bombay Stock Exchange (BSE), which provide historical stock price data and other relevant financial information. Additionally, the company websites of Tata Power and Adani Green Energy will be utilized to collect data on their financial performance, annual reports, and other relevant information. This secondary data collection approach will enable the study to gather accurate and reliable data, facilitating a comprehensive analysis of the stock performance of Tata Power and Adani Green Energy.

1.7. TOOLS FOR ANALYSIS

The following tools and techniques were used to analyse the stock performance of sustainable power companies:

- Standard deviation
- Beta
- Sharpe's Performance Index.
- Treynor's Performance Index.
- Jensen's Performance Index.

1.8. REVIEW OF LITERATURE

(Shwet Sampat, 2022) This study focuses how crucial sustainable practices are to the energy industry, especially when it comes to cutting greenhouse gas emissions. Prior studies have concentrated on certain facets of sustainability, such as ESG (Environmental, Social, Governance), business financial performance, or moral behavior. To present a comprehensive view of sustainability performance, this study, however, combines all three ideas. In order to reach net-zero transition, the literature analysis also highlights how important it is for businesses to implement sustainable practices. The absence of comprehensive methods for assessing sustainability performance is a research gap. While prior research has concentrated on distinct facets of sustainability, this study integrates company financial performance, ethical behavior, and ESG to offer a thorough knowledge of sustainable integration. Method of comparative case studies.

(P Hanumantha Rao December, 2020) This research focuses on world economy, particularly the Indian stock market, has been greatly influenced by the COVID-19 pandemic. Stock prices have dropped as a result of the epidemic; the NIFTY 50 index has dropped 15%. But the index has also shown resilient, rebounding by more than 90% the year after. The study's objective is to evaluate the stock market performance of Indian electricity businesses throughout the pandemic. The literature study emphasizes how crucial it is to examine the stock market performance of particular industries, such as the electricity sector, in order to comprehend how the epidemic has affected the economy. The dearth of studies examining the stock market performance of India's electricity sector during the COVID-19 pandemic represents a research need. This study uses a quantitative approach, analysing the financial performance of five sample companies in the power sector using ratios such as Current Ratio, Net Profit Margin (NPM), Quick Ratio, and Return on Capital Employed (ROCE).

(Saurabh Trivedi February, 2021) This study emphasizes how India's energy change has been fueled by falling solar tariffs, which have hit a record low of Rs1.99/kWh. Over the course of the pandemic, the cost of solar modules decreased by 20%. According to published research, India's solar industry is expected to rise further and reach Rs1.00/kWh by 2030. Government policies and the promise of 25-year power purchase agreements are driving the mobilization of international money to help India's development of grid infrastructure and renewable energy. Knowledge of the capital flows underlying India's energy transition, in particular the contribution of international capital to the country's development of grid infrastructure and renewable energy, is a research gap. The study seems to be based on a qualitative analysis, analyzing trends and changes in India's energy sector through industry reports, forecasts, and expert opinions.

(Dev Zinzuvadia, Prof. Deepesh Sheth April, 2024) This study focuses on how the need for renewable energy and lower carbon emissions is causing major changes in the Indian energy sector. The literature emphasizes how crucial innovation and adaptation are to the energy sector, especially in light of the COVID-19 pandemic and the conflict between Russia and Ukraine. Businesses that embrace sustainable practices and make investments in renewable energy are more resilient to shocks from the outside world, according to studies. The precise tactics and adjustments made by significant participants in the Indian energy industry, however, are not well studied. The knowledge gap concerns the particular tactics and adjustments made by significant participants in the Indian energy industry, especially in reaction to the COVID-19 outbreak and the conflict between Russia and Ukraine. This study appears to be based on a qualitative analysis, using case studies of three major players in the Indian energy sector: Reliance Industries, Tata Power, and Adani Power.

(Versha Gupta, Dr Neetu Jindal August 22, 2024) The renewable energy sector, which is the subject of this study, is essential for long-term, sustainable economic growth. The industry for renewable energy in India is expanding quickly and presents substantial financial prospects. Access to cash is still a major obstacle, though. The significance of assessing financial performance in the field of renewable energy has been emphasized in earlier research. Financial performance of renewable energy enterprises has been evaluated using a variety of financial parameters, including profitability, liquidity, and solvency ratios. By analyzing the financial performance of Adani Green Energy Ltd (AGEL), one of India's largest renewable energy firms, this study seeks to add to the body of existing work. The dearth of studies analyzing Adani Green Energy Ltd.'s (AGEL) financial performance in particular utilizing a variety of financial ratios represents a research gap. This study appears to be based on a quantitative analysis, using financial ratios such as liquidity, solvency, and profitability ratios to evaluate the financial performance of Adani Green Energy Ltd (AGEL) over a period of five years (2019-2023).

1.9. RESEARCH ANALYSIS

2. PORTFOLIO ANALYSIS(STANDARD DEVIATION, BETA)

Portfolio analysis is used to evaluate the risk and return of a group of investments. It helps investors make better decisions by understanding how different assets perform together. Standard deviation measures the total risk or volatility of portfolio returns. A higher standard deviation indicates greater fluctuation and higher risk. Beta measures the sensitivity of the portfolio to market movements, showing systematic risk.

Year	Tata Power	Adani	BSE Sensex	Tata Power	Adani	BSE Sensex
2018	76.75	41.9	36068.33			
2019	56.5	166.5	41253.74	-26%	297%	14%
2020	75.65	1052.55	47751.33	34%	532%	16%
2021	220.9	1327.75	58253.82	192%	26%	22%
2022	207.7	1932.1	60840.74	-6%	46%	4%
2023	332.05	1597.05	72240.26	60%	-17%	19%
2024	392.4	1041	78139.01	18%	-35%	8%

Returns	45%	142%	14%
Risk	71%	206%	6%
Beta	8.576241	4.719019	
Weight	0.5	0.5	
Correlation	-29%		
Portfolio Return	93%		
Portfolio Variance	98%		
Portfolio Risk	99%		

Interpretation:

The analysis shows that Tata Power and Adani Green Energy Limited have generated higher returns (45% and 142%) compared to the BSE Sensex (14%), indicating strong growth potential in the sustainable energy sector. However, Adani shows extremely high returns along with very high risk (206%), making it highly volatile, while Tata Power has relatively moderate risk (71%). The portfolio combines both stocks and achieves a high return of 93%, but it also carries very high risk (99%), indicating significant volatility. The negative correlation (-29%) between the two stocks provides some diversification benefit, but it is not sufficient to reduce overall risk substantially.

The high beta values (above 1) indicate that both stocks and the portfolio are highly sensitive to market movements, making them aggressive investments. Overall, the portfolio offers high return potential but with very high risk, suitable only for investors with a high risk tolerance.

3. CALCULATION OF PORTFOLIO BETA, SHARPE'S PERFORMANCE INDEX, TREYNOR RATIO, JENSEN'S ALPHA

A	B
Portfolio Return (Rp)	93%
Portfolio Risk (σ_p)	99%
Risk Free Rate (Rf)	6%
Market Return (Rm)	14%
Tata Beta	8.576
Adani Beta	4.719
Weight Tata	0.5
Weight Adani	0.5

✓ **Calculation of Portfolio Beta**

Portfolio beta measures the sensitivity of a portfolio's returns to overall market movements. It shows how much the portfolio will increase or decrease when the market changes. A higher beta means higher risk and higher volatility compared to the market.

Tata Beta	8.576
Adani Beta	4.719
Weight Tata	0.5
Weight Adani	0.5

Tata Beta	4.288
Adani Beta	2.3595
Portfolio Beta	6.6475

Interpretation:

The portfolio beta of 6.6475 is derived by combining Tata Power (8.576) and Adani Green Energy Limited (4.719) with equal weights. This shows that Tata Power has higher market risk compared to Adani, meaning it is more sensitive to market movements. In comparison, Adani has a lower beta than Tata Power, but both are still highly risky (beta > 1). The combined portfolio beta lies between the two values, indicating a balanced but still high-risk portfolio.

✓ **Calculation of Sharpe's Performance Index**

The Sharpe Ratio measures the excess return earned by an investment compared to the risk-free rate for each unit of total risk taken. It helps investors understand how efficiently a portfolio is performing relative to its risk.

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$

Where:

- R_p = Portfolio Return
- R_f = Risk-Free Rate
- σ_p = Portfolio Risk (Standard Deviation)

Sharpe Ratio	Meaning
< 1	Low / Moderate performance
= 1	Good
> 1	Very good
> 2	Excellent

Portfolio Return (R_p)	93%
Portfolio Risk (σ_p)	99%
Risk Free Rate (R_f)	6%
Sharpe's Ratio	87.88%

Interpretation:

The Sharpe Ratio of 0.88 (87.88%) indicates that the portfolio generates 0.88 units of excess return for every unit of total risk taken, which reflects moderate risk-adjusted performance. When compared to an ideal benchmark (Sharpe Ratio ≥ 1), the portfolio is slightly less efficient, meaning the returns are reasonable but not very high relative to the risk involved. Thus, although the portfolio return is high (93%), the very high risk (99%) reduces its overall efficiency, showing that the portfolio is not optimally balanced in terms of risk and return.

 ✓ **Calculation of Treynor Ratio**

The Treynor Ratio measures the excess return earned by a portfolio for each unit of systematic risk (beta) taken. It helps investors understand how well a portfolio performs relative to market risk. A higher Treynor Ratio indicates better risk-adjusted performance based on market risk.

$$\text{Treynor Ratio} = \frac{R_p - R_f}{\beta_p}$$

Where:

- R_p = Portfolio Return
- R_f = Risk-Free Rate
- β_p = Portfolio Beta

Portfolio Return (Rp)	93%
Risk Free Rate (Rf)	6%
Portfolio Beta	6.6475
Treynor ratio	13.09%

Interpretation:

The Treynor Ratio of 13.09% indicates that the portfolio earns 13.09% excess return for each unit of systematic risk (beta) taken. Since the value is relatively high, it shows that the portfolio is performing well in relation to market risk, despite having a high beta (6.6475). Thus, compared to risk taken, the portfolio demonstrates good risk-adjusted performance based on systematic risk, even though it is highly sensitive to market movements.

 ➤ **Jensen's Performance Index**

Jensen's Alpha is a performance measure that evaluates how much a portfolio has outperformed or underperformed its expected return based on the Capital Asset Pricing Model (CAPM). It compares the actual return of a portfolio with the return that should have been earned for the level of systematic risk (beta) taken. It is widely used to assess the skill of portfolio managers and the effectiveness of investment decisions.

$$\alpha = R_p - [R_f + \beta_p(R_m - R_f)]$$

Where:

- R_p = Portfolio Return
- R_f = Risk-Free Rate
- β_p = Portfolio Beta
- R_m = Market Return

Portfolio Return (Rp)	93%
Risk Free Rate (Rf)	6%
Portfolio beta	6.6475
Market Return (Rm)	14%
Jensen's Alpha	33.82%

Interpretation:

The Jensen's Alpha of 33.82% indicates that the portfolio has earned returns significantly higher than the expected return based on its risk level (beta). Since the alpha is positive and high, it shows that the portfolio has outperformed the market benchmark (14%) and delivered superior performance. Thus, compared to the expected CAPM return, the portfolio demonstrates excellent performance and effective investment decisions despite high risk.

Suggestions and Recommendations

- Investors should diversify their portfolio instead of investing only in high-risk stocks like Adani Green Energy Limited and include relatively stable options like Tata Power.
- Investors must assess their risk tolerance carefully due to high volatility and beta values of the stocks.
- A proper balance between risk and return should be maintained to improve overall portfolio efficiency.
- Long-term investment strategies should be preferred over short-term speculation in the sustainable energy sector.
- Investors should regularly monitor government policies, market trends, and technological changes affecting the energy sector.
- Risk-adjusted performance measures like Sharpe Ratio, Treynor Ratio, and Jensen's Alpha should be used for better investment decisions.

Scope for Further Study

- Future research can expand this study by including more companies from the renewable energy sector for a broader comparison.
- The analysis can be extended by considering longer time periods and incorporating recent market trends.
- Further studies may include advanced techniques such as portfolio optimization models and multi-factor analysis.
- Researchers can also examine the impact of ESG factors and government policies on stock performance.
- Additionally, comparing Indian companies with global renewable energy firms can provide deeper insights into international market dynamics.

Conclusion

The study provides a comprehensive analysis of the stock performance and risk-return characteristics of Tata Power and Adani Green Energy Limited within the Indian sustainable energy sector. The findings reveal that both companies have delivered strong returns during the study period (2018–2024), outperforming the broader market. This reflects the growing importance of renewable energy and increasing investor interest in sustainable investments.

However, the analysis also highlights that these high returns are accompanied by substantial risk. Adani Green Energy, in particular, exhibits extremely high volatility, while Tata Power shows relatively moderate but still significant risk. The portfolio constructed using equal weights of both stocks generates high returns, but the overall risk remains very high, indicating an aggressive investment profile. The negative correlation between the stocks provides limited diversification benefits, but not enough to significantly reduce portfolio risk.

Further, risk-adjusted performance measures provide mixed insights. The Treynor Ratio and Jensen's Alpha indicate that the portfolio performs well relative to systematic risk and has outperformed expected returns based on market movements. However, the Sharpe Ratio suggests that the returns are not fully efficient when total risk is considered, highlighting an imbalance between risk and return.

In conclusion, while the sustainable energy sector offers strong growth opportunities, investments in such stocks involve high volatility and market sensitivity. The portfolio is suitable for investors with a high-risk tolerance who aim for higher returns. For conservative investors, the findings emphasize the importance of diversification, careful risk assessment, and balanced portfolio construction to achieve stable and efficient returns.

References

1. Sampat, S. (2022). Financial performance, moral action & ESG: An integrated approach to sustainability.
2. Rao, P. H. (2020, December). Covid-19 and stock market performance of power sector in India.
3. Trivedi, S. (2021, February). Capital flows underpinning India's energy transformation.
4. Zinzuvadia, D., & Sheth, D. (2024, April). The rapidly changing energy sector of India.
5. Gupta, V., & Jindal, N. (2024, August 22). Financial and operational performance evaluation of Adani Green Energy Ltd (AGEL).

Bibliography

<https://www.bseindia.com/markets/equity/EQReports/StockPrcHistori.html?flag=0>

<https://www.nseindia.com/resources/historical-reports-capital-market-daily-monthly-archives-derivative-market>

<https://www.moneycontrol.com/markets/indian-indices/>

<https://www.adani.com/about-us>

<https://www.tatapower.com/>

https://en.wikipedia.org/wiki/Tata_Power#History

<https://www.adanipower.com/about-us>

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