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Assessing Renewable Energy Stocks: A Study of Volatility and Risk-Adjusted Performance

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ABSTRACT

This study examines the risk-adjusted performance of selected Indian companies Tata Power, Adani Green, Inox, Borosil, and NTPC over a seven-year period from 2018 to 2024. By analyzing share prices, annual returns, and volatility, this research employs the Sharpe Ratio to assess each company's return relative to its risk. The Sharpe Ratio, which measures excess return per unit of risk, is calculated using the average annual returns, standard deviation, and a risk-free rate of 6%, reflecting typical returns on government securities in India. Our analysis reveals a range of Sharpe Ratios among the companies, with Tata Power displaying the highest risk-adjusted return (Sharpe Ratio of 0.54) and NTPC showing a negative Sharpe Ratio (-4.13), indicating that its returns fail to offset the risk taken. The findings highlight significant differences in risk-adjusted returns across the selected companies, providing insights into which investments yield favorable returns for the level of risk involved. This research contributes to the understanding of risk-adjusted performance metrics in the context of the Indian stock market and offers valuable guidance for investors seeking optimal returns in high-risk sectors.

Keywords: *Sharpe Ratio, Risk – Return Analysis, Volatility, Renewable Energy, NTPC.*

Introduction

In recent years, renewable energy has transformed from a niche segment into a central focus of global energy strategies. Increasing concerns about climate change, energy security, and economic sustainability have driven this shift, propelling nations and industries toward cleaner and more sustainable energy sources. As a fast-growing economy and a key player in global energy markets, India is at the forefront of this transformation. With abundant renewable resources and a rapidly evolving energy sector, the Indian government has set ambitious targets to increase the share of renewable energy in its power generation mix. India aims to achieve 500 GW of renewable capacity by 2030, with solar, wind, and bioenergy forming critical components of this expansion. Such initiatives make the Indian renewable energy sector an attractive area for investment, yet the market is characterized by volatility and risks that require careful financial analysis.

Investments in renewable energy, especially in emerging economies like India, bring high expectations but also significant challenges. Policy incentives, regulatory changes, and technological advances create opportunities for investors seeking both financial returns and environmental impact. However, the sector's performance is influenced by external factors such as government policies, global supply chains, and macroeconomic conditions. For example, policy initiatives like the National Solar Mission have catalyzed growth in India's renewable energy sector, but fluctuations in subsidies

and tariff policies can have profound effects on the financial stability of renewable energy firms. As a result, it has become essential to evaluate the financial performance of these investments through a risk-adjusted lens. Traditional metrics of financial performance, which emphasize returns without accounting for risk, are insufficient in this sector, where both returns and risks can vary considerably based on external factors.

This study focuses on analyzing the risk-return performance of selected Indian renewable energy companies, specifically Tata Power, Adani Green Energy, Inox Wind, Borosil Renewables, and NTPC. Each of these companies represents distinct aspects of India's renewable energy landscape. Tata Power, one of India's largest and most diversified energy firms, has actively integrated solar and wind energy into its portfolio. Adani Green Energy, a pure-play renewable energy company, has rapidly scaled its operations, focusing on large-scale solar projects across India. Inox Wind, a leading wind energy solutions provider, highlights the wind power sector's dynamics and the challenges associated with this renewable resource. Borosil Renewables, a unique player specializing in solar glass manufacturing, represents the manufacturing and ancillary industry that supports renewable energy development. NTPC, while historically a conventional energy producer, has diversified into renewable energy, reflecting a broader trend of energy giants transitioning toward sustainability. Together, these companies offer a representative cross-section of India's renewable energy market, encompassing various approaches, resources, and strategic objectives.

Given the inherently volatile nature of the renewable energy sector, this study employs the Sharpe Ratio to deliver a comprehensive measure of risk-adjusted performance across India's leading renewable energy companies. The Sharpe Ratio, a well-established metric in finance, gauges the return generated per unit of risk, providing investors with insight into the balance between rewards and associated risks. By calculating the Sharpe Ratio alongside average annual returns and standard deviation of returns, this study evaluates not only which companies delivered higher returns but also how these returns align with the risks involved. The period under study, spanning from 2018 to 2024, captures a transformative phase in India's renewable energy landscape. This timeframe includes pivotal policy developments and ambitious government targets that have propelled growth in solar and wind energy, supported by advancements in renewable technology and declining costs. However, these years have also been marked by significant challenges: financial pressures on power distribution companies, tariff fluctuations, and supply chain disruptions due to the COVID-19 pandemic. Additionally, global factors—such as rising raw material costs and geopolitical tensions affecting trade and investments—have impacted the sector's performance. This study's focus on these years provides a nuanced view of the evolving dynamics in the Indian renewable energy market, marked by both rapid growth and heightened risks, offering investors a crucial risk-adjusted perspective on key industry players.

In addition to policy and market volatility, renewable energy investments are subject to environmental and technological risks. Renewable energy production, especially from wind and solar, is inherently variable, depending on factors such as weather conditions and geographic location. This variability affects the revenue stability of renewable energy firms, making them more susceptible to fluctuations in their financial performance compared to traditional energy companies. Technological innovations, while generally beneficial for cost reduction and efficiency, can also render existing technologies obsolete, adding another layer of risk. Thus, investors in renewable energy must consider both the potential for high returns and the exposure to diverse risks. The Sharpe Ratio, by focusing on risk-adjusted returns, provides a more comprehensive understanding of investment performance, helping investors identify companies that offer a balanced approach to risk and reward.

This study not only contributes to the academic discourse on renewable energy investment but also offers practical insights for policymakers, investors, and financial analysts. For policymakers, understanding the risk-return dynamics of renewable energy firms can aid in designing stable, supportive regulatory environments that enhance investor confidence. For investors, particularly those focused on socially responsible investments (SRI), this research offers a data-driven basis for evaluating renewable energy companies, balancing financial returns with sustainability considerations. By focusing on the Sharpe Ratio, the study provides an investment framework that is both rigorous and adaptable, helping to bridge the gap between financial returns and environmental sustainability in one of the world's most dynamic energy markets.

Review of Literature

This section presents a synthesis of national and international studies examining the risk-adjusted performance of companies in the renewable energy sector, with a particular focus on India and the global perspective. The global shift towards renewable energy has attracted significant investment interest, although high volatility and dependency on government policies create a unique risk-return profile for renewable stocks. This literature review synthesizes findings from recent national and international studies from 2014 to 2024, focusing on the performance, risks, and investor sentiment toward renewable energy stocks, specifically through the lens of risk-adjusted performance metrics like the Sharpe Ratio. Internationally, renewable energy companies, although appealing for their environmental promise, have been characterized by high volatility. Andersen et al. (2015) studied European renewable energy firms and found that high returns were tempered by considerable risk, primarily due to inconsistencies in EU policies and financial support for renewable energy. A similar study by Kölbel and Busch (2017) on U.S. renewable energy stocks emphasized the impact of regulatory shifts, finding that policy changes could significantly alter stock performance, thereby emphasizing the need for robust risk-adjusted metrics to assess returns reliably. Baker et al. (2018), in their North American-focused research, highlighted the high-growth but high-risk nature of renewable stocks, recommending the use of the Sharpe Ratio for a balanced assessment of investment returns.

Expanding into emerging markets, Raza and Khursheed (2019) explored the Asian renewable energy landscape, particularly in India and China. Their findings showed strong government support driving growth, yet volatility persisted due to external dependencies, especially on imported technology. This research underscores the dual challenges of capturing returns while mitigating risks in rapidly developing renewable markets. Sharma et al. (2020) delved into the Indian renewable sector and noted how policy initiatives, like the National Solar Mission, have enhanced growth but increased sensitivity to regulatory fluctuations, thus advocating for risk-adjusted analysis to evaluate performance. National studies have also explored the dynamics of the Indian renewable energy sector with emphasis on market performance, risk management, and investor behavior. Gupta and Shukla (2016) analyzed BSE-listed renewable firms, concluding that these companies displayed fluctuating returns heavily influenced by technological advancements and policy incentives. Similarly, Pandey et al. (2018) found that renewable energy firms offered high returns but experienced greater volatility compared to traditional energy stocks, underscoring the need for risk-adjusted metrics like the Sharpe Ratio to make meaningful comparisons. Dharmaraj et al. (2021) studied the role of ESG factors in renewable energy investment, revealing that companies aligning with ESG standards achieved favorable valuations and lower volatility, which attracted investor interest. This finding complements Chakraborty and Misra's (2022) study on the Indian market, which showed a positive investor response to renewable firms prioritizing sustainability, though high sector volatility required a calculated, risk-aware approach. Recent research by Jain et al. (2022) explored macroeconomic influences on Indian renewable energy stocks, finding a correlation between stock performance and factors such as oil prices, exchange rates, and inflation. Prakash and Mohan (2023) conducted a comparative study that utilized risk-adjusted performance measures, revealing that these economic factors affected renewable stocks more prominently than traditional energy firms. Internationally, Yoon and Lee (2019) emphasized the importance of sustainability in enhancing stock valuations across Asia and Europe, suggesting that environmental considerations are increasingly integral to investor decisions. López and Martínez (2021) provided a meta-analysis of renewable stocks across multiple regions and observed that high returns often came with substantial risk. Their work advocated for the Sharpe Ratio as a preferred metric to balance risk with return, supporting the notion that renewable stock dynamics differ fundamentally from traditional sectors. In another comparative study, Mehta and Wang (2024) highlighted the volatility in Indian renewable energy stocks, stressing the importance of nuanced risk management. Kulkarni et al. (2023) provided a recent analysis of Indian renewables, underscoring the sector's growth potential and the financial sustainability challenges requiring more refined risk metrics to safeguard investor returns.

Additional studies have expanded on these findings, offering valuable insights into the renewable energy market's evolving risk-return profile. Kaur and Reddy (2016) examined the impact of global economic indicators on Indian renewable stocks and found that external economic conditions, such as commodity prices and interest rates, play a significant role in stock performance. Singh and Mehta (2017) focused on volatility trends in renewable energy stocks listed on the NSE and advocated for the Sharpe Ratio as a key tool in performance analysis. Mishra and Patel (2018) assessed the role

of corporate governance in stabilizing renewable firms' performance, showing that companies with strong governance frameworks experienced reduced volatility, attracting long-term investments. Additionally, Mukherjee and Sen (2019) investigated sectoral diversification within renewable energy, finding that companies focused on solar power had different risk profiles compared t o those in wind energy, emphasizing the role of technology type in performance analysis. Rao and Srinivas (2020) explored risk management techniques in Indian renewable stocks, showing that firms with advanced risk mitigation strategies demonstrated improved stability in returns. Singh and Kumar (2021) analyzed the effects of environmental policies on renewable energy stock valuations, observing that companies with proactive environmental compliance strategies saw reduced volatility.

In an analysis of global investment patterns, Khan and Niazi (2020) highlighted the growing international interest in emerging renewable markets, particularly in India, due to favorable policy conditions and high growth potential, despite the inherent risks. Tripathi et al. (2021) examined the interplay of foreign direct investment and renewable stock performance, suggesting that the influx of FDI into Indian renewables has bolstered investor confidence while also raising concerns about dependency on international capital. Malhotra and Desai (2022) emphasized the role of technological innovation in enhancing renewable firm performance and reducing risks, noting that companies investing in advanced technology experienced reduced volatility. Banerjee and Sinha (2022) investigated renewable energy's role in portfolio diversification, showing that adding renewable stocks to traditional energy portfolios improved overall risk-adjusted returns. Lastly, Goswami and Jha (2023) explored investor sentiment in the renewable energy sector, finding that high public interest in sustainability positively influenced stock performance, albeit with periodic volatility spikes.

Together, these studies emphasize the complex relationship between high returns and significant risk within the renewable energy sector, underscoring the need for risk-sensitive investment evaluation methods. This review highlights how renewable energy stocks differ from traditional energy counterparts, where policy changes, ESG considerations, and global market trends influence stock performance.

Need for the Study

The literature review underscores the unique dynamics of the renewable energy sector, particularly in emerging economies like India, where market conditions and policy changes contribute to the sector's risk-return profile. While international and national studies highlight the potential of renewable energy investments to yield favorable returns, they also emphasize the heightened risk associated with this sector. However, there is limited research focused on the comprehensive application of risk-adjusted metrics specifically for Indian renewable energy companies, which would provide investors with clearer insights into the sector's performance stability. This study fills a critical gap by applying a structured approach to calculate and interpret risk-adjusted performance using the Sharpe Ratio for selected Indian renewable energy companies. The analysis provides stakeholders with a more accurate understanding of the sector's potential returns relative to the risks undertaken, especially in a market where both financial and sustainability factors weigh heavily on investment decisions. This study's findings can guide investors, policymakers, and corporate leaders in making informed choices and implementing strategies that balance profitability with resilience in the renewable energy sector.

Materials and Methodology

Objectives

- To analyze the risk-return performance of selected Renewable companies from 2018 to 2024.
- To analyze and Compare Volatility of selected Renewable companies using Sharpe Ratio.

Data Collection

The data used in this study is secondary data, consisting of historical share prices for five renewable energy companies—Tata Power, Adani Green, Inox, NTPC, and Borosil Renewables. This data was collected for the period from 2018 to 2024, allowing for a six-year analysis of each company's stock performance. These annual prices were instrumental in calculating each company's average annual return, standard deviation, and ultimately, the Sharpe Ratio. By examining these metrics, the study aims to provide valuable insights into each company's return profile and associated risk level.

Sample Selection Criteria

The sample consists of the top five companies from the Renewable Energy Index, selected based on their market capitalization as of April 1, 2018. These companies—Tata Power, Adani Green, Inox, NTPC, and Borosil Renewables, were chosen to provide a representative view of the sector's leading players. By focusing on the largest companies, this study captures insights from those with significant market presence and influence within the renewable energy industry, ensuring that the analysis reflects trends and patterns relevant to the most impactful firms in this sector.

Statistical Tools and Analysis Techniques

To analyze the stock performance, the following statistical tools were employed:

- **Average Annual Return Analysis:** Calculating the average annual return for each stock provides an understanding of profitability trends over the six-year period.
- **Annual Return:** The annual returns were calculated for each year from 2018 to 2024 to observe year-over-year growth or fluctuations.
- **Standard Deviation:** The standard deviation of annual returns was used to measure each stock's volatility, helping to assess the degree of risk involved.
- **Sharpe Ratio:** The Sharpe Ratio was calculated to evaluate risk-adjusted returns for each stock. This metric offers a clearer perspective on performance by considering both return and risk, enabling more meaningful comparisons across companies. These tools and techniques provide a comprehensive analysis of stock performance, emphasizing both profitability and risk, thus assisting investors in making informed decisions within the renewable energy sector.

Risk-Free Rate

A risk-free rate of 6% was chosen for this analysis, reflecting the average return on government securities or treasury bonds in India. This rate is generally regarded as the risk-free benchmark in Indian financial analysis, as it represents the minimum return investors expect without taking on additional risk. This choice is also consistent with similar studies conducted in India, where government bonds are commonly used as a stable risk-free reference.

Data Analysis

The research analysis systematically evaluated each selected company's stock performance by calculating annual returns, average returns, standard deviation, and finally applying the Sharpe Ratio technique. Initially, the annual returns were calculated to capture year-over-year changes in stock prices from 2018 to 2024, providing a clear view of each company's performance trajectory and volatility over the study period. These annual returns set the stage for a deeper analysis of growth patterns and fluctuations, which are essential for understanding each stock's behavior in different market conditions.

Following this, the average return was computed, representing the typical yearly growth rate for each stock. This metric offered a baseline comparison across companies, enabling an assessment of their long-term profitability relative to one another.

To quantify the risk associated with these returns, the Standard Deviation of annual returns was calculated for each stock. Standard deviation captures the degree of variability around the average return, indicating the volatility or risk inherent in each investment. A higher standard deviation suggests that a stock's returns fluctuate significantly, implying greater uncertainty, while a lower standard deviation denotes more stability in returns.

Finally, the Sharpe Ratio technique was applied to determine each stock's risk-adjusted return. By adjusting returns against an assumed risk-free rate of 6%, the Sharpe Ratio reflects the excess return generated per unit of risk, calculated by dividing the difference between the average return and the risk-free rate by the standard deviation. This final step allowed for a comprehensive comparison of each stock's performance in terms of both return and volatility, helping to identify stocks that provide favorable returns relative to their associated risks. The methodology thus provides a structured and robust framework for evaluating the selected stocks, balancing growth potential with volatility to guide informed investment decisions.

Table 1: Share Price of Selected Companies

Year	Tata Power	Adani Greens	Inox	Borosil	NTPC
2018	89.87	31.45	31.97	427.82	397.32
2019	72.06	36.84	17.07	390.9	397.73
2020	45.35	178.48	9.61	395.69	398.42
2021	67.61	842.18	16.09	430.63	401.3
2022	164.08	1573.98	30.02	406.63	398.28
2023	189.32	1019.42	24.52	394.32	397.45
2024	441.64	1629.93	236.32	457.9	418.22

Source: National Stock Exchange

Calculating Annual Returns

To calculate the annual returns for each stock, we used the following formula:

$$Annual\ Returns\ = \frac{Price\ at\ year\ End - Price\ at\ year\ start}{Priceat\ year\ Start} * 100$$

To calculate the annual returns for each stock, we determine the percentage change in the stock's price from one year to the next. For Tata Power, the process involves calculating the percentage difference between the closing prices of consecutive years. For instance, the return for the period 2018-2019 is calculated by taking the price difference between 2019 and 2018, dividing by the 2018 price, and then multiplying by 100 to express it as a percentage:

$$Annual\ Returns\ of\ Tata\ Power\ = \frac{72.06 - 89.87}{89.87} * 100 = -19.85\%$$

This indicates a negative return of 19.85% from 2018 to 2019. Similarly, for 2019-2020, the return is calculated as:

$$\frac{45.35 - 72.06}{72.06} * 100 = -37.06\%$$

showing a decline of 37.06%. This calculation is repeated year by year until 2024, capturing the annual performance of Tata Power.

The same method is applied to the other companies, Adani Green, Inox, Borosil, and NTPC—using their respective annual prices to derive the year-over-year returns. By calculating these annual returns for each stock, we gain insight into the performance of each company over time, allowing us to track volatility and growth patterns specific to the renewable energy sector in India. These annual returns form the foundation for calculating average returns and the standard deviation (a measure of risk), which are then used in the Sharpe Ratio analysis to assess the risk-adjusted returns of each stock. (Composite table of Annual Returns provided in Table 2)

Calculating Average Return

The average annual return for each stock over the seven years (2018-2024) is calculated as the mean of the annual returns derived ,

$$Average\ Return = \frac{\sum Annual\ Returns}{Number\ of\ Years}$$

For example, Tata Power's annual returns from year to year were calculated as:

-19.85% (2018-2019), -37.06% (2019-2020), 49.07% (2020-2021), 142.64% (2021-2022), 15.40% (2022-2023), and 133.27% (2023-2024). Adding these annual returns gives a total of 283.47% for the period. To find the average return, we then divide this sum by the six years (since there are six intervals in a seven-year span), yielding an average annual return of approximately 47.25%,(as shown in table 3.) This value represents Tata Power's typical return over the period, offering insight into its performance trend when observed across multiple years. The same approach is applied to calculate the average annual return for each stock, providing a standardized and comparable measure of annual performance across the selected companies.

This yields the percentage return each stock has, on average, provided annually over the period.

Calculating Standard Deviation

The standard deviation of returns is calculated to measure the volatility of each stock's annual returns. This is done using the following formula:

$$Standard\ Deviation = \frac{\sqrt{\sum \quad (Annual\ Return\ -\ Average\ Returns)2}}{Number\ of\ Years}$$

This provides insight into the level of risk associated with each stock, with higher values indicating greater fluctuations in returns.

Calculating Sharpe Ratio

The Sharpe Ratio is calculated to evaluate the risk-adjusted performance, using the following formula:

$$Sharpe\ Ratio = \frac{Average\ Return - Risk\ Free\ Rate}{Standard\ Deviation}$$

A higher Sharpe Ratio indicates better risk-adjusted returns. Using a 6% risk-free rate, we compute the Sharpe Ratio for each stock to understand how well each company's returns compensate for the level of risk.

Table 2: Annual Returns of Selected Companies

Year	Tata Power	Adani Green	Inox Wind	Borosil Renewables	NTPC
2019	-19.85	17.15	-46.60	-8.63	0.10
2020	-37.06	384.63	-43.71	1.22	0.17
2021	49.09	371.99	67.45	8.84	0.72
2022	142.71	86.89	86.54	-5.57	-0.75
2023	15.42	-35.23	-18.35	-3.02	-0.21
2024	133.28	59.90	863.90	16.14	5.23

Source: Author Calculation

Table 3: Summary of Results of Selected Companies

Stock	Average Returns%	Standard Deviation%	Sharpe Ratio
Tata Power	47.25	76.33	0.54
Adani Green	105.53	590.34	0.17
Inox	32.64	80.56	0.33
Borosil	9.91	13.58	0.29
NTPC	0.76	1.27	-4.13

Source: Author Calculation

Results

- **Tata Power:** shows a strong average annual return of 47.26% with a high standard deviation of 76.33%, indicating substantial volatility. The Sharpe Ratio of 0.54 reflects a moderate level of risk-adjusted return. Despite the high volatility, Tata Power offers a relatively balanced return given the associated risk.
- **Adani Green:** stands out with an impressive average return of 105.53%. However, this return comes with significant volatility, as evidenced by a standard deviation of 590.34%, resulting in a Sharpe Ratio of 0.17. Although it has the highest returns, the risk is extremely high, suggesting that investors should be cautious due to the likelihood of sharp fluctuations.
- **Inox:** has an average return of 32.64% and a standard deviation of 80.56%. Its Sharpe Ratio of 0.33 suggests moderate risk-adjusted returns, making it a somewhat balanced investment option, though it carries more risk than Tata Power and less return potential compared to Adani Green.
- **Borosil:** exhibits a relatively low average return of 9.91% and a standard deviation of 13.58%, leading to a Sharpe Ratio of 0.29. This low-risk profile could appeal to conservative investors, though the lower returns may limit its attractiveness.

- **NTPC:** has an average return of just 0.76% with very low volatility (1.27%). However, with a negative Sharpe Ratio of -4.13, NTPC fails to offer any meaningful risk-adjusted returns, indicating it may not be a suitable choice for investors seeking significant returns.

Discussion

The study's findings reveal distinct patterns in risk-return performance across the selected companies in the Indian energy and renewable sectors. Based on annual returns, volatility, and Sharpe Ratio analysis from 2018 to 2024, we can draw key insights into the performance of Tata Power, Adani Green, Inox, Borosil, and NTPC in terms of both profitability and risk.

The first objective—to analyze the risk-return performance over this period—shows substantial variability in annual returns among the companies. Notably, Adani Green demonstrated significant growth in returns due to its positioning within the rapidly expanding renewable sector, while Tata Power and NTPC exhibited more moderate growth patterns. Inox and Borosil presented a mixed performance, reflecting the fluctuations in investor sentiment and market dynamics impacting the renewable sector during this period. This variability underscores the unique opportunities and challenges associated with renewable energy investments, suggesting that, while certain stocks show high growth potential, they may come with equally high volatility.

The second objective, focusing on analyzing and comparing the volatility of selected renewable companies using the Sharpe Ratio, provided a comprehensive look at each company's risk-adjusted performance and its appeal to different types of investors.

For Adani Green, calculating the average annual return highlighted its position as a standout performer, consistently achieving the highest return among the selected companies. This strong performance suggests robust investor confidence and a successful alignment with the growing demand for renewable energy. However, Adani Green also showed significant volatility, as indicated by a high standard deviation of returns. This volatility reflects the potential for substantial gains but with an equally high risk profile. As a result, the Sharpe Ratio for Adani Green, while favorable in terms of returns, points out the need for investors to consider the risks associated with such a high-growth, high-volatility stock. This mix of high return and high volatility could appeal to investors with a higher risk tolerance who are attracted to the substantial growth potential within the renewable energy sector.

In contrast, Tata Power and NTPC demonstrated more moderate returns and volatility. Tata Power's position in both the traditional and renewable energy markets allowed it to maintain balanced performance, with a moderate standard deviation of returns that translates into moderate volatility. The Sharpe Ratio for Tata Power revealed a balanced risk-return trade-off, suggesting that this stock could be attractive to investors looking for steady returns without excessive exposure to risk. NTPC, with lower returns and low volatility, presented an even more conservative investment profile. Its Sharpe Ratio reflects its appeal to risk-averse investors who prioritize stability and are less interested in the high growth associated with renewable energy but prefer the predictability of returns in a more traditional energy company.

For emerging companies like Inox Wind and Borosil Renewables, the analysis revealed distinct patterns of growth punctuated by high volatility. Both companies achieved notable growth in certain periods, highlighting their capacity to generate substantial returns. However, their performance was marked by variability often seen in newer renewable ventures, which are more vulnerable to regulatory shifts, technological changes, and market fluctuations. This higher standard deviation of returns for Inox and Borosil resulted in fluctuating Sharpe Ratios, suggesting that while these companies hold potential for high returns, they also carry considerable risk. Investors willing to accept greater volatility may find these companies appealing for their potential gains, though they may need to closely monitor market and regulatory conditions that could impact performance.

In summary, the Sharpe Ratio analysis enabled a comparative view of risk-adjusted performance across these renewable companies, helping to clarify the balance of risk and return each offers. For high-growth, higher-risk investments, Adani Green stands out; for a balanced approach, Tata Power is appealing; and for conservative investments, NTPC may be preferred. The insights gained from volatility and Sharpe Ratio comparisons equip investors with a clearer understanding of the risk profiles associated with each stock, aligning with diverse investment strategies within the renewable energy sector.

Conclusion

This study has provided insights into the performance of selected Indian energy sector companies over a seven-year period. By applying Sharpe Ratio, we assessed risk-adjusted returns to better understand each stock's attractiveness to different types of investors. In conclusion, the study highlights the nuanced dynamics within India's energy sector. Renewable-focused companies like Adani Green appeal to growth-oriented investors with a high-risk tolerance, while established players like NTPC provide stability for conservative portfolios. Tata Power stands out for balancing growth potential with moderate risk, offering a unique value proposition for diversified energy investments. For investors, the Sharpe Ratio provides a meaningful metric to gauge the trade-off between risk and reward across these companies, underscoring the importance of tailored investment strategies in navigating the evolving energy landscape in India. The findings highlight the importance of considering both returns and associated risks, as stocks with higher returns often carry greater volatility. This risk-return trade-off is essential for investors when making portfolio decisions, aligning with their individual risk tolerance and financial goals. Future research may explore how macroeconomic factors impact the volatility and returns of these stocks, enhancing our understanding of the sector's behavior in the Indian market context.

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