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Cash Conversion Cycle and Profitability: Empirical Evidence from Ghana's Energy Sector

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Abstract: *This study investigates the impact of the Cash Conversion Cycle (CCC) on the profitability of energy sector companies in Ghana. Using data from four (4) firms spanning 2014 to 2022, the study employed descriptive statistics, correlation analysis, and regression techniques to explore the relationship between CCC components – Days Receivable Outstanding (DRO), Days Inventory Outstanding (DIO), and Days Payable Outstanding (DPO) – and key profitability metrics including Return on Assets (ROA) and Return on Equity (ROE). The findings revealed that a longer CCC negatively correlates with profitability while DIO and DRO positively influenced ROA. Extended payment periods were found to detract from both ROA and ROE. These findings underline the importance of optimizing CCC to enhance financial performance in Ghana's energy sector. This study contributes to the existing body of literature by providing empirical evidence on the financial performance of energy sector companies, particularly in the context of working capital management. It underscores the critical relationships between the Cash Conversion Cycle and profitability metrics such as ROA and ROE. Moreover, the findings offer actionable recommendations that can assist firms in enhancing their financial performance, thus bridging the gap between theory and practice in financial management within the energy sector.*
Keywords: firm profitability, cash conversion cycle, energy sector, working capital management, Ghana

INTRODUCTION

Working capital management (WCM) is a fundamental aspect of corporate finance that directly influences a company's liquidity, operational efficiency, and profitability. The Cash Conversion Cycle (CCC), which is a key component of WCM measures the time it takes for a company to convert its investments in inventory and receivables into cash flows from sales. Effective management of the CCC is essential, particularly for firms in capital-intensive sectors like energy, where cash flow disruptions can significantly impact profitability and operational sustainability (Rahman et al., 2021; Wang et al., 2020).

Previous research emphasizes the importance of optimizing CCC components such as Days Sales Outstanding (DSO), Days Inventory Outstanding (DIO), and Days Payable Outstanding (DPO) to enhance firm performance (Nastiti et al., 2019). However, much of the available literature concentrates on developed markets, leaving a significant gap in understanding how these dynamics affect firms in emerging economies like Ghana where economic and regulatory conditions differ substantially (Murphy, 2020).

The energy sector plays a key role in the economic development of Ghana by empowering industrial growth and improving living standards (Ghana Energy Commission, 2020). However, companies in this sector face unique challenges, including volatile energy prices, regulatory shifts, and high operating costs, which complicate cash flow management (World Bank, 2024). In this context, optimizing the CCC becomes essential for enhancing profitability and financial resilience (Padachi, 2006). Despite its significance, limited research has examined the impact of the CCC on profitability in Ghana's energy sector, thereby creating a need for focused empirical studies.

This study aims to fill this gap by exploring the relationship between the Cash Conversion Cycle and corporate profitability among energy companies in Ghana. Specifically, it assesses how CCC components (DIO, DRO, and DPO) affect key profitability metrics such as Return on Assets (ROA) and Return on Equity (ROE). By examining data from four leading energy firms, this study offers a specified analysis of how CCC dynamics impact profitability in a sector that is central to the nation's economic growth. The expected outcome will offer practical intuition for managers in the energy sector, guiding them in optimizing their working capital strategies.

LITERATURE REVIEW

Theoretical Review

Theory of Cash Conversion Cycle (CCC)

The Cash Conversion Cycle (CCC) is a key concept in financial management that evaluates the efficiency of a company's working capital management by measuring the time it takes to convert investments in inventory and receivables into cash flows from sales. This understanding is important for firms in capital-intensive industries where effective cash flow management can significantly impact both profitability and liquidity. The CCC concept was first introduced by Gitman, Forrester, and Forrester Jr. (1976) and later refined by Richards and Laughlin (1980) who emphasized how effective working capital management can enhance the operational efficiency of a firm and how it supports growth. The theory covers key elements of working capital, including inventory, receivables, cash, and payables. The CCC is calculated using the formula:

$$CCC = DSO + DIO - DPO \quad [1]$$

A long-lasting CCC signifies inefficiencies such as delayed receivables collection, excess inventory, or premature payment of obligations. This situation can strain cash flow and, in extreme cases, lead to financial distress, particularly for smaller firms. In contrast, a shorter CCC reflects prompt payment collections, efficient inventory management, and strategic payment delays, typically signaling better

financial health for the company (Hayes, 2021). Research suggests that firms with an optimized CCC are better situated to adapt to changing market conditions and utilize their resources more effectively which leads to improved financial performance (Wang et al., 2020). The CCC theory is valuable for assessing operational efficiency and cash flow management that provides businesses with an actionable insight to enhance profitability and financial stability. This is relevant in sectors such as energy where cash flow dynamics are closely entwined to operational success and long-term sustainability.

2.2 Conceptual Framework

Based on a comprehensive literature review that encompasses relevant theories and empirical studies on the cash conversion cycle and firm profitability, a conceptual framework has been developed, as illustrated in Figure 1**Error! Reference source not found.**. This framework identifies the dependent variable (DV) as the profitability of energy companies in Ghana which is influenced by several independent variables (IVs):Days Receivable Outstanding (DRO), Days Inventory Outstanding (DIO), and Days Payable Outstanding (DPO).

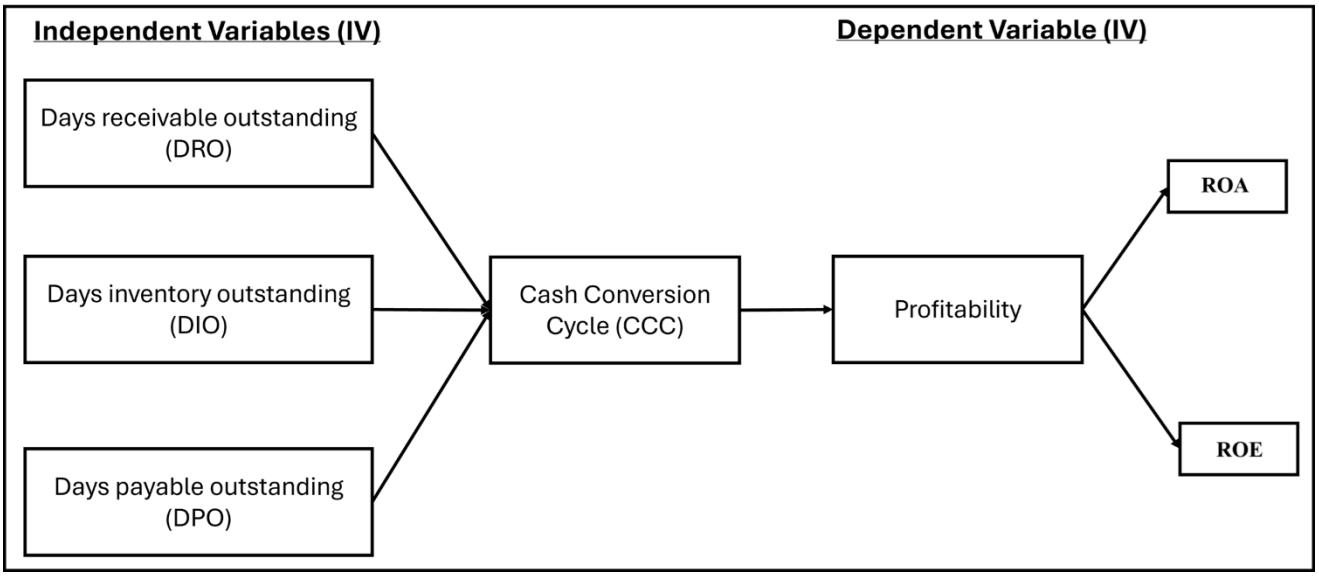

Figure 1. Conceptual framework

Empirical Review

Cash Conversion Cycle and Profitability in Ghana's Energy Sector

This section synthesizes empirical evidence regarding the relationship between the Cash Conversion Cycle (CCC) and profitability, focusing on studies relevant to various sectors, including insights that may apply to Ghana's energy industry. Laghari et al. (2023) examine cash flow management's impact on performance in non-financial firms in China, concluding that effective cash flow management significantly enhances financial performance, particularly in low-leverage firms. This finding underscores the importance of managing cash flows, which can be pivotal for firms in Ghana's energy sector as they navigate financial challenges. Similarly, Nasimiyu (2024) emphasizes that effective cash management is crucial for the financial performance of Small and Medium Enterprises (SMEs) in

Kenya. Key practices such as cash accountability and budgeting drive growth and profitability, supported by the Dynamic Trade-Off Theory and Free Cash Flow Theory. These principles are particularly relevant for energy firms aiming to optimize their cash flows. Mandalaputri et al. (2021) explore the retail trade sector, finding that components of the CCC, specifically Days Sales Outstanding (DSO) and Days Sales Inventory (DSI), negatively impact profitability, while Days Payable Outstanding (DPO) has a positive effect. This suggests that energy firms in Ghana could benefit from similar analyses to optimize their working capital. Karim et al. (2023) provide evidence from Bangladesh's manufacturing sector, indicating that a longer CCC adversely affects profitability indicators such as Return on Assets (ROA) and Earnings Per Share (EPS). Their recommendation to reduce inventory conversion time aligns with strategies that could enhance financial performance in Ghana's energy sector. In contrast, Nijam (2024) analyzes the hotel sector in Sri Lanka and finds a positive relationship between CCC and profitability, suggesting that effective management of CCC components is crucial for financial success. This highlights the variability of CCC effects across different sectors, implying that Ghana's energy sector may yield unique insights. Ghabban et al. (2024) focus on Saudi firms, revealing an insignificant impact of CCC on ROA but a significant effect on EPS, emphasizing the need for customized CCC strategies tailored to industry dynamics. This adaptability could inform Ghanaian energy firms as they develop financial strategies. Ceylan (2021) investigates the relationship between CCC and profitability among SMEs, reporting a significant positive correlation. This indicates that firms in Ghana's energy sector, particularly smaller entities, should prioritize efficient cash management to enhance profitability. In Botswana, Sathyamoorthi et al. (2023) report a non-significant negative relationship between CCC and profitability but a significant impact on Return on Equity (ROE). This finding suggests that while the CCC may not directly influence profitability, it can affect other financial metrics, which could be relevant for energy firms assessing their financial health.

Kouaib and Bu Haya (2024) identify a strong negative correlation between inventory conversion periods and firm performance, while shorter accounts receivable periods positively influence profitability. This duality highlights the importance of managing individual CCC components effectively, a strategy that could enhance operational efficiency in Ghana’s energy sector. Pham and Dinh (2023) find that the Average Collection and Inventory Conversion Periods negatively affect profitability, while the Average Payment Period positively impacts ROA. Their findings suggest that energy firms may need to refine their cash management practices to improve overall financial outcomes. Lazarus et al. (2023) specifically investigate the Ghana Stock Exchange, revealing significant negative effects of account receivables and inventory conversion periods on ROA and ROI. This study directly informs the energy sector, indicating that optimizing these components could lead to improved profitability. Ngari (2023) examines the relationship between CCC and profitability at a household supermarket in Mombasa, finding a significant negative relationship. This suggests that similar dynamics could exist in Ghana's energy sector, where streamlining the CCC could enhance cash flow and operational efficiency.

In summary, the empirical evidence highlights a complex relationship between the Cash Conversion Cycle and profitability across various sectors. While findings vary by industry, the overarching theme emphasizes the importance of effective cash flow and working capital management. For Ghana's energy sector, adopting strategies to optimize cash conversion metrics could enhance profitability and

operational efficiency, providing valuable insights for future research and practice.

RESEARCH METHODS

Data Collection

This study examines the impact of the Cash Conversion Cycle (CCC) on firm profitability within Ghana's energy sector and covers the period from 2014 to 2022. A purposive sampling technique was employed to select four energy companies based on the availability of relevant financial data. The data were sourced from published annual reports and the official websites of the selected firms. Profitability was measured using two key financial ratios (ROA and ROE), both of which assess the efficiency of profit generation. The independent variables considered in this study are components of the CCC (DRO, DIO, and DPO).

Data analysis

The analysis procedure began with descriptive statistics to summarize the characteristics of the variables considered in the study, followed by a correlation analysis to assess the relationships among the CCC components and profitability metrics. The main statistical technique for hypothesis testing was the multiple regression analysis which was utilized to quantify the impact of each CCC component on firm profitability. The focus was on the two key profitability metrics (ROA and ROE) and CCC components as independent variables as specified in the conceptual framework. The regression models are specified in equations [2] and [3] below:

$$ROA = \beta_0 + \beta_1 DIO + \beta_2 DRO + \beta_3 DPO + \beta_4 CCC + \varepsilon \quad [2]$$

$$ROA = \beta_0 + \beta_1 DIO + \beta_2 DRO + \beta_3 DPO + \beta_4 CCC + \varepsilon \quad [3]$$

Where:
ROA = Return on assets
DIO = Days Inventory Outstanding
DRO = Days Receivable Outstanding
DPO = Days Payable Outstanding
CCC = Cash Conversion Cycle
β_0 is the intercept, β_1 - β_4 are the coefficients of the respective independent variables, and ε is the error term.

RESULTS AND DISCUSSION

This section presents the results and discussion of the analysis conducted using the tools outlined in the methods section.

Table 1. Descriptive statistics

	ROA	ROE	DIO	DRO	DPO	CCC
Mean	0.0238	-0.0063	18.1510	324.6340	276.2500	66.5200
Minimum	-0.1800	-0.1700	1.7900	1.7350	12.7000	-25.1700
Maximum	0.2464	0.1400	44.6930	791.6810	1050.3200	453.0000
SD	0.0924	0.0792	13.4260	306.6263	304.5950	189.4792
Skewness	-0.2562	-0.4211	0.5555	0.2302	1.0902	0.4009
Kurtosis	0.3031	-0.5382	-1.1041	-1.8001	-0.3075	-0.1047

Based on the results presented in Table 1, return on assets (ROA) has a mean value of 0.0238, indicating slight profitability across firms. The minimum value of -0.1800 and maximum value of 0.2464 demonstrate variability in firm performance while the standard deviation of 0.0924 reflects moderate dispersion. The skewness of -0.2562 indicates a leftward tail in the distribution and the kurtosis of 0.3031 suggests a relatively flat distribution compared to a normal curve (Garcia-Teruel & Martinez-Solano, 2007).

Return on equity (ROE) presents a mean of -0.0063, reflecting challenges in generating returns. The range of -0.1700 to 0.1400 further highlights performance variability. A standard deviation of 0.0792 suggests some dispersion while the skewness of -0.4211 implies a leftward skew. The kurtosis of -0.5382 indicates a distribution with lighter tails (Deloof, 2003).

Days inventory outstanding (DIO) has an average of 18.151 days with values ranging from a minimum of 1.7900 to a maximum of 44.6930. The high standard deviation of 13.4260 reflects substantial variability in inventory management practices. The positive skewness of 0.5555 points to a rightward tail and the kurtosis of -1.1041 suggests a flatter distribution (Eljelly, 2004).

Days receivable outstanding (DRO) exhibits a mean of 324.6340 days, indicating inefficiencies in receivables collection. The range from 1.7350 to 791.6810 underscores this variability, with a standard deviation of 306.6263 reflecting substantial differences in collection periods. The skewness of 0.2302 and kurtosis of -1.8001 suggest a distribution with lighter tails than normal (Lazaridis & Tryfonidis, 2006).

Days payable outstanding (DPO) averages 276.2500 days with a wide range of 12.7000 to 1050.3200. The standard deviation of 304.5950 indicates significant variability in payment practices. A skewness of 1.0902 reveals a rightward tail and a kurtosis of -0.3075 suggests a relatively flat distribution (Shin & Soenen, 1998).

The cash conversion cycle (CCC) has a mean of 66.52 days with values ranging from −25.17 to 453.0. The standard deviation of 189.4792 highlights substantial variability in operational efficiency. The skewness of 0.4009 suggests a slight rightward tail while the kurtosis of −0.1047 reflects a relatively flat distribution (Raheman & Nasr, 2007).

Table 2 presents the results of Pearson's correlation test examining the relationships between the dependent variables and the independent variables.

Table 2. Correlation matrix

	ROA	ROE	DIO	DRO	DPO	CCC
ROA	1					
ROE	0.889	1				
DIO	0.061	-0.187	1			
DRO	-0.561	-0.704	0.689	1		
DPO	-0.157	-0.437	0.833	0.803	1	
CCC	-0.652	-0.451	-0.153	0.377	-0.25	1

The correlation matrix (Table 2) provides insight into the relationships between various financial metrics: Return on Assets (ROA), Return on Equity (ROE), Days Inventory Outstanding (DIO), Days Receivable Outstanding (DRO), Days Payable Outstanding (DPO), and Cash Conversion Cycle (CCC).

ROA and ROE: There is a strong positive correlation (0.889) between ROA and ROE, indicating that as the return on assets increases, the return on equity tends to increase as well. This suggests that firms with effective asset utilization also tend to generate higher returns for their equity holders.
DIO and Other Metrics: DIO shows weak correlations with ROA (0.061) and ROE (-0.187), suggesting that inventory management does not significantly impact overall profitability in this dataset. However, DIO has a strong positive correlation with DPO (0.833), indicating that firms with longer inventory holding periods may also have longer payment terms with suppliers.
DRO: The correlation between DRO and ROA (-0.561) and ROE (-0.704) is notably negative. This suggests that longer collection periods for receivables may adversely affect profitability, highlighting the importance of efficient credit management in maintaining profitability.
DPO: The correlation of DPO with ROA (-0.157) and ROE (-0.437) is also negative, albeit weaker than DRO. This indicates that while longer payment periods may not significantly impact ROA, they do correlate with lower ROE, suggesting that delaying payments could have implications for equity returns.
CCC: The Cash Conversion Cycle (CCC) exhibits a strong negative correlation with both ROA (-0.652) and ROE (-0.451), indicating that a longer cash conversion cycle is associated with lower profitability. This reinforces the idea that efficient management of inventory, receivables, and payables is critical for enhancing firm profitability.

Overall, the findings from the correlation matrix suggest that effective financial management, particularly in terms of inventory and receivables, plays a crucial role in enhancing both ROA and ROE. Future analysis could further explore causal relationships to inform strategic decision-making.

Table 3. Regression results for the effect of CCC on ROE

Variable	Coefficient	SE	t-Statistic	P-value
Intercept	0.0094	0.0140	0.6741	0.5052
DIO	0.1723	0.0639	2.6964	0.0112
DRO	0.1669	0.0634	2.6327	0.0131
DPO	-0.1672	0.0634	-2.6375	0.0129
CCC	-0.1672	0.0634	-2.6369	0.0130
SST	0.2196			
SSE	0.0591			0.7309
R-square	0.7309			
Adjusted R-square	0.6962			
F-statistic				
p-value	<0.0001			

The regression analysis presented in Table 3 reveals that the Cash Conversion Cycle (CCC) has a statistically significant negative effect on Return on Equity (ROE), with a coefficient of -0.1672 (p = 0.0130). This indicates that an increase in the CCC correlates with a reduction in ROE. This finding aligns with prior research, which suggests that prolonged cash conversion cycles can erode profitability and diminish shareholder value (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007).

Additionally, Days Inventory Outstanding (DIO) and Days Receivable Outstanding (DRO) demonstrate positive and statistically significant relationships with ROE, with coefficients of 0.1723 (p = 0.0112) and 0.1669 (p = 0.0131), respectively. These results imply that efficient management of inventory and receivables is beneficial for improving a firm's equity returns. Specifically, optimizing the time taken to convert inventory into sales and accelerating the collection of receivables can positively influence ROE.

Conversely, Days Payable Outstanding (DPO) exhibits a statistically significant negative effect on ROE, with a coefficient of -0.1672 (p = 0.0129). This finding suggests that extending the time taken to settle payables can adversely impact a firm's equity performance. This result supports the notion that prolonged payment periods may strain supplier relationships or indicate liquidity issues, which could ultimately harm a firm's financial standing.

The model's R-squared value of 0.7309 indicates that approximately 73.09% of the variability in ROE can be explained by the independent variables (DIO, DRO, DPO, and CCC) included in the regression. Furthermore, the adjusted R-squared value of 0.6962 reflects a strong model fit, accounting for the number of predictors. The F-statistic, with an associated p-value of less than 0.0001, confirms that the overall regression model is statistically significant, implying that the relationships between the components of the CCC and ROE are unlikely to be due to chance.

These findings reinforce the importance of optimizing the Cash Conversion Cycle and its components for firms aiming to enhance profitability and shareholder returns. Effective management of inventory and receivables is vital for improving ROE, while careful attention should be paid to balancing the

timing of payables to avoid negative impacts on equity performance.

CONCLUSION, RECOMMENDATIONS AND IMPLICATIONS

Conclusion

This study highlights the financial performance dynamics of four energy sector companies over nine (9) years (2014 – 2022) through the analysis of key performance indicators. The findings revealed a slight overall profitability indicated by a mean return on assets (ROA) of 0.0238, although substantial variability in profitability exists among these firms. In contrast, the Return on Equity (ROE) indicates challenges with a mean of -0.0063, suggesting that firms are struggling to generate adequate returns for shareholders. The analysis of working capital metrics such as Days Inventory Outstanding (DIO), Days Receivable Outstanding (DRO), Days Payable Outstanding (DPO), and Cash Conversion Cycle (CCC), reveals significant inefficiencies in operational management, particularly in cash flow processes.

The correlation and regression analyses further elucidate how the CCC negatively impacts ROA and ROE, aligning with existing literature. Efficient management of inventory and receivables appears to enhance profitability while extended payment periods may adversely affect financial performance. These insights emphasize the importance of effective working capital management in improving overall firm profitability and shareholder returns.

Recommendations

Based on the results and findings of the study, it is recommended that energy sector companies enhance their cash flow management by focusing on optimizing their Cash Conversion Cycle (CCC). Specifically, firms should streamline their inventory management processes and improve receivables collection. The implementation of efficient systems such as just-in-time (JIT) inventory management and stricter credit control measures can significantly reduce the length of the CCC and contribute to improved profitability.

Regular performance monitoring is also vital, and companies should conduct periodic reviews of key financial metrics (DIO, DRO, and DPO) to identify operational inefficiencies. These reviews should ensure that the performance of the firm aligns with industry benchmarks and best practices.

Investing in the training and development of finance and operations staff is essential to provide employees with knowledge of effective financial management practices in areas such as cash flow management and inventory control. This can lead to more informed decision-making and better overall management of the CCC.

Energy firms should consider developing internally tailored policies that are aimed at minimizing the CCC and boosting profitability. These policies should include clearly defined goals for reducing inventory turnover times and improving receivables collection efficiency to ensure that the company's working capital is managed effectively to enhance financial performance.

Implications

***Practical Implications*:** The findings of this study provide practical insights for energy sector firms aiming to enhance their financial performance. By understanding the relationships between working capital management and profitability, companies can implement targeted strategies to improve operational efficiency and financial health.

***Policy Implications*:** From a policy perspective, this study emphasizes the need for regulatory frameworks that encourage best practices in financial management within the energy sector. Policymakers should consider developing guidelines that promote transparency and efficiency in financial reporting, particularly concerning cash flow management and working capital practices.

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