

Financial Health of Indian Power Giants: A Comparative Analysis of Key Metrics and Stock Performance on Power Grid Corporation of India, NTPC, NHPC, TATA Power Ltd, Torrent Power Ltd

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Abstract: *This comparative analysis examines the financial health and stock performance of major Indian power companies, including Power Grid Corporation of India, NTPC, NHPC, Tata Power Ltd, and Torrent Power Ltd. Key financial metrics such as dividend per share, operating profit margin, net profit margin, debt-to-equity ratio, asset turnover ratio, and earnings retention ratio are assessed alongside stock performance indicators like monthly returns and volatility. Insights into operational efficiency, profitability, leverage, and asset utilization are provided, offering valuable information for investors and stakeholders.*

Keywords: Indian power sector, financial analysis, stock performance, operational efficiency, leverage, asset utilization

1. Introduction

The Indian power sector has witnessed significant growth and transformation in recent years, emerging as one of the largest and fastest-growing in the world. This sector plays a crucial role in driving economic development and ensuring energy security for the nation. With the government's focus on expanding electricity access, promoting renewable energy, and enhancing operational efficiency, the power sector has undergone substantial reforms and initiatives. Amidst these developments, it becomes imperative to evaluate the financial health and stock performance of key players in the Indian power generation and distribution segment.

1.1 Problem Statement

Despite the notable advancements in the Indian power sector, challenges persist, including high debt levels, regulatory uncertainties, and fluctuating market conditions. The financial stability and performance of major power companies are crucial not only for investors but also for policymakers and industry stakeholders. Understanding the financial dynamics and stock performance of these companies is essential for making informed decisions and formulating effective policies to sustain growth and stability in the sector.

1.2 Objective of the Study

- 1) **Compare Financial Performance:** Evaluate and compare key financial variables (such as OPM, NPM, DER, ERR, ATR, DPS, DPR) of the top five Indian power generation and distribution companies over a five-year period (2018-19 to 2022-23).
- 2) **Analyze Stock Performance:** Assess the risk and return profiles of these companies by calculating parameters like mean monthly return, variance, standard deviation, coefficient of variation, and Beta value.

1.3 Limitations of the Study

- 1) **Data Limitation:** The study relies on secondary data sources, which may have limitations in terms of accuracy and completeness.
- 2) **Sample Size:** The analysis focuses on the top five companies, which may not fully represent the entire power generation and distribution sector, limiting the generalizability of findings.
- 3) **Time Period:** The study covers a specific time frame (2018-19 to 2022-23), and market conditions may have fluctuated during this period, impacting company performance.
- 4) **Assumption of Quantitative Nature:** The study primarily focuses on quantitative variables, potentially overlooking qualitative aspects that could be significant in a comprehensive evaluation.
- 5) **Stock Market Volatility:** Stock performance analysis is subject to market volatility, which may not always reflect the fundamental strength of companies accurately.

2. Literature Review

- 1) **Behcet, F. (2019):** Behcet's study analyzed financial ratios across countries like France, Germany, Italy, Japan, Korea, Spain, and Turkey from 2008 to 2016, using metrics like return on equity and liquidity ratios, employing descriptive statistics and ANOVA tests for comparison.
- 2) **Yap, B. C. F., Mohamad, Z., & Chong, K. R. (2013):** Yap et al. examined the stability of six financial ratios across industries and time, finding that while most ratios were consistent, some varied significantly, emphasizing the importance of considering industry specifics in financial analysis.

Research Methodology:

The research methodology employed in this study is based on secondary data analysis focusing on the power generation and distribution sector in India. The universe for this research comprises companies operating within this sector,

with data primarily sourced from balance sheets, stock market reports, and relevant financial websites such as Money control, Yahoo Finance, and Screener.in. The study selects a sample of the top five Indian power generation and distribution companies, namely Power Grid Corporation of India, NTPC, NHPC, TATA Power Ltd, and Torrent Power Ltd, utilizing purposive sampling methodology.

Key variables considered in the analysis include Operating Profit Margin (OPM), Net Profit Margin (NPM), Debt Equity ratio (DER), Earnings Retention ratio (ERR), Asset turnover ratio (ATR), Dividends Per Share (DPS), and Dividends Payout Ratio (DPR). The study covers a time period of five years, spanning from 2018-19 to 2022-23.

Statistical tools such as Arithmetic Mean (Average), Standard Deviation (SD), Compound Annual Growth Rate (CAGR), One Way Analysis of Variance (ANOVA), and Post-Hoc Test are employed to analyze the data and draw conclusions. Additionally, the study incorporates stock risk-return calculations and portfolio optimization techniques. Parameters for stock risk-return calculation include mean monthly return, variance, standard deviation, coefficient of variation, beta value, and variance-covariance matrix. Two portfolio optimization strategies are explored: equally-weighted portfolio and optimal-weighted portfolio.

Stock Risk -Return Calculation & Portfolio Optimization: -

Stock Monthly Returns:-

- 1) **Highest Monthly Return:** Torrent Power was identified as the top performer in terms of monthly returns, indicating that its stock price experienced the highest average increase per month compared to other companies in the dataset. This suggests that investors who held shares of Torrent Power saw the most significant gains on a monthly basis.
- 2) **Stability in Monthly Returns:** Power Grid Corporation of India (PGCIL) exhibited the lowest volatility in its monthly returns. This means that PGCIL's stock price experienced less fluctuation or variability from month to month compared to other companies. Investors may perceive this stability positively, as it indicates consistent performance over time.
- 3) **Implication of Monthly Performance:** The analysis suggests that Torrent Power may offer strong short-term returns, while PGCIL provides stability and consistency

in returns over the same period. Investors may interpret these findings differently based on their investment objectives and risk tolerance. Those seeking short-term gains may favor Torrent Power, while risk-averse investors may prefer the stability offered by PGCIL.

NIFTY 100 Monthly Performance:

Table 1: NIFTY 100 Monthly Performance

	NIFTY 100
Average monthly return	1.04%
Monthly variance	0.22%
Monthly standard deviation	4.69%
Average return	12.54%
Annual variance	2.64%
Annual standard deviation	16.23%
Coefficient of variation (CV)	1.29

Source: Researcher Calculation

- 1) **Monthly Average Return:** The NIFTY 100 index has an average monthly return of 1.04%. This indicates the typical monthly increase in the index's value over time.
- 2) **Standard Deviation and Monthly Variance:** The monthly variance is 0.22%, and the standard deviation is 4.69%. These values measure the extent of fluctuation or volatility in the index's monthly returns. A lower standard deviation and variance suggest less variability in monthly returns, indicating a more stable performance.
- 3) **Average Annual Return:** The NIFTY 100 index has an average annual return of 12.54%. This represents the typical yearly increase in the index's value, providing an indication of long-term growth potential.
- 4) **Standard Deviation and Annual Variance:** The annual variance is 2.64%, and the annual standard deviation is 16.23%. These values measure the volatility of the index's annual returns. Typically, annual figures have higher values compared to monthly figures due to the cumulative effect over the year.
- 5) **Coefficient of Variation (CV):** The CV is 1.29, indicating the risk-to-return ratio. A CV greater than 1 suggests a higher level of risk relative to the return. In this case, the moderate CV implies a moderate level of risk compared to the expected return from investing in the NIFTY 100 index.

Company Monthly Returns

Table 2: Company Monthly Returns

	PGCIL	NTPC	NHPC	TATA POWER	TORRENT POWER
Average monthly return	1.51%	1.13%	1.28%	1.42%	1.96%
Monthly variance	0.35%	0.64%	0.77%	1.03%	1.36%
Monthly standard deviation	5.92%	7.98%	8.78%	10.14%	11.67%
Average return	18.07%	13.59%	15.31%	17.03%	23.58%
Annual variance	4.20%	7.65%	9.25%	12.34%	16.33%
Annual standard deviation	20.50%	27.65%	30.42%	35.12%	40.41%
Coefficient of variation (CV)	1.13	2.03	1.99	2.06	1.71
BETA (slope)	0.69	0.85	0.80	1.29	0.77

Source: Researcher Calculation

Variance-Covariance Matrix: -

Table 3: Variance- Covariance Matrix

	Variance - Covariance matrix				
	PGCIL	NTPC	NHPC	TATA POWER	TORRENT POWER
PGCIL	4.20%	3.65%	2.85%	3.79%	3.31%
NTPC	3.65%	7.65%	4.74%	5.50%	4.88%
NHPC	2.85%	4.74%	9.25%	5.37%	4.18%
TATA POWER	3.79%	5.50%	5.37%	12.34%	5.11%
TORRENT POWER	3.31%	4.88%	4.18%	5.11%	16.33%

There is a perfect match between variance – covariance matrix and Annual variance. It means that the variables in the portfolio have no correlation. The variance of each variable is the same as the variance of the corresponding element in the variance-covariance matrix.

This circumstance implies that the portfolio is made up of independent assets, which means that the performance of one asset has no bearing on the performance of another. The portfolio's risk is solely decided by the unique variances of the assets.

Risk Free Rate: -

Table 4: Risk Free Rate

Risk free rate	0.0732
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Annual Return: -

Table 5: Annual Return

	Annual Return
PGCIL	18.07%
NTPC	13.59%
NHPC	15.31%
TATA POWER	17.03%
TORRENT POWER	23.58%

Equally - Weighted Portfolio: -

Table 6: Equally – Weighted Portfolio

	Equally-weighted Portfolio
PGCIL	0.2
NTPC	0.2
NHPC	0.2
TATA POWER	0.2
TORRENT POWER	0.2
SUM	1
Expected return	0.18
Risk	0.23
Sharpe ratio	0.44

Table 8: Dividend Per Share

Year	Power Grid Corporation of India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	8.33	6.08	1.46	1.3	5
2019-2020	10	3.15	1.5	1.55	11.6
2020-2021	12	6.15	1.6	1.55	11
2021-2022	14.75	7	1.81	1.75	9
2022-2023	14.75	7.25	1.85	2	26
Mean	11.966	5.926	1.644	1.63	12.52
SD	2.854300265	1.63451	0.17784825	0.26124701	7.965676368

Table 9: One-Way ANOVA for DPS

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	567.3167	4	141.8292	9.535307	0.000175	2.866081
Within Groups	297.4822	20	14.87411			
Total	864.7989	24				

Formula: - 1. Expected return: - (=MMULT(TRANSPOSE (W19:W23),W12:W16)).

2. Risk: - (=SQRT(MMULT(MMULT(TRANSPOSE (W19:W23),W3:AA7),W19:W23))).

3. Sharpe ratio: - (Expected Return-Risk free rate)/Risk.

Optimally - Weighted Portfolio: -

Table 7: Optimally – Weighted Portfolio

	Optimally -weighted Portfolio
PGCIL	0.787562449
NTPC	0
NHPC	0
TATA POWER	0
TORRENT POWER	0.212437551
SUM	1
Expected return	0.19
Risk	0.21
Sharpe ratio	0.56

Source: Researcher Calculation

ONE-WAY ANOVA: -

Dividend Per Share (DPS): -

Dividend Per Share (DPS) is a financial metric representing the amount of profit allocated to each outstanding share of common stock by a company, calculated by dividing the total dividends paid by the company over a specified period by the total number of outstanding shares. It indicates the cash distributed to shareholders per share and is used to assess the dividend-paying capability of a company and its attractiveness to investors.

Table 10: Post – Hoc Test for DPS

POST-HOC TEST		
Groups	P-value (T-test)	Significant?
PGCIL v NTPC	0.00340868	Yes
NTPC v NHPC	0.00039445	Yes
NHPC v Tata Power	0.92353217	No
Tata Power v Torrent Power	0.0156937	Yes
Torrent Power v PGCIL	0.88722751	No

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

Operating Profit Margin: -

Operating profit margin assesses a company's efficiency by measuring the percentage of revenue remaining after

deducting operating expenses and cost of goods sold. It reflects the profitability of a company's core operations before considering interest and taxes.

Table 11: Operating Profit Margin

Year	Power Grid Corporation of India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	85.82	25.21	54.91	35.64	23.44
2019-2020	86.77	27.73	52.3	37.81	25.46
2020-2021	87.76	29.03	54.13	29.39	27.44
2021-2022	87.46	29.14	56	13.93	24.3
2022-2023	85.99	26.39	57.64	9.08	22.42
Mean	86.76	27.5	54.996	25.17	24.612
SD	0.861191036	1.699970588	2.001532	12.96557558	1.936006198

Table 12: One-Way ANOVA for OPM

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	14759.29	4	3689.822	102.7852	4.86E-13	2.866081
Within Groups	717.9678	20	35.89839			
Total	15477.26	24				

Table 13: Post – Hoc Test for OPM

POST-HOC TEST		
Groups	P-value (T-test)	Significant?
PGCIL v NTPC	2.04E-12	Yes
NTPC v NHPC	1.18E-08	Yes
NHPC v Tata Power	0.00094886	Yes
Tata Power v Torrent Power	0.9265139	No
Torrent Power v PGCIL	3.25E-12	Yes

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

Net Profit Margin: -

Net profit margin quantifies the proportion of revenue that translates into profit after accounting for all expenses. It gauges a company's efficiency in converting sales into profit.

Table 14: Net Profit Margin

Year	Power Grid Corporation of India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	29.12	13.01	32.23	21.42	6.85
2019-2020	29.87	10.35	34.42	1.91	9.21
2020-2021	31.68	13.87	38.01	14.9	11.25
2021-2022	42.81	13.87	42.34	25.05	2.98
2022-2023	35.37	10.5	41.15	18.43	11.16
Mean	33.77	12.32	37.63	16.342	8.29
SD	5.600941885	1.765955832	4.306477679	8.892933712	3.468234421

Table 15: One-Way ANOVA for NPM

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3479.83	4	869.9576	30.17588	3.23E-08	2.866081
Within Groups	576.5913	20	28.82956			
Total	4056.422	24				

Table 16: Post – Hoc Test for NPM

POST-HOC TEST		
Groups	P-value (T-test)	Significant?
PGCIL v NTPC	3.76E-05	Yes
NTPC v NHPC	1.94E-06	Yes
NHPC v TATA POWER	0.00132546	Yes
Tata Power v Torrent Power	0.09597852	No
Torrent Power v PGCIL	2.48E-05	Yes

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

total dividends given to shareholders by the net income of the business, and it is expressed as a percentage. The dividend payout ratio is calculated as follows:

$$\text{Dividend Payout Ratio} = (\text{Per Share Dividends} / \text{Per Share Earnings}) \times 100\%$$

Dividend Payout Ratio: -

Investors use the dividend payout ratio, a financial statistic, to assess how much of a company's earnings are given to its shareholders as dividends. It is computed by dividing the

Table 17: Dividend Payout Ratio

Year	Power Grid Corporation of India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	45.42	41.89	38.03	19.9	27.02
2019-2020	28.84	4.89	64.46	237.63	64.43
2020-2021	57.15	0	48.77	45.49	19.95
2021-2022	51	24.07	47.13	17.79	170.09
2022-2023	45.49	23.96	49.78	17.11	50.26
Mean	45.58	18.962	49.634	67.584	66.35
SD	10.52975071	16.84000802	9.506589	95.79224645	60.67200961

Table 18: One-Way ANOVA for DPR

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	7794.16468	4	1948.541	0.730224	0.581888	2.866081
Within Groups	53368.33592	20	2668.417			
Total	61162.5006	24				

Table 19: Post – Hoc Test for DPR

POST-HOC TEST		
Groups	P-value (T-test)	Significant
PGCIL v NTPC	0.01715509	Yes
NTPC v NHPC	0.00754664	Yes
NHPC v Tata Power	0.68767371	No
Tata Power v Torrent Power	0.98118167	No
Torrent Power v PGCIL	0.47234005	No

Debt-Equity Ratio: -

The debt-to-equity ratio assesses the proportion of debt and equity a company utilizes for financing, calculated by dividing total debt by shareholders' equity. It indicates the extent to which a company relies on borrowed funds versus shareholders' investment to fund its operations and assets, with higher ratios suggesting higher financial leverage and potential risk.

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

Table 20: Debt – Equity Ratio

Year	Power Grid Corporation of India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	2.29	1.26	0.6	1.2	0.93
2019-2020	2.15	1.41	0.72	1.27	0.79
2020-2021	1.88	1.38	0.69	1.2	0.59
2021-2022	1.77	1.33	0.78	2.27	0.79
2022-2023	1.53	1.33	0.79	1.6	0.76
Mean	1.924	1.342	0.716	1.508	0.772
SD	0.302456608	0.057183914	0.077006493	0.457022975	0.121326007

Table 21: One-Way ANOVA for DER

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.214576	4	1.303644	20.10121	8.86E-07	2.866081
Within Groups	1.29708	20	0.064854			
Total	6.511656	24				

Table 22: Post – Hoc Test for DER

POST-HOC TEST		
Groups	P-value(T-test)	Significant
PGCIL v NTPC	0.0028848	Yes
NTPC v NHPC	4.77E-07	Yes
NHPC v Tata Power	0.0050815	Yes
Tata Power v Torrent Power	0.008314	Yes
Torrent Power v PGCIL	4.76E-05	Yes

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

Asset Turnover Ratio: -

The asset turnover ratio evaluates a company's efficiency in more efficient asset utilization, while a lower ratio suggests generating revenue from its assets. By dividing net sales by the average total assets, it indicates how effectively a company

utilizes its resources to generate income. A higher ratio signifies

Table 23: Asset Turnover Ratio

Year	Power Grid Corporation OF India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	0.18	0.39	0.18	0.28	0.78
2019-2020	0.18	0.38	0.18	0.25	0.8
2020-2021	0.19	0.36	0.16	0.18	0.72
2021-2022	0.19	0.4	0.15	0.31	0.8
2022-2023	0.21	0.53	0.15	0.5	1.01
Mean	0.19	0.412	0.164	0.304	0.822
SD	0.012247449	0.067601775	0.015166	0.119707978	0.110090872

Table 24: One-Way ANOVA for ATR

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.424536	4	0.356134	56.70924	1.24E-10	2.866081
Within Groups	0.1256	20	0.00628			
Total	1.550136	24				

Table 25: Post – Hoc Test for ATR

POST-HOC TEST		
Groups	P-value(T-test)	Significant?
PGCIL v NTPC	9.02E-05	Yes
NTPC v NHPC	4.35E-05	Yes
NHPC v TATA POWER	0.0318956	Yes
Tata Power v Torrent Power	9.98E-05	Yes
Torrent Power v PGCIL	1.34E-06	Yes

Earning Retention Ratio: -

The Earnings Retention Ratio (ERR) measures the portion of earnings retained by a company for reinvestment after dividends are paid out to shareholders. A higher ERR indicates greater reinvestment in internal operations, while a lower ERR suggests more significant dividend distributions to shareholders.

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

Table 26: Earning Retention Ratio

Year	Power Grid Corporation of India	NTPC	NHPC	Tata Power	Torrent Power
2018-2019	63.79	68.43	44.64	59.69	72.98
2019-2020	65.85	90.64	27.22	76.79	64.36
2020-2021	45.93	100	50.59	46.07	80.05
2021-2022	37.08	73.8	65.32	70.94	59.24
2022-2023	53.74	76.84	52.03	61.7	49.74
Mean	53.278	81.942	47.96	63.038	65.274
SD	12.0948241	13.00618391	13.83854581	11.75235593	11.79260701

Table 27: One-Way ANOVA for ERR

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3411.148	4	852.7869	5.43776	0.003951	2.866081
Within Groups	3136.538	20	156.8269			
Total	6547.685	24				

Table 28: Post – Hoc Test for ERR

POST-HOC TEST		
Groups	P-value (T-test)	Significant
PGCIL v NTPC	0.0068939	Yes
NTPC v NHPC	0.0039436	Yes
NHPC v Tata Power	0.1003868	No
Tata Power v Torrent Power	0.7715948	No
Torrent Power v PGCIL	0.1509637	No

ALPHA	
Test	Alpha
ANOVA	0.05
Post-hoc test (Bonferroni corrected)	0.01

Compound Annual Growth Rate:

The Compound Annual Growth Rate (CAGR) is a financial metric used to measure the average annual growth rate of an investment over a specified period of time. It is calculated by taking the nth root of the ratio of the ending value to the beginning value, where "n" is the number of periods, and then subtracting 1. CAGR provides a smoothed annualized rate of return, useful for comparing investment performance across different time frames.

Table 29: Compound Annual Growth Rate

Particulars	Power Grid Corporation OF India	NTPC	NHPC	Tata Power	Torrent Power
DPS	12.11%	3.58%	4.85%	9.00%	39.06%
OPM	0.04%	0.92%	0.98%	-23.93%	-0.89%
NPM	3.97%	-4.20%	5.01%	-2.96%	10.25%
DPR	0.03%	-10.57%	5.53%	-2.98%	13.22%
DER	-7.75%	1.09%	5.66%	5.92%	-3.96%
ATR	3.13%	6.33%	-3.58%	12.30%	5.30%
ERR	-3.37%	2.35%	3.11%	0.66%	-7.38%

By analysing all 5 companies metric performance and calculating their CAGR we can come to a point where we can see a annual growth in: -

Table 30: Average Compound Returns

Particulars	Power Grid Corporation OF India	NTPC	NHPC	Tata Power	Torrent Power
Average (CAGR)	1.16%	-0.07%	3.08%	-0.28%	7.94%

Source: Researcher Calculation

- Torrent Power:** High CAGR likely stems from robust growth in renewable energy sector.
- Power Grid Corporation of India Limited (PGCIL):** Dominant position in power transmission contributes to impressive CAGR.
- NTPC and NHPC:** Leading roles in power generation sector likely drive notable CAGRs.
- TATA Power:** Diverse business model covering generation, transmission, and distribution contributes to CAGR.

Findings

- PGCIL shows the highest monthly return and stability, making it a reliable investment choice.
- Torrent Power has the highest monthly return but also exhibits higher volatility, warranting caution.
- Undervalued opportunities exist with PGCIL, NTPC, NHPC, and Tata Power Ltd.
- Thorough research and diversification are crucial for optimizing investment outcomes.
- Careful consideration of company fundamentals and market trends is essential for informed investment decisions.

Conclusion

In conclusion, the research findings highlight Power Grid Corporation of India (PGCIL) as the top-performing company, exhibiting strong monthly returns, reduced volatility, and lower market sensitivity, making it a reliable investment option. However, caution is advised with Torrent Power Ltd due to its higher volatility and market sensitivity.

Undervalued opportunities exist with PGCIL, NTPC, NHPC, and Tata Power Ltd, but thorough research and diversification are essential for optimal investment outcomes.

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