



A STUDY ON WORKING CAPITAL MANAGEMENT IN POWER INDUSTRIES

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ABSTRACT

This study examines how effective working capital management ensures financial stability and operational efficiency within the capital-intensive power sector. By analyzing inventory, cash strategies, and receivables, the research identifies how balancing current assets and liabilities mitigates insolvency risks and project delays. A primary focus is placed on the challenges created by delayed payments from distribution companies (DISCOMs) and their strain on liquidity. Through an evaluation of financial ratios and cash conversion cycles, the paper highlights methods to optimize the operating cycle despite fluctuating fuel costs. Ultimately, it proposes strategic frameworks to maintain continuous production, meet short-term obligations, and maximize long-term shareholder value.

KEY WORDS: *Power Sector Liquidity, Cash Conversion Cycle (CCC), Operational Efficiency, Financial Stability, Inventory Management, Insolvency Risk Mitigation.*

INTRODUCTION

The Indian power sector stands as one of the most diversified and dynamic industries globally, currently undergoing a historic transition from fossil fuel dependency toward a leadership role in renewable energy. As the world's third-largest producer and consumer of electricity, India's energy landscape serves as the primary engine for its "Viksit Bharat" 2047 goals. The nation has successfully shifted from a position of chronic power scarcity to becoming a power-surplus entity, supported by a massive national grid that facilitates "One Nation, One Grid, One Frequency." This vast sector is strategically categorized into three main functional segments: Generation, Transmission, and Distribution. While coal remains the foundational backbone of the current grid, the country is rapidly scaling its green capacity to meet ambitious international climate commitments.

The total installed power capacity has already crossed the significant milestone of 440 GW, with a target to reach 500 GW of non-fossil fuel capacity by 2030. These efforts align with India's long-term pledge to achieve Net Zero emissions by 2070, a move bolstered by robust policy support through schemes like PM-KUSUM and PLI incentives for solar manufacturing. Furthermore, the National Green Hydrogen Mission is positioning the country as a global hub for clean energy exports, while the widespread implementation of Smart Meters is modernizing the grid for the digital age. This evolution is fueled by a massive influx of Foreign Direct Investment, particularly within the high-potential solar and wind corridors of Rajasthan and Gujarat. Ultimately, the industry is pivoting toward advanced solutions like Pumped Storage Projects and Battery Energy Storage Systems to ensure a reliable, 24/7 power supply for its growing economy.

REVIEW OF LITERATURE

Anjay Kumar Mishra & Abdul Rahman – 2026. Evaluating the Relationship Between Working Capital Management and Profitability: Insights from Nepal. This study is based on Working Capital and Profitability Theory and aims to investigate the relationship between working capital management (WCM) components and profitability in Nepalese companies. The dependent variable is profitability, while the independent variables include inventory turnover period, receivables period, payment period, and the cash conversion cycle (CCC). The research question addressed is: What is the relationship between WCM metrics and profitability? The study employs secondary data analysis using financial ratios to examine the association between working capital management and profitability.

Florinda Silva and Sónia Silva – 2026, in their study on Working Capital Management and Corporate Performance: The Role of Financial Constraints, examine how working capital investment influences corporate profitability and how this relationship is shaped by firms' financial constraints. Grounded in corporate finance theory is particularly working capital management theory and financial frictions theory has the study builds on prior literature suggesting that the effect of working capital on performance is non-linear rather than strictly linear.

Using data from EU-based small and medium-sized enterprises (SMEs), the authors aim to analyse the relationship between working capital management and corporate profitability and to assess whether financial constraints moderate this relationship. Corporate profitability, commonly measured through indicators such as return on assets (ROA) or return on investment (ROI), is treated as the dependent variable, while working capital management is captured through measures such as the net trade cycle or working capital investment level, including its squared term to test for non-linearity. The study addresses key research questions, including whether an inverted U-shaped relationship exists between working capital and profitability and how financial constraints influence the optimal level of working capital. Methodologically, the study employs panel regression models with non-linear specifications and interaction terms to capture the moderating role of financial constraints, typically using fixed or random effects models common in corporate finance research.

Anthony Muema Ithanzu & Peter Ng'ang'a – 2025. WCM & Profitability of Energy & Petroleum Firms in Kenya. This study is grounded in Contingency and Agency Theory and aims to determine the influence of working capital management (WCM) on the profitability of energy and petroleum firms in Kenya. The dependent variable is firm profitability, while the independent variables include accounts payable, inventory, accounts receivable, and cash management. The research question addressed is: How does working capital management affect the profitability of energy and petroleum firms? The study employs panel regression analysis along with descriptive statistics to examine the relationships.

Disheng Wang and Han Nie – 2025, in their study on Business Process Digitalization and Efficiency of Corporate Working Capital Management, explore how the digitalization of business processes influences firms' working capital management efficiency within the Chinese capital market. Anchored in corporate finance theory and digital transformation theory, the study draws on literature that emphasizes the role of technology adoption in improving financial operations and internal process efficiency. The primary objective of the research is to investigate whether business process digitalization (BPD) enhances working capital management (WCM) efficiency and to identify the mechanisms through which this effect operates. Working capital management efficiency is measured using indicators such as the net trade cycle, cash conversion cycle, or related efficiency metrics as the dependent variable, while business process digitalization is the key independent variable, typically measured through textual analysis of corporate disclosures or similar digitalization proxies. The study also considers moderating factors such as industry competition, capital allocation efficiency, and default risk. The main research questions address whether BPD improves WCM efficiency, through which channels, such as improved data accuracy and operational automation of this improvement occurs, and how firm- and industry-level characteristics moderate the relationship. Methodologically, the study employs empirical econometric techniques, primarily panel regression models with control variables and interaction terms, to assess the impact of BPD on WCM efficiency, with detailed statistical results reported in the full article.

K. Kavyashree et al. – 2025. Effect of Cash Conversion Cycle on Earnings and Profitability. This study is grounded in Cash Conversion Cycle (CCC) and Profitability Theory and aims to explore how the cash conversion cycle relates to earnings and overall profitability. The dependent variables are earnings and profit, while the independent variable is the cash conversion cycle (CCC). The research question addressed is: Does the cash conversion cycle influence earnings and profitability? To analyse this relationship, the study employs regression analysis.

Mujie Song and Shuangzhou Liu – 2025, in their study on Fostering Energy Innovation: Integrating Working Capital Management Strategies for Sustainability in Hydrogen Entrepreneurship Industries Ecosystem, explore how working capital management strategies can be aligned with energy innovation and sustainability objectives within the hydrogen entrepreneurship ecosystem. Drawing on corporate finance theory and sustainability-oriented innovation theory, the study integrates perspectives from financial strategy, technological innovation, and environmental remediation, particularly in the context of clean energy transition and hydrogen-based industries. The main objective of the research is to examine how working capital management supports energy innovation activities and sustainable development goals, with special emphasis on outcomes such as hydrocarbon bioremediation effectiveness and innovation efficiency. Sustainability performance is captured through indicators related to technological innovation outputs, operational efficiency, and environmental remediation effectiveness as the dependent variable, while working capital management strategies and energy innovation variables act as key explanatory factors. Methodologically, the research employs an advanced econometric framework including QARDL models.

Nadhir Khairunnisa et al. – 2025. WCM & Financial Performance of Energy Sector. This study is based on Financial Performance Theory and aims to analyse the effect of working capital management (WCM) on the



financial performance of firms in the energy sector. The dependent variables are financial performance indicators, including Return on Assets (ROA) and Tobin's Q, while the independent variables include working capital levels, Economic Policy Uncertainty (EPU), and the impact of COVID-19. The study employs regression analysis.

Nhan Huynh and Quynh Nga Le – 2025, in their article From Chain to Capital: Supply Chain Risks and Working Capital Management, investigate how exposure to supply chain risks affects firms' working capital management decisions. The study employs empirical econometric regression analysis.

U. K. Tiwari et al. – 2025. Effect of Working Capital Management on Manufacturing Profitability. This study is based on Working Capital Management Efficiency Theory and employs regression analysis.

Ashok Panigrahi – 2024, in the study on Working Capital Management Strategies and Financial Performance of Cement Companies, examines whether different working capital management strategies lead to variations in financial performance within the cement industry.

Belay Mengstie et al. – 2024. WCM Impact on Profitability of Banks of Ethiopia. This study employs regression and comparative empirical tests.

Muhammad Kamran Sabir & Hira Moeen – 2022. Comparative WCM Impact on Firm Performance of Power vs Tech. The study employs regression analysis.

Augustine Tarkom – 2021, in the study on Impact of COVID-19 Exposure on Working Capital Management, employs econometric regression techniques.

Sarfraz Hussain et al. – 2021, in their study on Macroeconomic and Working Capital Management Impact on Firm Performance, employ static and dynamic panel data analysis techniques.

Shubham Bhatt, Rahul Hiremath, and Shreesh Shroff – 2021, in their study on Working Capital Management and Its Impact on Profitability: Case on Indian Power Sector, employ ratio analysis and the Mortals test.

Grzegorz Zimon – 2019. WCM Strategy in Polish Energy Companies. The study employs descriptive analysis.

G. Damodhar & B.R. Reddy – 2018. WCM in Power Distribution Companies, Andhra Pradesh. The study employs ratio analysis.

Islam & Mili – 2018. WCM of Selected Power Companies in Bangladesh. The study employs ANOVA and t-test.

Syed Azhar – 2018. Comparative Study of WCM, Solvency & Profitability in Power Utilities. The study employs the Mann-Whitney U Test.

Arpita Naskar and Prasanta Guha – 2017, examine WCM and firm profitability using correlation and regression analysis.

Artor Nuhui and Arben Dërmaku – 2017, provide a theoretical review of working capital management and company performance.

Hamdi Ben-Nasr – 2016, examines ownership structure and the value of working capital management using panel econometric regression models.

Amin & Islam – 2014. Impact of WCM on Profits in Fuel & Power Firms. The study employs regression and correlation analyses.

Winnie M. Nyabuti & Benedict O. Alala – 2014. WCM Policy & Firm Financial Performance of Nairobi. The study employs regression and correlation analyses.

A.K. Sharma and Satish Kumar – 2011, investigate the effect of working capital management on firm profitability in India using OLS multiple regression analysis.



OBJECTIVES

- ❖ To examine the impact of working capital management on profitability of the selected power sector companies.
- ❖ To assess the short-term financial strength of the selected power sector companies.
- ❖ To improve and suggest the measures for enhancing liquidity and efficiency in working capital utilisation through comparative analysis of financial ratios among the selected power sector companies.

RESEARCH DESIGN

The research design adopted for this study is **descriptive and analytical research design**.

It aims to describe and analyze the working capital management practices of selected power sector companies using financial data.

NATURE OF DATA

The study is mainly based on **secondary data**.

SECONDARY DATA

Secondary data refers to data already collected and published by other sources. The data used in this study is obtained from:

- Annual reports of the selected companies
- Company official websites
- Financial statements (Balance Sheet and Profit & Loss Account)
- Stock exchange reports
- Financial websites and journals

PERIOD OF STUDY

The study covers a **period of ten years** from **2016 to 2026**. This period helps in analyzing the trend and performance of working capital management over time.

TOOLS AND TECHNIQUES USED FOR ANALYSIS

To evaluate working capital management, the following financial tools are used:

- Descriptive Statistics (Mean and Standard Deviation)
- Chi – Square
- Linear Regression

DATA ANALYSIS

DESCRIPTIVE STATISTICS (MEAN AND STANDRAD DEVIATION)

ADANI POWER LIMITED

	NO. OF. YEARS	MEAN	STD. DEVIATION
Total Income (in crore)	10	37991.6370	16186.91578
Total Expenses (in crore)	10	68500.0000	20710.97401
Current Assets (in crore)	10	17682.7000	4778.15620
Current Liabilities (in crore)	10	42169.4000	4862.65970
Net Profit	10	8196.5900	7546.55222
ROA	10	5.3710%	9.05193%
Net Profit Margin	10	9.2710%	20.26910%
Valid No. Of Years (Listwise)	10		

INTERPRETATION

These 6 companies are in a risky financial situation. On average, they are spending much more ₹68,500 crore than they are earning ₹37,991 crore. Even though they show a profit ₹8,196 crore, it may not be from their main business, it could be from other sources or adjustments. Their performance is very unstable. Measures like ROA and profit margin vary a lot between companies, meaning some are doing okay while others are performing very poorly. There is also a serious liquidity problem. The companies have far fewer current assets ₹17,682 crore compared to current liabilities ₹42,169 crore. With a low current ratio of 0.42, they may struggle to pay their short-term debts. Overall, these companies are financially weak, with high risk, unstable profits, and difficulty managing short-term obligations.

**POWER GRID CORPORATION OF INDIA**

	NO. OF YEARS	MEANS	STD. DEVIATION
Total Income (in crore)	10	39109.2170	6790.71711
Total Expenses (in crore)	10	174272.3000	11845.05567
Current Assets (in crore)	10	49082.2000	18777.23180
Current liabilities (in crore)	10	36058.1000	5876.01387
Net Profit	10	11824.7750	2923.54142
ROA	10	4.6820%	0.95319%
ROE	10	16.8310%	1.10905%
Net Profit Margin	10	30.2540%	3.15706%
Valid No. Of Years (Listwise)	10		

INTERPRETATION

These 6 companies show a strong but slightly unusual financial situation. Their expenses ₹174,272 crore are much higher than their main income ₹39,109 crore, yet they still report good profits ₹11,824 crore. This likely means they are earning money from other sources like investments or non-core activities. Their performance is stable and consistent. Profit margin 30.25% and return on equity 16.83% do not vary much between companies, showing steady efficiency. They are also in a good liquidity position. Their current assets ₹49,082 crore are higher than their current liabilities ₹36,058 crore, and the current ratio of 1.36 means they can comfortably pay short-term debts. Overall, these companies are financially stable, with strong profits, consistent performance, and good ability to meet short-term obligations.

CHI – SQUARE**NTPC LIMITED**

NULL HYPOTHESIS (H0) – There is no significance between total income and total expenses, net profit.

ALTERNATIVE HYPOTHESIS (H1) – There is a significance between total income and total expenses, net profit.

	CHI – SQUARE	DF	ASYMP. SIG
Total Income (in crore)	.000	8	1.000
Total Expenses (in crore)	.000	8	1.000
Current Assets (in crore)	.000	8	1.000
Current Liabilities (in crore)	.000	8	1.000
Net Profit	.000	8	1.000
ROA	.778	7	.998
ROE	.778	7	.998
Net Profit Margin	.000	8	1.000

INTERPRETATION

The Chi-Square test checks whether there is any significant difference in the data. The key value to look at is the p-value. In this case, the p-values are very high like 1.000 and 0.998. This means there is no significant difference in the data. So, we accept the null hypothesis no change or no difference. The values like 0.000 for income, expenses, and assets suggest that there is almost no variation in those data points. In simple terms, the financial data is very stable and consistent. There are no major changes or unexpected differences in performance across these categories.

NHPC LIMITED

NULL HYPOTHESES (H0) – There is no significance between total income and total expenses, net profit.

ALTERNATIVE HYPOTHESIS (H1) – There is a significance between total income and total expenses, net profit.

	CHI - SQUARE	DF	ASYMP. SIG
Total Income (in crore)	.000	8	1.000
Total Expenses (in crore)	.000	8	1.000
Current Assets (in crore)	.000	8	1.000
Current Liabilities (in crore)	.000	8	1.000
Net Profit	.000	8	1.000
ROA	.000	8	1.000
ROE	.778	7	.998
Net Profit Margin	.000	8	1.000

INTERPRETATION

The Chi-Square test is used to see if there is any difference in the data. In this case, the p-values are very high 1.000 and 0.998, which are greater than 0.05. This means there is no significant difference in the data, so we accept the null hypothesis. The values of 0.000 show that the observed data matches the expected data almost perfectly, meaning there is no variation. In simple terms, the company's financial data is very stable and consistent, with no unusual changes or differences over the period.

LINEAR REGRESSION

SJVN LIMITED

MODEL	UNDERSTANDARDIZED COEFFICIENTS		STANDARDIZED COEFFICIENTS	t	Sig.
	B	STD. ERROR	BETA		
(Constant)	1918.644	828.760		2.315	.068
Total Expenses (in crore)	.177	.050	.913	2.329	.067
Net Profit	-.045	.031	-.698	-1.473	.201
Net Profit Margin	-2.605	11.239	-.111	-.232	.826

INTERPRETATION

This regression analysis looks at how three factors affect a result. Total Expenses has the strongest impact very high beta value. But its p-value 0.067 is slightly above 0.05, so it is not fully statistically significant, it only shows a strong trend. Net Profit and Profit Margin have weak effects and high p-values 0.201 and 0.826. This means they do not significantly influence the result in this model. In simple terms, Total Expenses seems important, but since all p-values are above 0.05, none of the factors are statistically proven to affect the outcome. The results may be due to chance or limited data.

NLC LIMITED

MODEL	UNDERSTANDARDIZED COEFFICIENTS		STANDARDIZED COEFFICIENTS	t	Sig.
	B	STD. ERROR	BETA		
(Constant)	2333.362	11734.766		.199	.849
Total Expenses (in crore)	.056	.695	.079	.080	.939
Net Profit	4.267	8.123	.517	.525	.618
Net Profit Margin	-28.449	868.429	-.034	-.033	.975

INTERPRETATION

This regression analysis checks how Total Expenses, Net Profit, and Net Profit Margin affect a result. All the p-values are very high 0.618 to 0.975, which are greater than 0.05. So, none of the variables are statistically significant. Net Profit has the highest impact among them, but it is still not strong enough to be considered important. Net Profit Margin shows almost no effect. In simple terms, none of these factors clearly influence the result, and the changes seen in the data are likely due to chance, not a real relationship.

FINDINGS

1. The subject companies exhibit severe financial distress characterized by negative operational cash flow, artificial profitability, and a critical liquidity deficit, Current Ratio: 0.42, indicating a high risk of short-term insolvency.
2. The companies demonstrate robust financial stability and healthy liquidity, Current Ratio: 1.36, maintaining consistent profitability and efficiency despite a heavy reliance on non-operating income streams.
3. The Chi-Square test yields high p-values up to 1.000, leading to the acceptance of the null hypothesis and confirming that the financial data across all categories is exceptionally consistent with no statistically significant variation.
4. The Chi-Square analysis yields p-values exceeding 0.05, necessitating the acceptance of the null hypothesis and confirming that the financial data remains statistically stable and consistent with no significant deviations.

5. The regression analysis indicates that while Total Expenses shows a strong directional trend, the model lacks overall statistical significance as all independent variables yielded p-values exceeding 0.05.
6. The regression model confirms a lack of statistical significance across all variables p-values 0.618–0.975, indicating that Total Expenses, Net Profit, and Net Profit Margin have no measurable impact on the dependent variable.

SUGGESTIONS

1. To mitigate high insolvency risk, these companies must prioritize aggressive debt restructuring and overhead reduction while shifting focus toward stabilizing core operational cash flows.
2. The companies should focus on diversifying and strengthening their core operational revenue streams to reduce long-term dependency on non-operating income and ensure the sustainability of their current profitability.
3. Given the extreme statistical stability and lack of variance, the focus should shift toward long-term strategic growth and market expansion rather than short-term corrective measures.
4. Management should leverage this high level of statistical consistency to establish more aggressive performance benchmarks and explore external growth opportunities, as internal processes are currently fully stabilized.
5. To improve the model's reliability, it is recommended to expand the sample size or introduce additional independent variables, as the current results fail to establish statistically significant causal relationships.
6. The study should be re-evaluated using a broader dataset or alternative financial indicators, as the current variables demonstrate no statistically significant relationship with the outcome.

CONCLUSION

Effective working capital management is the primary driver of financial resilience in the power sector, bridging the gap between high operational costs and delayed revenue cycles. The study concludes that optimizing the Cash Conversion Cycle is essential to counter the liquidity strain caused by chronic payment delays from DISCOMs. By maintaining a strategic balance between fuel inventory and short-term liabilities, companies can successfully mitigate insolvency risks and avoid project interruptions. Ultimately, proactive management of current assets ensures that power utilities remain solvent, creditworthy, and capable of delivering consistent shareholder value. This financial discipline is what allows the industry to sustain continuous production despite the volatility of fuel prices and regulatory pressures.

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