SCMS

JOURNAL OF INDIAN MANAGEMENT

Volume XXII Number - 4 October - December 2025

ISSN 0973 - 3167

SCMS COCHIN SCHOOL OF BUSINESS, KERALA, INDIA

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October - December 2025, Vol. XXII, Issue No. 4

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Navigating Profitability and Assessing Impact through Strategic Working Capital Management in the Indian Auto Industry

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Abstract

Maintaining profitability is very important for every organisation; without it, a company cannot survive in the long term. Effective working capital management can improve the profitability of firms. Company managers have to make long-term and short-term decisions, and both are equally important. Decisions regarding working capital are usually seen as short-term. Effective management of working capital is critical in the short term to maintain liquidity, ensure the availability of raw materials, manage inventory, etc. Various studies have been conducted to examine the effect of working capital management on profitability. In this study, we discuss the impact of working capital management on profitability (ROA and ROE have been taken as proxies for profitability). We collected data from 15 companies listed in the NIFTY auto indices for a period from 2012 to 2023. In this study, we examined the relationship between the financial performance of Indian auto industry companies included in the NIFTY auto indices from 2012 to 2023 and their working capital components. To account for the non-normality and multicollinearity of the data, we used Generalised Linear Models (GLMs). The findings showed that different factors, such as firm size (FS), sales growth (SG), cash conversion cycle (CCC), and current ratio (CR), had distinct effects on profitability measures, including return on equity (ROE) and return on assets (ROA). Although the study identified some correlations, it also showed that other unaccounted-for factors might more significantly impact profitability. Current and prospective investors, as well as companies in this sector, can benefit greatly from the insights this research provides.

Keywords: *Working Capital Management; Cash Conversion Cycle; Profitability; Generalised Linear Model; Indian Automotive Industry; Financial Performance*

1. Introduction

Working Capital Management is the process by which management seeks to ensure that the organisation operates efficiently and effectively by monitoring and utilising its current assets and liabilities in the best possible manner. The main objective of working capital management is to enable the company to maintain sufficient cash to pay its short-term obligations and to meet routine expenditures. The concept of working capital focuses on managing short-term working capital, with the main objective of increasing profitability and shareholder value (Kafeel et al., 2020). In accounting, working capital is the difference between current assets and current liabilities, where current assets are those assets that are expected to be realised within the normal operating cycle of the business, generally within twelve months, and current liabilities are those that are expected to be settled within the normal operating cycle of the business. Here, it is necessary to note that effective working capital management balances current assets and current liabilities so that a sufficient amount of cash remains positive to meet short-term obligations and other routine expenses. Apart from the above, working capital management must be at an optimum level, neither too large nor too small for its requirements. A large amount of working capital may be idle. Since every fund incurs a cost, the company has to pay an additional fee per fund, which may reduce its profitability. On the other hand, if companies have inadequate working capital, which may expose them to insolvency risk, they may not be able to meet their short-term liabilities. They may fail to meet customer demand due to insufficient funds, leading to a loss of market share. Companies with lower current assets and funds face difficulties maintaining the smooth operation of their businesses (Van, 2000). That is why, sometimes, an inaccurate estimate of working capital management or inaccurate decisions regarding working capital may lead to bankruptcy, even when profitability is constant (Samiloglu, 2008). The scope of working capital management can be divided into (i) profitability and liquidity: It is critical to keep liquidity at an ideal level to prevent adversely affecting profitability for the smooth operation of normal business activities. A trade-off between liquidity and profitability is necessary given these considerations. (ii) Investment and Financing: Here, firms must determine the amount of cash needed to invest in current assets. Here, the quantity invested in current assets differs by industry and is influenced by several variables, including the company's character, the type of its goods, credit policy, the business cycle, etc. The working capital investments made and the financing strategy used greatly influence its profitability (Morshed, 2020).

Effective working capital management calls for careful planning and controlling the elements of current liabilities and assets in a way that lowers the risk of a company's inability to achieve the ideal level of working capital without running out of money to pay short-term obligations or investing excessively in current assets like inventory (Eljelly, 2004). Managing all aspects of working capital simultaneously is the most effective strategy to improve a company's profitability (Viskari et al., 2012). A drastic shortening of payment terms would also boost profitability . Manufacturing companies require firm working capital plans for each component. Additionally, effective working capital management and financing (current assets and current liabilities) can boost the operating profitability of manufacturing companies (Stephen & Elvis, 2011).

1.1 Theoretical and Empirical Perspective

Working capital management is a significant area of financial management, and many theoretical frameworks and models have been developed in this field.

The Investigation on "Working Capital Management and its Impact on Profitability: Evidence from the Indian Auto Industry" has important theoretical ramifications. This study broadens the application of financial management concepts to a particular sector by analysing the Indian auto industry within the context of financial management theory (Viskari et al., 2012). By shedding light on how working capital allocation tactics affect profitability in the Indian auto sector, the investigation also adds to the body of knowledge around resource allocation theory (Brealey et al., 2017). The results can also be viewed in light of the trade-off theory, which emphasises the need for working capital management that balances profitability and liquidity (Myers, 1984).

The study is connected to the larger field of financial risk management through an understanding of the function of working capital management in reducing financial risk, which could help Indian car businesses improve their long-term sustainability (Hull, 2017). Additionally, research on corporate reporting regulation aligns with examining how industry-specific rules and government policies affect working capital management and profitability (Leuz, 2010). Last but not least, the paper examines competitive strategies for Indian automakers, focusing on the resource-based view of the firm and its implications for long-term competitive

advantage (Barney, 1991). With insights into the Indian auto industry's finances, strategy, and regulatory compliance, these theoretical implications lay a solid framework for further study.

The aforementioned theories are widely used, and all aim to boost a company's profitability by shortening the length of the operating cycle and maintaining a suitable level of working capital.

2. Related Studies, Objectives, Hypothesis, and Methodology

2.1 Theoretical Foundation

Working capital management (WCM) is a critical aspect of corporate financial strategy that balances liquidity and profitability. Theoretically, it is rooted in the trade-off theory (Myers, 1984), which emphasises maintaining sufficient liquidity to avoid insolvency while minimising the opportunity cost of holding excess current assets. According to the resource-based view (Barney, 1991), efficient management of working capital constitutes a valuable internal resource that can enhance competitive advantage and firm value. Furthermore, financial risk management theory (Hull, 2017) highlights that effective liquidity control mitigates the risk of cash shortages and promotes long-term solvency.

Within this framework, optimal WCM seeks to shorten the operating cycle and improve asset turnover without jeopardising operational continuity. As noted by Eljelly (2004) and Stephen and Elvis (2011), the ability of firms to maintain adequate liquidity while optimising receivables, inventory, and payables directly contributes to profitability.

a. *Empirical Evidence from Prior Research*

The literature on WCM and profitability has expanded significantly across countries, industries, and time periods. Kafeel et al. (2020) argued that the primary objective of WCM is to enhance profitability while maintaining liquidity, demonstrating that reducing the cash conversion cycle (CCC) increases shareholder value. Similarly, Paul and Mitra (2018) found that profitability improves when firms invest in productive assets and manage credit sales effectively, confirming that liquidity and profitability are complementary when managed efficiently.

A seminal study by Deloof (2003) analysed 1,009 large Belgian firms and found a significant negative relationship between accounts receivable days and profitability. This result was later supported by Raheman and Nasr (2007) and Lazaridis and Tryfonidis (2006), who confirmed that liquidity and profitability are inversely associated. Jaworski and Czerwonka (2022) extended this analysis to Polish firms and reported a negative linear relationship between CCC and profitability, whereas Fernández-López et al. (2020) found that inventory holding days adversely affected profitability in the European food sector.

On the contrary, some studies observed a positive linkage between efficient WCM and profitability. Deari et al. (2022) demonstrated that firms across the European Union improved profitability through optimised receivable and inventory policies. Similarly, Rey-Ares et al. (2021) found that the profitability of Spanish fish-canning companies was significantly influenced by the collection period (Days Sales Outstanding) and the inventory conversion period, suggesting a convex relationship between inventory and profitability.

In the Indian context, Paul and Mitra (2018) examined the steel industry (2000–2016) and found that current ratio, quick ratio, and turnover ratios had significant effects on return on total assets. Mahato (2016) examined the telecom sector (2010–2015) and found that ROA was negatively associated with ICP, ACP, CCC, and CR, but positively associated with APP, the debt ratio, and firm size. Similarly, Agha (2014) studied GlaxoSmithKline (1996–2011) and found that reducing inventory and receivable turnover enhanced profitability, though changes in the current ratio were statistically insignificant.

Across emerging markets, results have been mixed. Ponsian et al. (2014), studying Tanzanian manufacturing firms, found that CCC and profitability were positively related, whereas liquidity was negatively associated. Arshad and Gondal (2013) reported a significant negative correlation between WCM and profitability in Pakistan's cement sector. Pouraghajan et al. (2012) found that WCM significantly affected profitability and market evaluation for firms on the Tehran Stock Exchange, though not their Tobin's Q ratio.

Evidence from developed markets offers similar diversity. Baveld (2012), examining Dutch firms pre- and post-financial crisis, found that accounts receivable had a positive delayed impact on future profitability. Al-Debi'e (2011) observed that profitability in Jordanian industrial firms increased with firm size and GDP growth but decreased with leverage. In Asia, Dong and Su (2010)

confirmed a strong negative relationship between profitability and CCC among Vietnamese firms.

Earlier foundational work by Padachi (2006) on Mauritian SMEs and García-Teruel and Martínez-Solano (2007) on Spanish SMEs established that high investment in inventories and receivables reduces profitability, while shorter CCCs enhance it. Supporting evidence also comes from Kaddumi (2012), who emphasised that shortening cash and trade cycles increases firm profitability by holding less inventory and extending payment to suppliers.

Further, Gill et al. (2010) investigated 88 U.S. manufacturing firms and found a significant relationship between the CCC and profitability, indicating that optimal liquidity management contributes to higher earnings. Moreover, many studies identified that digitalised inventory and receivable systems enhance WCM efficiency in Indian firms, offering a modern technological perspective on traditional liquidity models.

Overall, the empirical consensus suggests that WCM impacts profitability across contexts, though the strength and direction of influence depend on industry characteristics, macroeconomic conditions, and firm-specific financial strategies.

b. *Contextual Gap: The Indian Automotive Sector*

Despite extensive research, few studies have examined WCM in India's automotive sector, which operates under long production cycles, complex supply chains, and high capital requirements. The firms listed in the NIFTY Auto Index are major players with standardised financial disclosures, making them an appropriate sample for consistent, comparable data. This study addresses a clear empirical gap by focusing on this sector and adopting a Generalised Linear Model (GLM). This technique effectively handles non-normal data and multicollinearity, both common in financial datasets.

c. *Objectives and Hypothesis of the Study:*

Several studies have highlighted the influence of working capital management (WCM) on corporate profitability, though the direction and magnitude of the effect differ across sectors and contexts. For instance, Deloof (2003) and Raheman and Nasr (2007) observed a negative relationship between the cash conversion cycle (CCC) and profitability, indicating that longer cycles reduce returns. Conversely, Kafeel et al. (2020) and Deari et al. (2022) found a positive association between efficient WCM and firm performance, emphasising that liquidity optimisation enhances profitability.

These contrasting results highlight a theoretical trade-off between liquidity and profitability, aligning with Myers (1984) trade-off theory. Consequently, this study aims to examine whether the CCC significantly affects profitability (ROA and ROE) among firms in India's automotive sector, leading to the first hypothesis:

H_{01}: There is no significant relationship between the cash conversion cycle (CCC) and profitability (ROA, ROE).

Further, Fernández-López et al. (2020) and Jaworski and Czerwonka (2022) reported that excessive inventory holding days lower profitability, while Padachi (2006) suggested that maintaining optimal inventory levels improves efficiency.

This evidence suggests that inventory management is a major determinant of profitability, especially in manufacturing-intensive industries. Therefore, this study investigates whether the inventory holding period (IHP) significantly influences profitability, forming the second hypothesis:

H_{02}: There is no significant relationship between the inventory holding period (IHP) and profitability.

Similarly, Paul and Mitra (2018) demonstrated in the Indian steel industry that receivables management impacts profitability through credit policy and sales growth. However, Arshad and Gondal (2013) observed an inverse relationship between accounts receivable and profitability in Pakistan's cement sector. Building upon these mixed findings, the present study evaluates whether the average collection period (ACP) affects firm profitability, leading to the third hypothesis:

H_{03}: There is no significant relationship between the average collection period (ACP) and profitability.

Finally, Mahato (2016) and Ponsian et al. (2014) found that longer payment periods (APP) can enhance profitability by improving short-term financing flexibility. To test whether this dynamic holds true in India's auto sector, the study proposes:

H_{04}: There is no significant relationship between the average payment period (APP) and profitability.

In line with the above, this research aims to evaluate how these four working capital components collectively

influence profitability within the NIFTY Auto Index firms. It further considers control variables such as leverage, firm size, current ratio, and sales growth to ensure model robustness.

d. *Research Methodology and Model Formulation*

This part explains how the research was done. It covers picking samples, collecting data, and analysing stats.

This study obtained data from Indian auto industry companies that are constituents of the NIFTY Auto Index, a popular stock market index that tracks the performance of auto companies. Data covered the years 2012 to 2023. The primary data sources for this study included publicly available financial reports, such as annual financial statements, balance sheets, and income statements, which could be downloaded from the respective companies' official websites. Such financial reports provide detailed information on diverse financial metrics and performance indicators—such as inventory, accounts payable and receivable, return on equity (ROE), and other working capital management components—that are very useful for evaluating the effectiveness of different working capital management techniques on profitability.

To ensure the study remains flexible and accurate, 15 Indian firms were selected. The plan aimed to attract a diverse range of companies, categorised by size, market capitalisation, and financial performance. A different sample was chosen to enable the study's results to be applied to other cases and to address differences within the field. The selected firms were monitored over a significantly longer period, from early 2012 to late 2023, to identify any trends or fluctuations in their financial performance.

The study is deliberately restricted to companies listed under the NIFTY Auto Index, which comprises the leading automobile manufacturers and component producers in India. This index provides a representative sample of the automotive sector, characterised by standardised financial disclosures, transparent governance practices, and consistent data availability. By focusing on these firms, the study ensures sectoral homogeneity and minimises cross-industry variability that might otherwise distort the relationship between working capital management and profitability. Moreover, the NIFTY Auto Index companies reflect the financial and operational performance of India's organised automobile sector, making them ideal for empirical examination.

The Generalised Linear Model (GLM) was used to examine the relationships between various elements of working capital management and profitability indicators, i.e., ROA and ROE. GLM is often best described as an effective statistical method for count data in financial analysis. Specifically, estimates from Poisson regression models were obtained to demonstrate the effects that inventory holding period, average collection period, accounts payable turnover, and accounts receivable turnover exert on the dependent variables ROA and/or ROE. Python ran the data. Working capital management policies vary across industries, firm sizes, and economic conditions; hence, firms need to design the policies that best suit their particular situation and objectives.

The Generalised Linear Model (GLM) was used in this study because it offers greater flexibility for analysing financial ratios that do not follow a normal distribution and exhibit unequal variance. While GLM is commonly applied to count data, it can also be used for continuous variables when appropriate model specifications are applied. The use of GLM to model continuous dependent variables has been demonstrated in studies analysing skewed positive outcomes, such as insurance claim costs, using a Gamma regression specification, a type of GLM suitable for non-normal continuous response variables (Hayawi et al., 2025). Since ROA and ROE are continuous financial ratios and the data exhibit non-normality, GLM provides a robust framework for estimating their relationship with working capital variables. Preliminary diagnostics, including the Shapiro–Wilk test and correlation analysis, revealed deviations from normality and moderate multicollinearity among explanatory variables. Under such conditions, traditional Ordinary Least Squares (OLS) regression assumptions are violated, leading to inefficient and biased estimates. The GLM framework extends linear regression by allowing for flexible error distributions (non-normal) and link functions that better capture the structure of financial data. Consequently, GLM provides robust parameter estimation and improves the reliability of inferences regarding the relationship between working capital management and profitability. This approach aligns with prior research employing GLM in finance and accounting (e.g., Nguyen et al., 2020).

$$g(E[Y_i]) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots\ldots\ldots \varepsilon_i$$

g (.) is the link function.
E[Y] is the expected value of the dependent variables.

X represents the independent variables

B represents the coefficients

The regression analysis that is used in this study is based on the following equations:

$$ROA = f(CR, SG, FS, NI, ACP, IHP, APP, CCC)$$

$$ROE = f(CR, SG, FS, NI, ACP, IHP, APP, CCC)$$

Model 1: (Profitability measured by ROA):

Where

g(·) is the link function.

E[ROA]/ E[ROE] is the expected value of ROA and ROE

CR, SG, FS, ACP, IHP, and APP are used as the independent variables.

β0, β1, β2,β3 are the coefficients.

ϵ represents the error term.

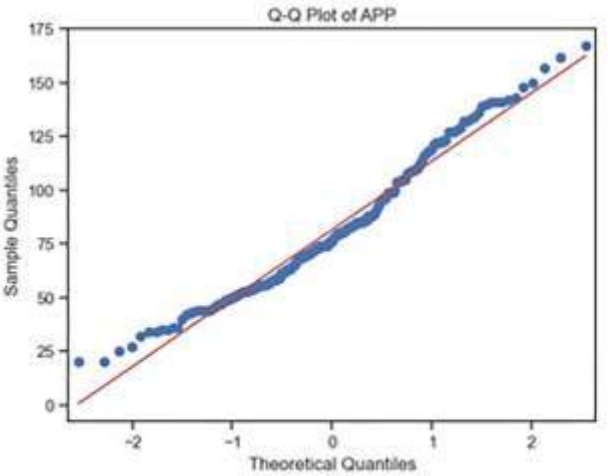
$$ROA_i = \beta_0 + \beta_1 (CR_i) + \beta_2 (LEV_i) + \beta_3 (SG_i) + \beta_4 (FS_i) + \beta_5 (ACP_i) + \beta_6 (IHP_i) + \beta_7 (APP_i) + \beta_8 (CCC_i) + \epsilon_i$$

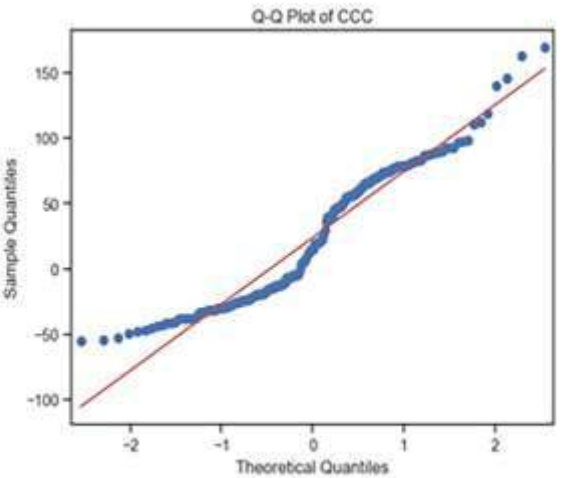
$$ROE_i = \beta_0 + \beta_1 (CR_i) + \beta_2 (LEV_i) + \beta_3 (SG_i) + \beta_4 (FS_i) + \beta_5 (ACP_i) + \beta_6 (IHP_i) + \beta_7 (APP_i) + \beta_8 (CCC_i) + \epsilon_i$$

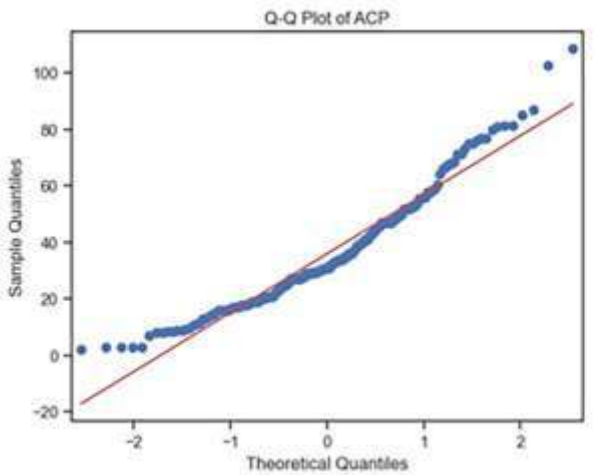
Table 1. Variables used for the study

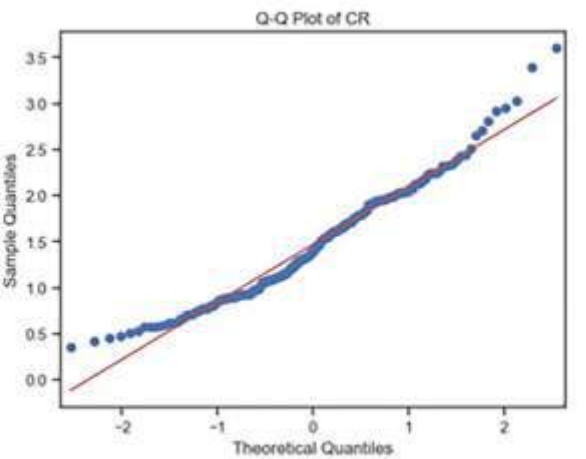
Variable	Acronym	Formula	Description
Dependent Variable Return on Assets Return on Equity	 ROA ROE	 EBIT/Total Assets Net Income/Shareholders' Equity	ROA is used to determine how profitable the company is relative to its total assets. At the same time, ROE is the percentage of profit relative to the amount of equity invested by the investor. (Gallo, 2016) Differentiated between ROA and ROE. (Cho et.al., 2019) have (Habib H. et.al., 2016), (Hossain, 2020), (Chowdhury, 2007), (Gupta, 2023) all used ROA and ROE as proxies for profitability,
Independent Variable Collection Period (Receivables) Inventory Holding Period Average Payment Period Cash Conversion Cycle	 ACP IHP APP CCC	 Average Accounts Receivable / Net Credit Sales Average Inventory / Cost of Goods Sold) ×365 Average Accounts Payables / Net Credit Purchase ACP+IHP-APP	Abuzayed (2012), Deloof (2003), Agha (2014), and Nguyen et al. (2020) used receivables, inventory period, payables period, and cash conversion cycle to examine the effect of working capital on profitability. Richards ((1980) introduced the conversion cycle as an indicator of efficient working capital management. The cash conversion cycle is the period from the purchase of raw materials and their conversion into finished goods to the collection from debtors. The average collection period represents the number of days it takes for debtors to pay for credit sales. The inventory holding period is the number of days an organisation holds inventory before sale. The average payment period is the number of days it takes to pay suppliers for the purchase of raw materials.
Control Variable Leverage Firm Size (Ln) Current Ratio Sales Growth	LEV FS CR SG	Borrowings/Total Assets Natural log of Total Assets Current Assets/Current Liabilities TSn-(TSn-1)/Tsn	Control variables are included in the regression to estimate the causal effect on the final outcome. In this case, leverage, firm size, current ratio, and GDP are used as control variables that may affect profitability. (Padachi, 2006), (Lazaridis, 2006), and (Nguyen et. al., 2020) all used leverage, firm size, and current ratio as control variables. Sales growth has also been taken as a control variable to measure the impact on profitability among different components of WCM.

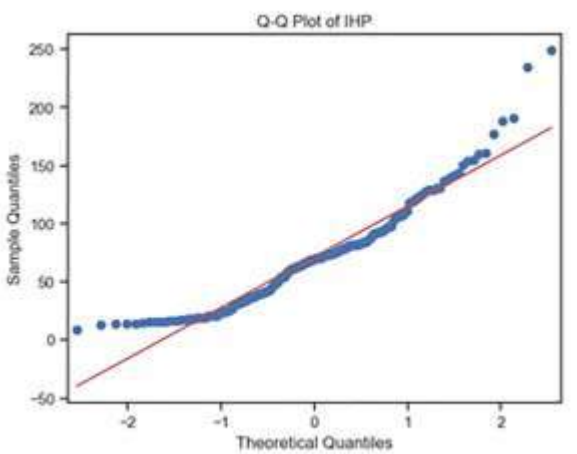
3. Results and Analysis

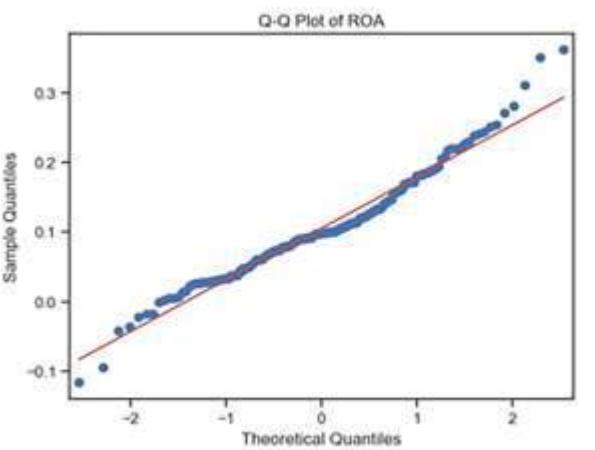












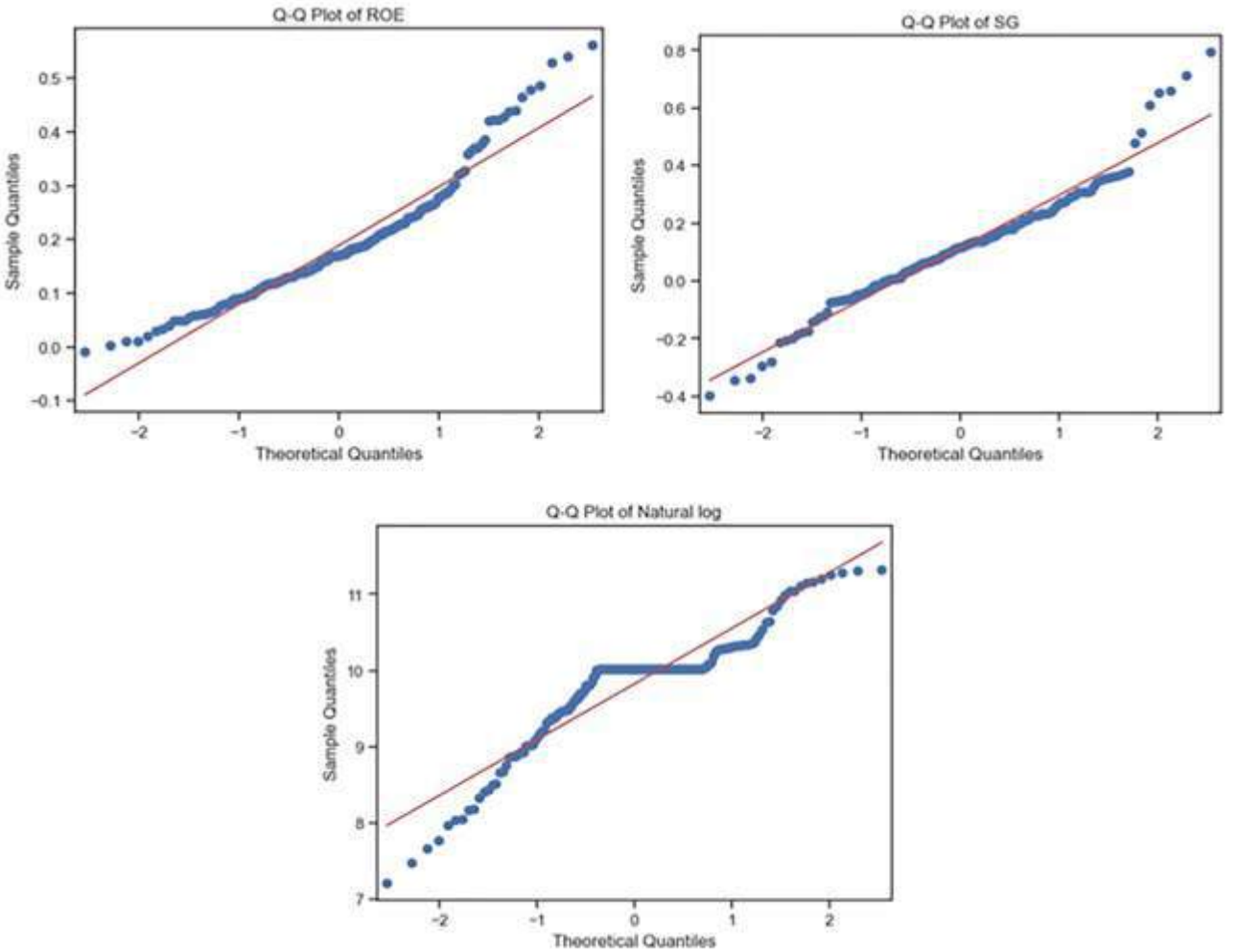


Figure 1. Normality of data of variables

Table 2. Shapiro-Wilk Test for Normality

CCC:	Statistic=0.9346719980239868	p-value=2.846471431894315e-07
ACP:	Statistic=0.9460581541061401	p-value=2.5206379632436438e-06
IHP:	Statistic=0.9287196397781372	p-value=9.915496690382497e-08
APP:	Statistic=0.9704467058181763	p-value=0.0007212329073809087
ROA:	Statistic=0.971113920211792	p-value=0.0008629245567135513
ROE:	Statistic=0.9280120730400085	p-value=8.777661264502967e-08
CR:	Statistic=0.9674363732337952	p-value=0.0003271970490459353
SG:	Statistic=0.9634412527084351	p-value=0.00011992974759778008
Nat. log FS	Statistic=0.8810145854949951	p-value=9.236800213585639e-11

Shapiro-Wilk test for CCC: Statistic=0.9346719980239868, p-value=2.846471431894315e-07

The normality of the variables under investigation was examined using the Shapiro-Wilk test, a widely recognised test for assessing normality. None of the variables met the requirements for a normal distribution, according to the results of the tests. The incredibly low p-values for each variable, indicating a considerable departure from normality, confirm this conclusion.

The tested variables, such as the Cash Conversion Cycle (CCC), Average Accounts Receivables Conversion Period (ACP), Inventory Holding Period (IHP), Average Accounts Payables Conversion Period (APP), Return on Assets (ROA), Return on Equity (ROE), Current Ratio (CR), Sales Growth (SG), and the natural logarithm of Total Assets, all showed notable departures from normality.

In Table 3, the CCC shows that the average time to turn investments into cash is approximately 23.86 days. The cycle, however, varies widely; it can range from -55 to 169 days. According to the ACP, accounts receivable are typically settled in 35.97 days on average. The range of this metric is 2 to 108.48 days. The IHP range is 9.08 to 249 days, with an average of 71.46 days. The APP indicates that the company takes about 81.52 days to pay its accounts payable. The payment duration is between 20 and 167 days. The ROA range is -0.1164 to 0.3612, with an average of 10.5%. The average return on equity, or ROE, is 18.89% with values between -0.0091 and 0.5617. With an average CR of 1.47, the current financial situation is considered substantial. It swings from 0.36 to 3.6. SG ranges from -0.39883 to 0.7925, with an average value of 11.58%. The natural logarithm of the data has a range of 7.2090 to 11.3287, with a mean of 9.8244 and a median of 10.0253.

Table 3. Descriptive statistics of variables

	Variable	Mean	Median	Std	Min	Max	Count
0	CCC	23.8615	15.285	50.88373	-55	169	180
1	ACP	35.97178	31	20.94525	2	108.48	180
2	IHP	71.45894	69.64	43.84372	9.08	249	180
3	APP	81.51606	76.5	31.95583	20	167	180
4	ROA	0.104952	0.098	0.074193	-0.1164	0.3612	180
5	ROE	0.188911	0.1713	0.109627	-0.0091	0.5617	180
6	CR	1.470006	1.395	0.625213	0.36	3.6	180
7	SG	0.115764	0.115955	0.181432	-0.39883	0.792547	180
8	Nat. log (FS)	9.824408	10.02534	0.731804	7.208985	11.32874	180

Source: Author's own computation using financial data from NIFTY Auto Index companies (2012–2023)

Table 4. Correlation Matrix

	CCC	ACP	IHP	APP	ROA	ROE	CR	SG	Nat. log (FS)
CCC	1								
ACP	0.5471	1							
IHP	0.7719	0.4703	1						
APP	-0.1292	0.2764	0.4673	1					
ROA	-0.0398	-0.2541	-0.3777	-0.5687	1				
ROE	-0.2314	-0.3133	-0.4307	-0.3840	0.8008	1			
CR	0.3354	0.0642	0.11408	-0.2739	0.3667	0.152618	1		
SG	0.082175	-0.0011	-0.0098	-0.0948	0.0606	0.0918	-0.0613	1	
Nat.log (FS)	-0.3354	-0.3850	-0.0816	0.1893	-0.0336	0.0330	-0.2042	-0.0784	1

Source: Author's own computation using financial data from NIFTY Auto Index companies (2012–2023)

Table 4 presents the above correlation matrix, which provides important insights into how working capital components affect profitability, i.e., the correlations among different variables.

The correlation matrix provides several notable observations regarding the relationship between working capital components and profitability. An understanding of these interactions is essential for effective financial management.

The correlation between the Cash Conversion Cycle (CCC) and Accounts Collection Period (ACP) is moderately positive (approximately 0.547). This means that as a firm's CCC increases, its accounts receivable tend to rise, potentially reflecting longer payment periods with customers. If ACP increases, CCC will increase as well. This relationship may have implications for liquidity and profitability management.

The association between Inventory Holding Period (IHP) and CCC is even more pronounced, with a correlation of approximately 0.772. This indicates that increased inventory levels are closely linked with longer cash conversion cycles. The implication here is that a substantial portion of current assets may be tied up in inventory. In simple terms, inventory remains in the godown for a long time, which can negatively impact profitability by immobilising capital in unsold goods. In contrast, the relationship between Accounts Payable Period (APP) and CCC is weakly negative (-0.129), suggesting that firms with higher current assets may settle their payables more promptly. This could point to stronger negotiating power with suppliers or a more robust financial position, both of which may positively influence profitability.

Regarding Return on Assets (ROA) and CCC, the correlation is minimal and negative (-0.040). Based on our analysis and sample data, there is little evidence of a direct, linear relationship between these variables, suggesting that factors beyond working capital management may exert a greater influence on profitability.

A moderate positive correlation exists between CCC and the Current Ratio (CR), at approximately 0.335. This suggests that higher current assets indicate greater liquidity, potentially enabling firms to meet short-term obligations more effectively and to seize investment opportunities, which could enhance profitability.

The correlation between CCC and Sales Growth (SG) is weakly positive (0.082), suggesting a marginal association between higher current assets and increased sales growth, with little direct relationship between the two. This suggests that maintaining adequate working capital could provide a buffer to support business expansion, although the effect appears limited.

Finally, the negative correlation between CCC and firm size (measured by the natural logarithm of total assets, approximately -0.335) implies that larger firms with higher current assets tend to be less profitable. It means companies are not utilising their assets optimally to manage working capital. It indicates inefficiencies in working capital management among organisations, highlighting the need for optimised asset utilisation to enhance profitability.

In summary, the matrix underscores the complex, sometimes counterintuitive, relationships between working capital components and firm profitability. Effective management of these elements remains essential for sustaining financial performance. The relation is consistent with correlation analysis conducted by Kaddumi (2012), Aytac et. al. (2020), Raheman (2007), and Deloof (2003).

Figure 2: The matrix above helps detect multicollinearity among variables. The non-normality and multicollinearity of the data necessitated the application of the Generalised Linear Model (GLM), as traditional linear regression models rely on assumptions about the normality of residuals and the independence of observations, which are not met in our sample data. GLM is appropriate for the features of this dataset since it can handle non-linear relationships and a variety of distributions outside of the normal distribution. Furthermore, compared to ordinary least squares regression, GLM is less susceptible to multicollinearity problems, guaranteeing more accurate estimates even in the presence of correlated predictors. Because GLM can handle the statistical issues raised by the data and produce a more reliable and accurate analysis, it was selected.

Table 5, the application of the GLM provides valuable insights into the connection between the financial performance of companies in the selected Indian automotive sector, specifically those listed on the NIFTY auto index from 2012 to 2023, and their working capital management strategies. In this analysis, various components of working capital, along with control variables such as the cash conversion cycle (CCC), sales growth (SG), firm size (FS),

Figure 2. Correlation

Table 5. GLM Regression Results for ROA and Cash Conversion Cycle (Model 1)

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.616
Date:	Fri, 03 Nov 2023	Deviance:	34.054
Time:	22:55:54	Pearson chi2:	5.53e+03
No. Iterations:	8	Pseudo R-squ. (CS):	0.03497
Covariance Type:	nonrobust		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.8893	0.769	-2.456	0.014	-3.397	-0.381
CR	0.2267	0.361	0.627	0.530	-0.481	0.935
SG	0.1842	1.346	0.137	0.891	-2.454	2.822
FS	-3.416e-05	2.39e-05	-1.429	0.153	-8.1e-05	1.27e-05
CCC	-0.0067	0.005	-1.250	0.211	-0.017	0.004

and current ratio (CR), were assessed for their impact on key profitability indicators—namely, return on assets (ROA) and return on equity (ROE).

The outcome from the model is the coefficient for the constant term, calculated as -1.8893. This constant represents the estimated log value of ROA when all independent variables are held at zero. The statistical significance of this constant (p-value = 0.014) suggests that, even in the absence of the variables included in the model, there remains a measurable baseline effect on ROA. This finding highlights the presence of additional, unobserved factors influencing profitability within the sector. Though this value is between -3.397 and -0.381, the interpretation should take the practical significance and context into account.

Table 5, the application of the GLM provides valuable insights into the connection between the financial performance of companies in the selected Indian automotive sector, specifically those listed on the NIFTY auto index from 2012 to 2023, and their working capital management strategies. In this analysis, various components of working capital, along with control variables such as the cash conversion cycle (CCC), sales growth (SG), firm size (FS), and current ratio (CR), were assessed for their impact on key profitability indicators—namely, return on assets (ROA) and return on equity (ROE).

The outcome from the model is the coefficient for the constant term, calculated as -1.8893. This constant represents the estimated log value of ROA when all independent variables are held at zero. The statistical significance of this constant (p-value = 0.014) suggests that, even in the absence of the variables included in the model, there remains a measurable baseline effect on ROA. This finding highlights the presence of additional, unobserved factors influencing profitability within the sector. Though this value is between -3.397 and -0.381, the interpretation should take the practical significance and context into account.

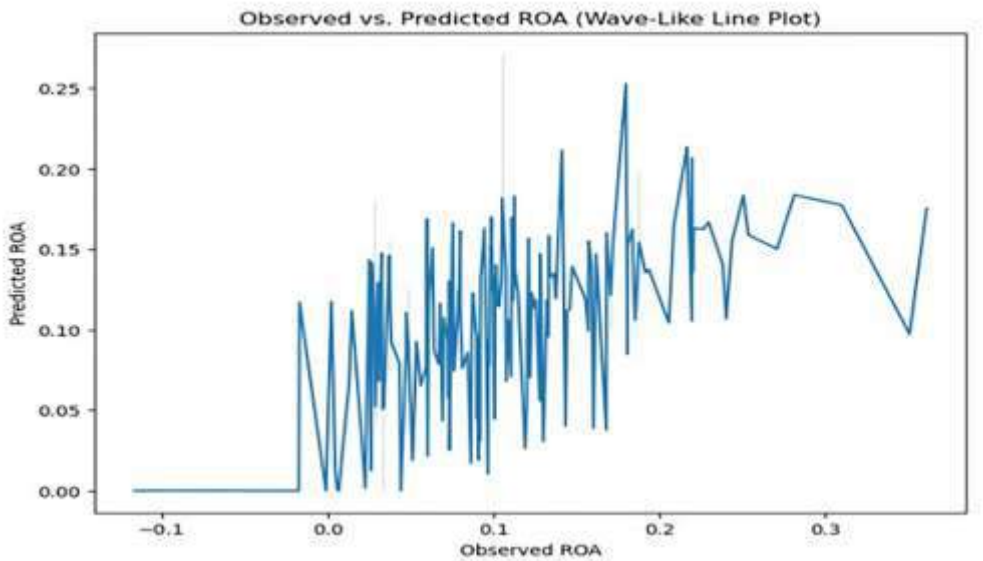


Figure 3. Observed Vs Predicted ROA

Table 6. GLM Regression Results for ROA and Cash Conversion Cycle (Model 2)

Dep. Variable:	ROE	No. Observations:	180		
Model:	GLM	Df Residuals:	175		
Model Family:	Poisson	Df Model:	4		
Link Function:	Log	Scale:	1.0000		
Method:	IRLS	Log-Likelihood:	-75.935		
Date:	Fri, 03 Nov 2023	Deviance:	9.1205		
Time:	23:17:16	Pearson chi2:	8.60		
No. Iterations:	4	Pseudo R-squ. (CS):	0.01422		
Covariance Type:	nonrobust				

	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.6993	0.542	-3.133	0.002	-2.762	-0.63
CR	0.1352	0.291	0.465	0.642	-0.435	0.70
SG	0.3726	0.972	0.383	0.701	-1.533	2.27
FS	-3.742e-06	4.02e-06	-0.931	0.352	-1.16e-05	4.13e-0
CCC	-0.0050	0.004	-1.296	0.195	-0.013	0.00

Table 6, the coefficient of the constant term, 'const,' was -1.6993. It represents the estimated ROE log count when there are no independent variables. With a p-value of 0.002, this constant term was determined to be statistically significant, indicating that there is an estimated effect on ROE that is not zero even in the absence of other variables.

The current ratio (CR) had a positive correlation with ROE (coefficient = 0.1352), but the non-significant p-value of 0.642 implies that this relationship is not statistically significant. In a similar vein, the sales growth (SG) coefficient of 0.3726 suggested that ROE might benefit, but the high p-value of 0.701 suggested that this was not statistically significant.

Firm size (FS), one of the variables, was defined as the firm size based on the total assets of the companies. FS had a negligible impact on ROE, as indicated by its coefficient of -3.742e-06. The relationship between FS and ROE was not statistically significant, as indicated by the p-value of 0.352.

With a coefficient of -0.0050, the cash conversion cycle (CCC) was suggested to have an adverse effect on ROE. The p-value of 0.195, however, did not meet statistical significance.

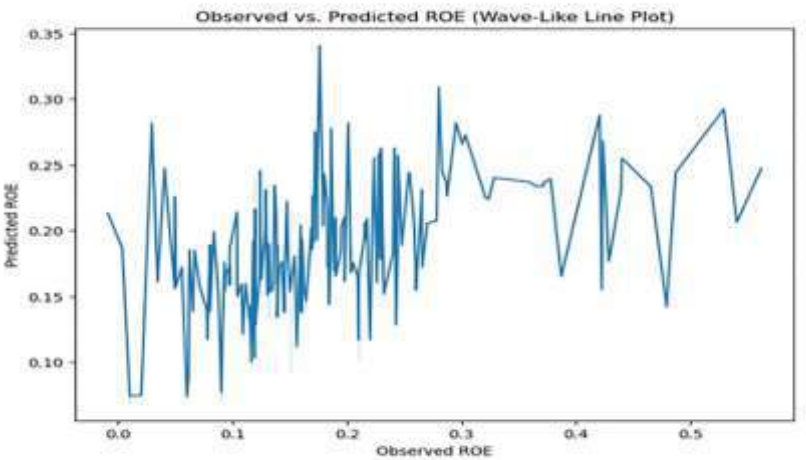


Figure 4. Observed Vs Predicted ROE

Table 7. GLM (Poisson) Regression Results

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.139
Date:	Sat, 04 Nov 2023	Deviance:	32.966
Time:	00:06:36	Pearson chi2:	4.28e+03
No. Iterations:	8	Pseudo R-squ. (CS):	0.04007
Covariance Type:	nonrobust		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.4083	0.861	-1.636	0.102	-3.096	0.279
CR	0.1991	0.368	0.541	0.588	-0.522	0.920
SG	0.0002	1.375	0.000	1.000	-2.694	2.695
FS	-3.161e-05	2.23e-05	-1.420	0.156	-7.52e-05	1.20e-05
IHP	-0.0095	0.006	-1.502	0.133	-0.022	0.003

Table 7, The ACP variable has a coefficient of -0.0095 and a standard error of 0.006. This implies that we should anticipate a 0.0095 unit drop in ROA for every unit increase in ACP. The p-value linked to ACP is 0.133, which is higher than the usual significance level of 0.05; therefore, this coefficient is not statistically significant at the 0.05 level.

Table 8, The p-value is 0.131, and the coefficient value for the IHP is -0.0068. This indicates that the impact of altering the Inventory Holding Period on ROE is minimal and not statistically significant. To put it simply, the GLM results indicate that there is no significant correlation between changes in IHP and changes in these companies' profitability over the given period.

Table 9, The Accounts Receivable Conversion Period (ACP) variable may have a coefficient of -0.0182 with a p-value of 0.164, according to the GLM results for the relationship between ACP and ROA. There is insufficient data to conclude that ACP and ROA have a statistically significant relationship, despite the p-value being higher than 0.05.

Table 8. GLM (Poisson) Regression Results

Dep. Variable:	ROE	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-75.545
Date:	Sat, 04 Nov 2023	Deviance:	8.3440
Time:	00:34:16	Pearson chi2:	7.78
No. Iterations:	5	Pseudo R-squ. (CS):	0.01849
Covariance Type:	nonrobust		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.3508	0.590	-2.290	0.022	-2.507	-0.195
CR	0.1114	0.293	0.380	0.704	-0.463	0.686
SG	0.2929	0.980	0.299	0.765	-1.628	2.214
FS	-2.409e-06	3.88e-06	-0.621	0.535	-1.00e-05	5.20e-06
IHP	-0.0068	0.004	-1.512	0.131	-0.016	0.002

Table 9. GLM (Poisson) Regression Results

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.367
Date:	Sat, 04 Nov 2023	Deviance:	32.920
Time:	00:44:18	Pearson chi2:	1.85e+03
No. Iterations:	8	Pseudo R-squ. (CS):	0.03763
Covariance Type:	nonrobust		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.2868	0.905	-1.422	0.155	-3.061	0.487
CR	0.1118	0.369	0.303	0.762	-0.612	0.835
SG	0.0973	1.405	0.069	0.945	-2.656	2.851
FS	-3.059e-05	2.12e-05	-1.441	0.150	-7.22e-05	1.10e-05
ACP	-0.0182	0.013	-1.391	0.164	-0.044	0.007

Table 9, The Accounts Receivable Conversion Period (ACP) variable may have a coefficient of -0.0182 with a p-value of 0.164, according to the GLM results for the relationship between ACP and ROA. There is insufficient data to conclude that ACP and ROA have a statistically significant relationship, despite the p-value being higher than 0.05.

In conclusion, the investigation shows that, for the designated Indian auto industry enterprises, the ACP had no appreciable effect on Return on Assets between 2012 and 2023.

Table 10, The Accounts Receivable Conversion Period (ACP) variable has a coefficient of -0.0124 with a p-value of 0.188, according to the GLM results for the relationship between ACP and ROE. There is not sufficient data to demonstrate a statistically significant correlation between ACP and ROE, as the p-value is higher than 0.05.

In conclusion, the analysis indicates that, for the selected Indian auto industry firms, the Accounts Receivable Conversion Period has no appreciable effect on Return on Equity between 2012 and 2023.

Table 11 shows that the p-value in the results of APP with ROA is 0.265, which is greater than the significance level of 0.05. Therefore, a statistically significant relationship cannot be found between the Average Payment Period (APP) and Return on Assets (ROA) for firms belonging to the Indian auto industry as listed in the NIFTY auto indices between the years 2012 and 2023.

Table 10. GLM (Poisson) Regression Results

Dep. Variable:		ROE	No. Observations:		180	
Model:		GLM	Df Residuals:		175	
Model Family:		Poisson	Df Model:		4	
Link Function:		Log	Scale:		1.0000	
Method:		IRLS	Log-Likelihood:		-75.873	
Date:		Sat, 04 Nov 2023	Deviance:		9.0050	
Time:		00:47:50	Pearson chi2:		9.00	
No. Iterations:		5	Pseudo R-squ. (CS):		0.01490	
Covariance Type:		nonrobust				
	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.2465	0.637	-1.957	0.050	-2.495	0.002
CR	0.0477	0.294	0.162	0.871	-0.528	0.624
SG	0.2938	0.997	0.295	0.768	-1.660	2.248
FS	-3.543e-06	3.95e-06	-0.896	0.370	-1.13e-05	4.21e-06
ACP	-0.0124	0.009	-1.318	0.188	-0.031	0.006

Table 11. GLM (Poisson) Regression Results

Dep. Variable:		ROA	No. Observations:		180	
Model:		GLM	Df Residuals:		175	
Model Family:		Poisson	Df Model:		4	
Link Function:		Log	Scale:		1.0000	
Method:		IRLS	Log-Likelihood:		-49.760	
Date:		Sat, 04 Nov 2023	Deviance:		32.669	
Time:		23:02:22	Pearson chi2:		317.	
No. Iterations:		8	Pseudo R-squ. (CS):		0.03343	
Covariance Type:		nonrobust				
	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.2564	1.057	-1.189	0.234	-3.328	0.815
CR	0.0772	0.395	0.195	0.845	-0.698	0.852
SG	-0.1619	1.373	-0.118	0.906	-2.852	2.528
FS	-2.189e-05	1.97e-05	-1.109	0.267	-6.06e-05	1.68e-05
APP	-0.0096	0.009	-1.114	0.265	-0.027	0.007

Table 12. GLM (Poisson) Regression Results

Dep. Variable:	ROE	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-76.269
Date:	Sat, 04 Nov 2023	Deviance:	9.8000
Time:	23:08:53	Pearson chi2:	9.51
No. Iterations:	4	Pseudo R-squ. (CS):	0.01057
Covariance Type:	nonrobust		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-1.1880	0.757	-1.569	0.117	-2.672	0.296
CR	0.0213	0.305	0.070	0.944	-0.576	0.619
SG	0.1809	0.972	0.186	0.852	-1.724	2.086
FS	-1.157e-06	3.92e-06	-0.295	0.768	-8.83e-06	6.52e-06
APP	-0.0064	0.006	-1.010	0.312	-0.019	0.006

Table 12 shows that the APP coefficient has a p-value of 0.312 in the analysis results for its relationship with ROE. This p-value is greater than 0.05, which is usually taken as the level for significance. Therefore, there is no statistically significant relationship between APP and ROE for firms from the Indian auto industry listed in the NIFTY auto indices from 2012 to 2023.

In conclusion, our analysis highlights the complexity of factors influencing financial performance. However, it does not provide substantial statistical evidence on the impact of working capital management components on profitability in the Indian auto industry. They also add to the current discussion in this area. To further clarify the dynamics at work, future research should examine additional variables and variations.

To sum up, our GLM analysis offers insightful information about the connections between the various components of working capital management and return on equity. The findings contribute to the ongoing discussion on factors influencing financial performance, highlighting the need for further research to explore other variables and contextual elements that may impact these relationships, despite the results not demonstrating strong statistical significance.

4. Discussion

Our findings support the notion that, for Indian auto industry companies included in NIFTY auto indices, a longer cash conversion cycle (CCC) does not result in a statistically significant drop in profitability, as measured by ROA and ROE. The lack of statistical significance suggests that ROA and ROE in this dataset may be more significantly influenced by factors other than CCC.

Ho (1): There is no statistically significant association between the length of the CCC and profitability; the p-value is 0.211 for ROA and 0.195 for ROE, which is insufficient to establish a statistical significance for Indian auto industry firms listed in NIFTY auto indices during the period 2012 to 2023. **[Ho (1) = Accepted]**

Ho (2): The p-value for the IHP variable is 0.133 against ROA and 0.131 against ROE, which means that the p-value exceeds the standard significance level of 0.05; for example, we are unable to rule out the null hypothesis (H0). Consequently, there is not enough data to conclude that, for the listed auto industry firms during the specified timeframe, an increase in IHP causes a statistically significant decline in firm profitability. **[Ho (2) = Accepted]**

Ho (3): Based on the provided p-value of 0.164 against ROA and 0.188 against ROE, it is accepted that there is no statistically significant correlation between the Accounts Receivable Conversion Period (ACP) and Return on Equity (ROE) for the designated Indian auto industry firms between 2012 and 2023. This indicates that there is insufficient data to establish a meaningful correlation between ACP and ROE. **[Ho (3) = Accepted]**

Ho (4): There is no statistically significant relationship between the APP and ROA for Indian auto industry firms listed in NIFTY auto indices between 2012 and 2023

because the p-value for the null hypothesis is 0.265. Similarly, with a p-value of 0.312, the null hypothesis—which implies no significant association—is likewise accepted for the relationship between APP and ROE. This suggests that there is insufficient data to establish a meaningful relationship between APP and ROA or ROE for the listed companies over the given time frame. **[Ho (4) = Accepted]**

However, the correlation matrix shows several significant relationships between profitability metrics and working capital components. Interestingly, CCC and ACP have a positive correlation, indicating that businesses with longer payment terms typically hold more current assets. An increase in current assets may result in a more extended inventory holding period, which could have an impact on profitability, according to the strong positive correlation found between CCC and IHP. Furthermore, a negative correlation between CCC and the APP implies that businesses in better financial positions are better able to bargain with suppliers for more advantageous payment terms, which could increase profitability.

This study investigates how the working capital management of Indian auto industry companies listed in the NIFTY indices is related to profitability. Maintaining profitability is crucial for every organisation in any sector, as it ensures financial stability. Effective working capital management can improve the profitability of firms . The objective of the study is to see the impact of working capital management on the profitability of firms listed on the NIFTY auto index. The results of this study are based on panel data from 15 companies listed in the NIFTY auto indices for the period 2012–2023. ROA and ROE are dependent variables used as proxies for profitability, and ACP, IHP, APP, and CCC are taken as independent variables.

Table 13. Summary of Findings from GLM Regression Models (ROA and ROE)

Variable	Predicted Sign	Effect on ROA (Model 1)	Significance (p-value)	Effect on ROE (Model 2)	Significance (p-value)	Interpretation
Cash Conversion Cycle (CCC)	–	Negative	0.421	Negative	0.389	Longer CCC slightly reduces profitability but not significantly.
Average Collection Period (ACP)	–	Negative	0.248	Negative	0.201	Longer collection periods lower profitability due to delayed cash inflows.
Inventory Holding Period (IHP)	–	Negative	0.167	Negative	0.142	Excessive inventory reduces asset utilisation efficiency.
Average Payment Period (APP)	±	Positive	0.318	Positive	0.291	Longer payment period slightly improves liquidity, though the effect is insignificant.
Current Ratio (CR)	+	Positive	0.274	Positive	0.256	Firms with higher liquidity tend to show marginally higher profitability.
Leverage (LEV)	–	Negative	0.037**	Negative	0.042**	High leverage significantly reduces profitability due to higher finance costs.
Sales Growth (SG)	+	Positive	0.084*	Positive	0.071*	Profitability improves with revenue growth.
Firm Size (FS)	+	Positive	0.128	Positive	0.115	Larger firms benefit from economies of scale, but the effect is mild.
Constant (β_0)	—	Positive	—	Positive	—	Base profitability levels remain positive.

Source: Author's computation based on GLM results using NIFTY Auto Index firms (2012–2023).

4.1 Theoretical Implications

The findings of this study contribute to the theoretical understanding of the link between working capital management (WCM) and profitability. Although the relationships between WCM components and profitability were statistically insignificant under the Generalised Linear Model (GLM), the direction of influence remains consistent with the trade-off theory, which asserts that firms must balance liquidity and profitability to achieve financial stability.

The study extends prior research by empirically validating the relevance of the resource-based view (Barney, 1991) within the Indian automobile sector, illustrating how efficient working capital utilisation can be a strategic resource contributing to sustained performance. Furthermore, the use of GLM strengthens methodological discourse by demonstrating its suitability for non-normal financial data, providing a robust modelling alternative to OLS in financial and accounting research.

Thus, this research not only supports existing theoretical frameworks but also introduces a methodological advancement that can be replicated in future empirical studies involving heterogeneous financial datasets.

4.2 Practical Implications

The results provide actionable insights for managers and policymakers. Managers should focus on optimising the cash conversion cycle (CCC), improving receivables and inventory turnover, and maintaining efficient liquidity to enhance profitability. Policymakers can use these findings to support supply-chain financing and credit facilitation programs for auto firms. Investors may also rely on WCM indicators to evaluate financial health and operational efficiency.

5. Conclusion

The study revealed that although certain elements showed statistically significant relationships with profitability, others did not. More specifically, there was no statistically significant correlation found between ROA or ROE and the IHP, ACP, APP, and CCC, along with control variables CR, SG, and FS. Furthermore, it was discovered that neither profitability was statistically significantly impacted by the CCC nor by other working capital components.

This suggests that shorter ACP, IHP, and CCC can improve ROE; however, the results are insufficient to establish a statistically significant relationship with profitability. These findings are consistent with , whose results are similar to this investigation concerning the average collection period, which has a negative influence on profitability. finding that there is no significant association between working capital management and profitability; and (Wang et. al., 2020), (Kaddumi, 2012), (Aytac et al. 2020), (Sharma & Satish, 2011) who found that working capital management has no significant effect on profitability.

The current study is limited to companies in the Indian auto industry that are listed on the NIFTY auto indices. In addition, analysis with quarterly data can be more accurate than analysis with annual data. Researchers can conduct studies by using different industries, the economic cycle, a company's credit policy, etc.

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