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The Average Collection Period, The Inventory Turnover Period, and The Average Inventory Period: Statistical Relations and Interpretation

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Abstract

The importance of the Cash Conversion Cycle emerges in helping to make appropriate financing decisions for different industries. Therefore, the research mainly focuses on the return on assets (ROA) issues and how it is affected by the three components of the cash conversion cycle; Average Collection Period (ACP), Average Inventory Turnover Period (ITP), and Average Payment Period (APP). Since the topic refers to the potential statistical relationship between the three components and the return on assets, the research has been organized to ascertain the validity of the answer to the research questions and hypothesis regarding which component affects more on the return on assets. The research indicates that more APPs lead to more return on assets. On the other hand, a negative relationship between ACP ITP and ROA indicates that managers can produce more value by minimizing ACP and ITP to a fair figure. In addition, the findings indicate that attention should be paid to the components of the cash conversion cycle to avoid periods of potential financial distress.

Keywords: Cash Conversion Cycle, Average Collection Period, Average Turnover Period, and Average Payment Period

Introduction

Working capital represents dynamic business situations. Therefore, careful control of the working capital becomes important because it has a significant effect on the company's financial health and operating performance (Hingurala et al., 2017). A company's working capital is usually interpreted by utilizing a cash conversion cycle calculated as the average number of collection days plus the average number of inventory days minus the average number of payment days. Generally, the average number of collection days plus the average number of inventory days interpreted as cash recovered from sales of finished goods while the average number of payment days is interpreted as the days are needed for payments made to raw material suppliers. From a time and credit purchase perspective, when inventory turnover starts, the average payment period starts because when a company utilizes credit purchase of raw material, both accounts payable and accounts inventory increase with the same amount at the same time. On the other hand, the average collection period starts with sales being recognized.

The three components of APP, ITP, and ACP represent a dynamic business situation. Therefore, careful control of these three components, and thus the cash conversion cycle, becomes important because they have a significant effect on the company's financial health and operating performance (Hingurala et al., 2017). Companies with a more effective cash conversion cycle have an effective liquidity ratio, require fewer debt and/or equity financing, and generate a better return. According to Ebben and Johnson (2011), utilizing a higher level of receivables and inventory compared to payables increases the need to finance these current assets by debt and/or equity, while lowering the average collection period and average inventory period to the average payable period decreases the need to finance these current assets by debt and/or equity and increase a company's opportunity to finance its operations through payables.

The research aims to explore the impact of the three components of the cash conversion cycle on companies' performance and profitability to study the optimal level of three components of the cash conversion cycle that may reduce the cost of inventories and creditors, and receivables to optimize the return on asset. To achieve this aim, the research investigates the statistical relationships between the three components of the cash conversion cycle and return on assets. The research leads to three contributions: distinguishing between the role of each component of the cash conversion cycle and extending the concept of the cash conversion cycle by identifying the significant contribution of three components to the return on asset. Finally, the research highlights the importance of the integration of the three components of the cash conversion cycle.

Literature Review

The cash conversion cycle is a cycle in which the business purchases and keeps goods in its inventory, sells the inventory on a credit sale and records it in its accounts receivable, and finally, collects cash that closes its receivables. The cash conversion cycle specifies the number of days on which the organization should devote new capital beyond its existing obligations to finance its operational activities. The cash conversion cycle considers the time that is tied up to transforming inventory and receivables into cash as well as the period the company is provided to pay its payables without paying extra fines. The level of a company's assets is mostly handled and operated by individuals holding a non-financial position and thus they may not be able to connect their decision to liquidity and profitability (Bolek et al., 2012). For instance, from a management perspective, the inventory is managed by the supply chain department, receivables are determined by sales negotiations and the sales department, while the payable and billing payment cycle is determined because of the engagement and agreement with suppliers with various potentials of discounts conditions and early payment invoices. If the average collection period and average inventory period get longer and the average payable period gets shorter, the more money a company would utilize to finance its operations which may contribute to a decrease in the investment viability and profitability, and the company may not be able to have low-interest incentives (Bolek et al., 2012). Delaying payment to creditors may increase companies' opportunity to access higher quality raw materials and more versatile means of financing (Gull and Arshad, 2013). On the other hand, too much delay in paying creditors obligations will negatively impact profits and reduce the company's credit scores in the business environment. However, the absence of inventory control may require extra financing in this scenario. This financing may arise from existing obligations and short-term debts (Bolek et al., 2012).

Return on Assets (ROA)

Profitability is known as the purpose of business activities. Profitability is seen as a measure of organizational performance because it measures the efficiency of its manufacturing efforts, facilities, equipment, and current assets that are turned into profit (Mohamad and Saad, 2010). Reducing the average collection period may decrease a company's profitability as the company may lose its solid credit customers resulting in lower sales, lower revenue, and thus lower profit (Bolek and Grosicki, 2015). To improve the profitability of the business, the cash conversion cycle should be shortened either by reducing the average collection period or the average inventory period or by extending the average payment period. The

research relies on the data obtained periodically for 90 days. Since the research preserves the stability of the data collected over time, the ROA is determined as follows,

$$\text{Return on Assets (ROA)} = \frac{Net\ Income}{Total\ Assets}$$

Average Collection Period (ACP)

The average collection period is the average time that is needed to collect cash from credit sales. Generally, the average collection period involves accounts receivable ages, setting a credit sales policy, and the collection process (Kumaraswamy, 2016). According to Kumaraswamy (2016), a short average collection period reduces investment in accounts receivable but may lower sales and thus profit. Conversely, a longer average collection period increases sales and thus profit but increases accounts receivable investment. Lazaridis and Tryfonidis (2006) noted that more credit sales create a longer collection period and thus capital structure combination. Companies with good receivable financing capability during sales fluctuation may experience low free cash flow that may increase debt levels (Hill et al., 2010). Therefore, credit sales, sometimes, are considered insufficient operating performance. Theoretically, the average collecting period may declaim to zero. According to Lucic (2014), this presents a leading situation. The research relies on the data obtained periodically for 90 days. Since the research preserves the stability of the data collected over time, the ACP is determined as follows,

$$\text{Average Collection Period (ACP)} = \frac{Average\ of\ Accounts\ Receivable}{Sales} * 90$$

H01: there is a negative association between the average collection period and the return on assets.

Inventory Turnover Period (ITP)

Inventory can be interpreted as the level that shall be determined by the production department under engineering decisions (Bolek et al., 2012). There are three types of inventories; raw materials, work in process, and finished goods. The average inventory period is the average time needed to utilize raw materials plus the time needed to be converted into finished goods plus the time needed to be sold (Kumaraswamy, 2016). In other words, the raw material inventory level is controlled by the procurement department, while work in process and finished goods inventories are controlled by the production department (Bolek et al., 2012). On the other hand, the sales volume is the product of an agreement with buyers. If the inventory and sales

volumes are not synchronized, it can generate liquidity issues. Thus, inventory is considered as one of the most important components of the cash conversion cycle because of the significant investments involved.

Companies endeavor an optimal inventory level to increase profitability and reduce potential asset loss. Therefore, the shorter the average inventory period, the higher the return on assets which results in reducing potential obsolescence and price privilege, and reducing short-term financing demands (Kumaraswamy, 2016). A long average inventory period can be demonstrated as a company has high liquidity to manufacture more goods without sales. Therefore, inventories are needed to support the company's sales. The research relies on the data obtained periodically for 90 days. Since the research preserves the stability of the data collected over time, the ITP is determined as follows,

$$\text{Inventory turnover period (ITP)} = \frac{Average\ of\ Accounts\ Inventory}{COGS} * 90$$

H02: there is a negative association between the average inventory turnover period the return on assets

Average Inventory Period (AIP)

The average payment period is the time that is needed by a company to pay its credit suppliers. To reduce the need for instant financing or cash and enhance liquidity, companies prolong the payment period. According to Hill et al. (2010), companies attempt to delay their payables to increase their ability to finance their sales fluctuation. The short average payment period represents the average time between a credit purchase and paying for it. Therefore, if a company experiences low cash or liquidity, the average payment period may increase. Bauer (2004) stated that profitability and short-term debt are positively related. The research relies on the data obtained periodically for 90 days. Since the research preserves the stability of the data collected over time, the APP is determined as follows,

$$\text{Average Payment Period (APP)} = \frac{Average\ of\ Accounts\ Payable}{COGS} * 90$$

H03: there is a positive association between the average payment period and the return on assets.

Method

Data Collection

The datasets have been downloaded from the U.S. Security and Exchange Commission (SEC) website which uses an eXtensible Business

Reporting Language (XBRL) as a mandatory format that should be used by all registered companies to provide and fill their financial transactions and statements. The datasets include quarterly fiscal financial figures over the period from 2015 to 2017 of seven companies. Table-1 shows the equations that were used by some previous researchers who investigated the effect of the cash conversion cycle on profitability. These researchers mainly used Return on Assets (ROA) or Return on Equity (ROE) in their models.

Table 1. Authors versus Regression

	Author	Regression
1	Anser and Malik (2013)	ROA = α + β1 Size + β2 Debt +β3 CCC + eit ROE = α + β1 Size + β2 Debt + β3 CCC + eit
2	Murugesu, (2013) who used regression that been used by Uyar (2009)	ROE = α + β ccc + ε ROA = α + β ccc + ε NP = α + β ccc + ε
3	Deloof (2003)	Ln (sales) = Sales Growth + Financial Debt + Fixed Financial Assets + Variability + No. of Days Accounts Receivables + No. of Days Inventories + No. of Days Accounts Payables + Cash Conversion Cycle

Statistical Model

The research uses the multivariate regression method to investigate the relationship between the three components of the cash conversion cycle and the return of assets. Multivariate linear regression is a linear approach that models the association between a dependent variable and more than one independent variable. This concept predicts multiple associated dependent variables by utilizing the linear equation function. The uncertain equation parameters are calculated from the dataset. The advantage of linear regression is the capability to evaluate the proportional effect of the independent variables on a significant level. The other advantage is the potential to detect outliers or deviations. On the other hand, any defect in utilizing the multiple regression is typically due to the data that was used. The research only uses the Average Collection Period, Average payment Period, and Average Inventory period as dependent variables. Thus, no other financial ratio will be used to avoid intercorrelation factors with other ratios that may affect the significant statistical level with the profitability ratio, ROA. In addition, by only using the three components, the research will use the regression that has been used by Murugesu, (2013) after extracting the CCC variable into its three components to more understand the effects of these components on companies' profitability. The proposed regression will be as follows,

$$ROA = \beta_0 + \beta_1 ACP + \beta_2 ITP + \beta_3 APP + \varepsilon$$

Where:
$\beta_0, \beta_1, \beta_2, and\ \beta_3$: are unknown parameters that will be determined
ε: the random error of observations
And,

Table 2. Variables

	Initial	Variable	Calculation	Used by
1	ROA	Return on Assets	Net Income / Total Assets	Murugesu, (2013) who used regression that been used by Uyar (2009)
2	ACP	Average Collection Period	(Average Accounts Receivables / Sales) * 90	Deloof (2003)
3	ITP	Average Inventory Period	(Average Accounts Inventory / Cost of Goods Sold) * 90	Deloof (2003)
4	APP	Average Accounts Payable	(Average Accounts payables / Cost of Goods Sold) * 90	Deloof (2003)

Descriptive Statistics

Table-3 shows the statistical figures of the variables used in the research. As seen in table-3 and Figures 1-4, the ROA data is not skewed. While the ACP, ITP, and APP are right-skewed because most of the data are located on the right side. In other words, most of the average days of each independent variable are relatively small. Companies maintain low and reasonable levels of the average collection period and inventory period levels and take advantage of increasing the average payment period to provide adequate financing resources for their investments.

Table 3. Descriptive Statistics

		ACP	APP	ITP	ROA
1	Min.	0.3361	1.353	0.1561	0.006952
2	1st Qu.	1.3275	5.568	5.5831	0.027655
3	Median	3.8528	7.939	45.2169	0.042603
4	Mean	8.3127	8.391	81.1539	0.042498
5	3rd Qu.	14.6699	11.043	149.9614	0.057526
6	Max.	28.3375	18.209	243.2271	0.079022

Figure 1. Return on Assets (ROA)

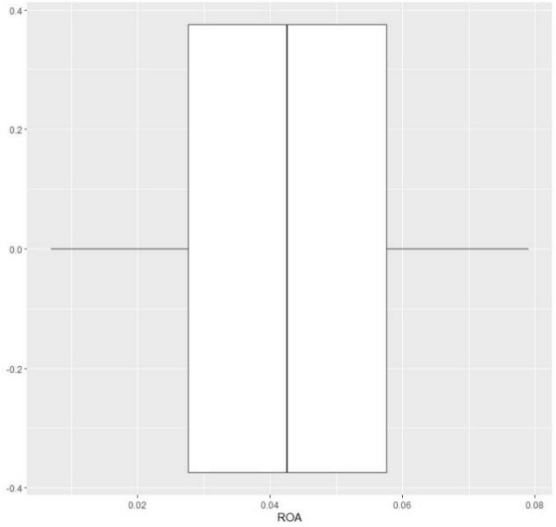


Figure 2. Average Collection Period (ACP)

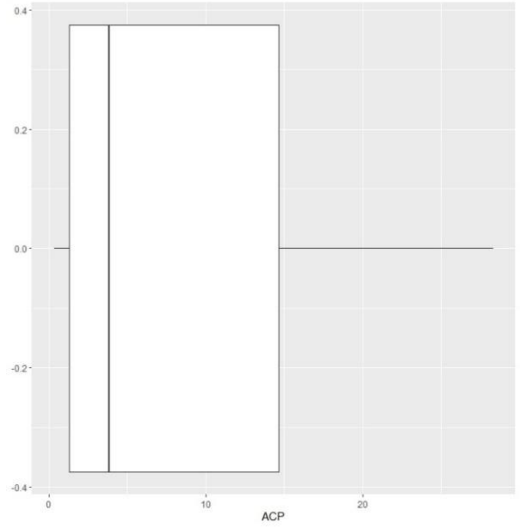


Figure 3. Average Inventory Turnover Period

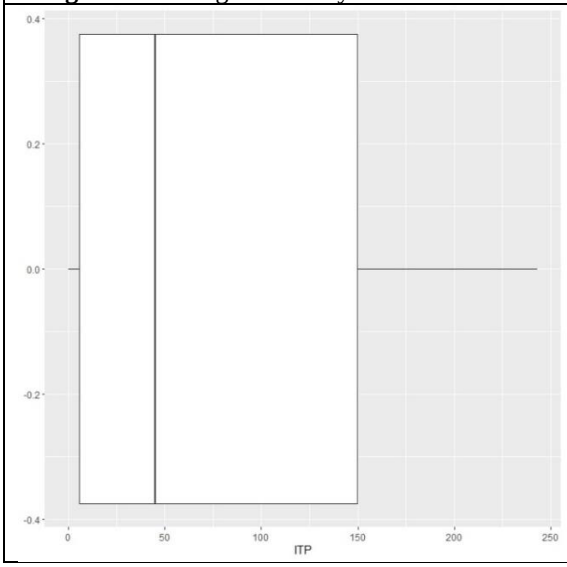
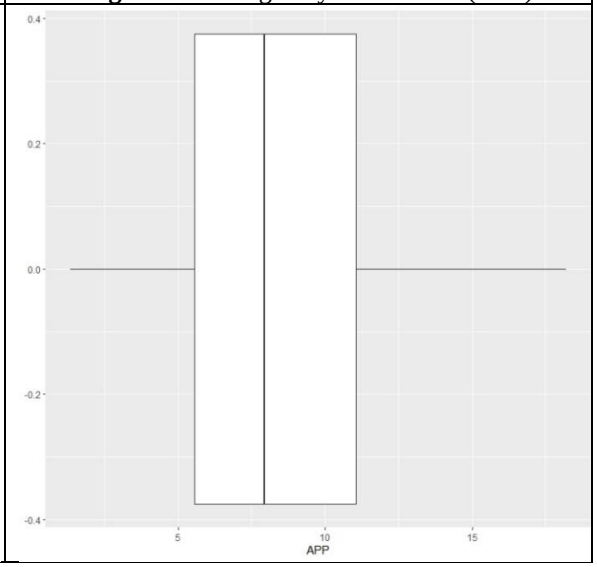


Figure 4. Average Payment Period (APP)



Regression Model

From table-4, the ACP is significantly statistically negative with ROA, and thus the null hypothesis H01 can't be rejected at a significant level of 0.001. The ITP is significantly statistically negative with ROA and thus the null hypothesis H02 can't be rejected at a significant level of 0.001. The APP is significantly statistically positive with ROA and thus the null hypothesis H03 can't be rejected at a significant level of 0.1.

Table 4. Regression model results

Variables	Coefficients	Std. Error	t value	p-value
Intercept	7.589e-02	2.242e-03	33.857	2e-16 ***
ACP	-1.845e-03	1.407e-04	-13.114	2e-16 ***
ITP	-2.743e-04	1.256e-05	-21.840	2e-16 ***
APP	5.010e-04	2.392e-04	2.094	0.0394 *
No. of Observations	84			
R-Squared	0.8578			
Adjusted-R^2	0.8524			
F-statistic	160.8, p-value = 2.2e-16			
Durbin-Watson	DW = 1.8224, p-value = 0.1547			

Notes: The dependent variable includes *Return on Assets (ROA)* equals to the Net Income divided by the Total Assets.
The independent variables include *the Average Collection Period (ACP)*, which is equal to the Average Accounts Receivables divided by Sales. *The Average Payment Period (APP)* equals to the Average Accounts Payables divided by the Costs of Goods Sold. *The Average Inventory Turnover Period (ITP)* equals the Average of Accounts Inventory divided by Costs of Goods Sold.

T-statistics are in parentheses beneath coefficient estimates.
*** significant at 0.001
** significant at 0.05
* significant at 0.1

Evaluation of Linear Regression Assumptions

The linear regression assumes that the linear relationship between the independent variable and dependent variables, homoscedasticity, independence (no autocorrelation), and the dependent variable and independent variables are normally distributed for any fixed value. The linearity assumption indicates that the mean of the residuals equals zero. The meaning of the residuals is equal to 5.286393e-20 which is very close to zero. In addition, to check the homoscedasticity, the research uses the studentized Breusch-Pagan test. The test result was BP = 3.9922, df = 3, p-value = 0.2623. Therefore, the null hypotheses cannot be rejected and there is a constant variance of residual for any value of dependent variables. Furthermore, to check the independence, the research uses the ACF plot. From figure-5, the horizontal axis represents the lags of the residuals that increase by one step as an interval. The first vertical line always equals one because it represents the correlation of residual with itself. The next vertical lines are within the two dashed lines that represent the upper and lower significant levels. This means that the residuals were not autocorrelated. In addition, the research uses Pearson's correlation matrix to test any intercedence between the independent variables that may exceed 0.7, as shown in table-5 and figure-6. Finally, to check the normality assumption, the research uses the Shapiro-Wilk normality test. The test result was W = 0.9723, p-value = 0.06687. Therefore, the null hypotheses cannot be rejected

and thus the data is normally distributed. In addition, the result can also be seen in figure-7 which shows that the points are very near to the line in the Normal Q-Q plot.

Table 5. Pearson's Correlation Matrix

		ACP	APP	ITP
1	ACP	1	0.594001589	-0.658071279
2	APP	0.594001589	1	-0.26955209
3	ITP	-0.658071279	-0.26955209	1

Figure 5: ACF Graph

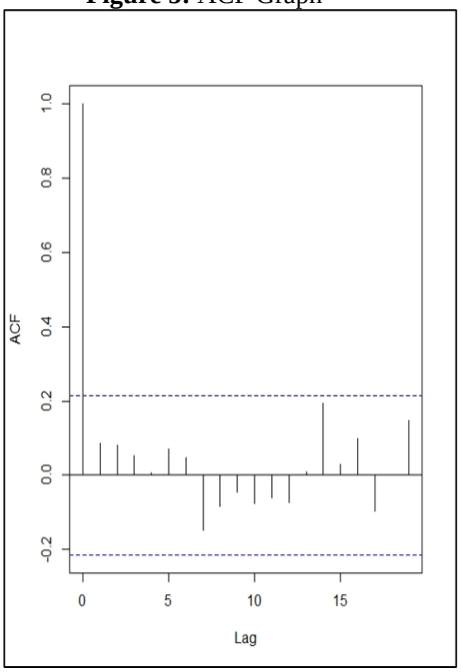


Figure 6: Pearson's Correlation Graph

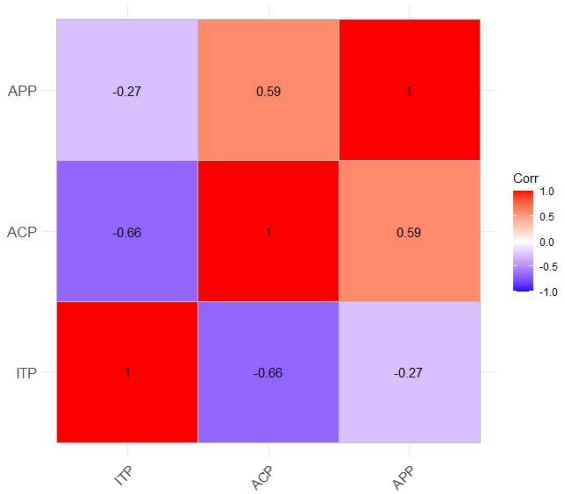
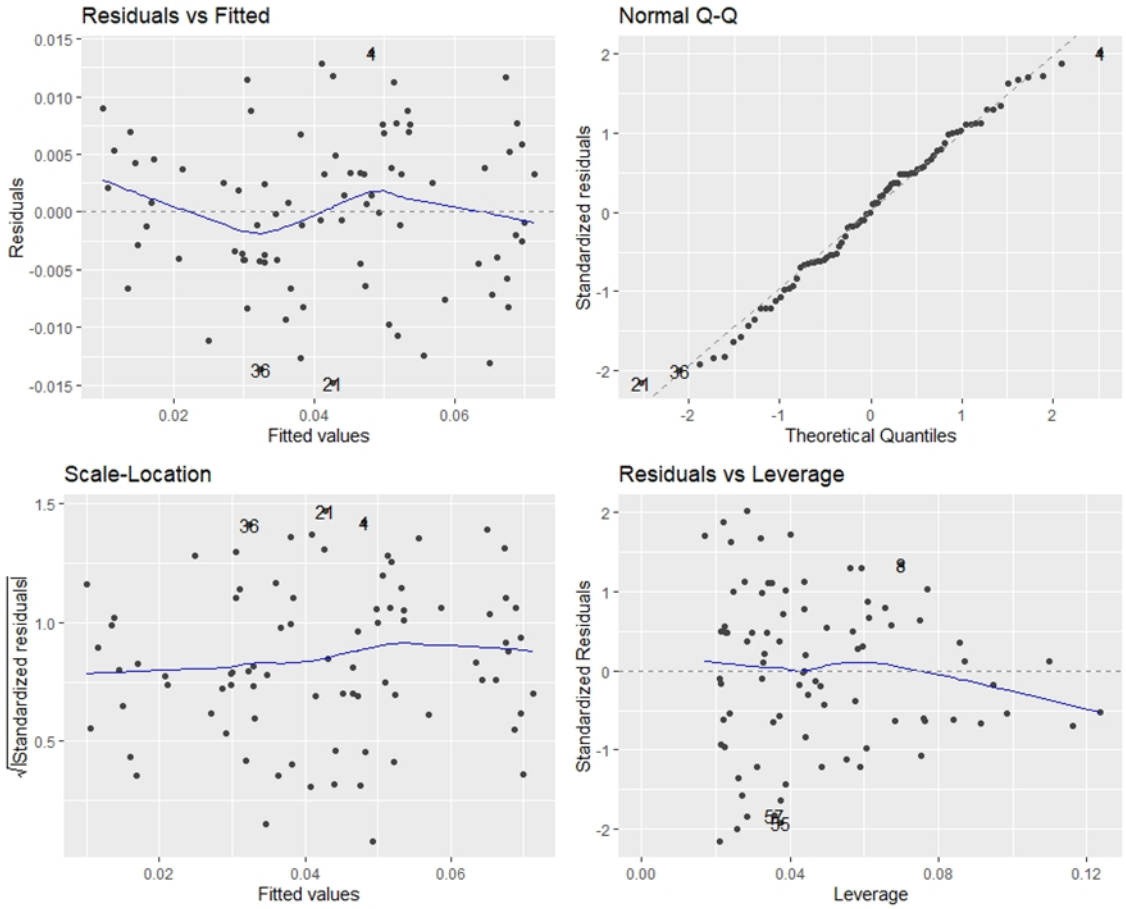


Figure 7. Multilinear Regression Tests Graphs



Conclusion

This research found that a more average payment period leads to more return on assets. Therefore, the results propose that managers can produce value for their owners by minimizing the average collection period and inventories to a fare minimum figure. The findings indicate that attention should be paid to the value of managing the components of the cash conversion cycle to avoid periods of potential financial distress. The results demonstrate the importance of balancing the needs for three components of the cash conversion cycle to achieve an increase in a company's profitability and performance. Therefore, these three components should be part of the strategic and financial planning of the company to function effectively, consistently, and successfully. The results show that profitable companies have shorter days of average collection period and average inventory period as well as longer average payment period. In other words, the results are consistent with Bolek et al. (2012) and García-Teruel and Martínez-Solano

(2007). García-Teruel and Martínez-Solano (2007) noted that the shorter the cash conversion cycle, the more profitable for the companies. The longer the cash conversion cycle, the more utilization in current assets, thus higher the requirement for financing the current asset. In addition, the results are consistent with Deloof (2003). The results indicate that managers can add value by reducing the days of both the average collection period and the average inventory turnover period. In addition, according to Nobanee et al. (2011), the shorter the cash conversion cycle, the more efficient it is to utilize a company's working capital as well as daily operations.

Conflict of Interest: The author reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

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