

The Relationship Between Working Capital Management And Profitability: Evidence From The United States

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Abstract

The paper seeks to extend Lazaridis and Tryfonidis's findings regarding the relationship between working capital management and profitability. A sample of 88 American firms listed on New York Stock Exchange for a period of 3 years from 2005 to 2007 was selected. We found statistically significant relationship between the cash conversion cycle and profitability, measured through gross operating profit. It follows that managers can create profits for their companies by handling correctly the cash conversion cycle and by keeping accounts receivables at an optimal level. The study contributes to the literature on the relationship between the working capital management and the firm's profitability.

Keywords: Working Capital; Corporate Profitability; Firm Size.

1. Introduction

This paper investigates the relationship between the working capital management and the firms' profitability for a sample of 88 American manufacturing companies listed on the New York Stock Exchange for the period of 3 years from 2005-2007. Management of working capital is an important component of corporate financial management because it directly affects the profitability of the firms. Management of working capital refers to management of current assets and of current liabilities [2, 3].

Researchers have approached working capital management in numerous ways. While some studied the impact of proper or optimal inventory management, others studied the management of accounts receivables trying to postulate an optimal way policy that leads to profit maximization [1, 4]. According to Deloof [5], the way that working capital is managed has a significant impact on profitability of firms. Such results indicate that there is a certain level of working capital requirement, which potentially maximizes returns.

Firms may have an optimal level of working capital that maximizes their value. Large inventory and generous trade credit policy may lead to high sales. The larger inventory also reduces the risk of a stock-out. Trade credit may stimulate sales because it allows a firm to access product quality before paying [2, 6]. Another component of working capital is accounts payables. Raheman and Nasr [2] state that delaying payment of accounts payable to suppliers allows firms to access the quality of bough products and can be inexpensive and flexible source of financing. On the other hand, delaying of such payables can be expensive if a firm is offered a discount for the early payment. By the same token, uncollected accounts receivables can lead to cash inflow problems for the firm.

A popular measure of working capital management is the cash conversion cycle, that is, the time span between the expenditure for the purchases of raw materials and the collection of sales of finished goods. Deloof [5], for example, found that the longer the time lag, the larger the investment in working capital. A long cash conversion cycle might increase profitability because it leads to higher sales. However, corporate profitability might decrease with the cash conversion cycle, if the costs of higher investment in working capital rise faster than the benefits of holding more inventories and/or granting more trade credit to customers.

For many manufacturing firms the current assets account for over half of their total assets [2, p. 279]. The management of working capital may have both negative and positive impact of the firm's profitability, which in turn, has negative and positive impact on the shareholders' wealth. The present study seeks to explore in detail these effects.

A variety of variables related to working capital management that might potentially be associated or 'responsible' for the profitability of manufacturing firms can be found in the literature. In this study, the choice of explanatory variables is based on alternative theories related to working capital management and profitability and additional variables that were studied in reported empirical work. The choice is sometimes limited, however, due to lack of data. As a result, the final set includes eight proxy variables: accounts receivables, accounts payables, inventory, cash conversion cycle, firm size, financial debt ratio, fixed financial assets ratio, and gross operating profit. The variables, together with theoretical predictions as to the direction of their influence on profitability are summarized in Table 1.

Lazaridis and Tryfonidis [1] and Raheman and Nasr [2] have tested variables by collecting data from Athens stock exchange and Pakistani firms respectively. This study extends these studies using data about American manufacturing firms. The results might be generalized to manufacturing industries.

This study contributes to the literature on the relationship between the working capital management and the firm's profitability in at least two ways. First, it focuses on American manufacturing firms where only limited research has been conducted on such firms recently. Second, this study validates some of the finding of previous authors by testing the relationship between working capital management and the profitability of the sample firms. Thus, this study adds substance to the existing theory developed by previous authors.

2. Literature Review

The management of working capital is defined as the "management of current assets and current liabilities, and financing these current assets." Working capital management is important for creating value for shareholders [7]. Management of working capital management was found to have a significant impact on both profitability and liquidity in studies in different countries.

Long *et al.* [6, p. 117] developed a model of trade credit in which asymmetric information leads good firms to extend trade credit so that buyers can verify product quality before payment. Their sample contained all industrial (SIC 2000 through 3999) firms with data available from COMPUSTAT for the three-year period ending in 1987 and used regression analysis. They defined trade credit policy as the average time receivables are outstanding and measured this variable by computing each firm's days of sales outstanding (DSO), as accounts receivable per dollar of daily sales. To reduce variability, they averaged DSO and all other measures over a three-year period. They found evidence consistent with the model. The findings suggest that producers may increase the implicit cost of extending trade credit by financing their receivables through payables and short-term borrowing.

Shin and Soenen [7] researched the relationship between working capital management and value creation for shareholders. The standard measure for working capital management is the cash conversion cycle (CCC). Cash conversion period reflects the time span between disbursement and collection of cash. It is measured by estimating the inventory conversion period and the receivable conversion period, less the payables conversion period. In their study, Shin and Soenen [7] used net-trade cycle (NTC) as a measure of working capital management. NTC is basically equal to the cash conversion cycle (CCC) where all three components are expressed as a percentage of sales. NTC may be a proxy for additional working capital needs as a function of the projected sales growth. They examined this relationship by using correlation and regression analysis, by industry, and working capital intensity. Using a COMPUSTAT sample of 58,985 firm years covering the period 1975-1994, they found a strong negative relationship between the length of the firm's net-trade cycle and its profitability. Based on the findings, they suggest that one possible way to create shareholder value is to reduce firm's NTC.

To test the relationship between working capital management and corporate profitability, Deloof [5, p. 573] used a sample of 1,009 large Belgian non-financial firms for a period of 1992-1996. By using correlation and regression tests, he found significant negative relationship between gross operating income and the number of days accounts receivable, inventories, and accounts payable of Belgian firms. Based on the study results, he suggests that managers can increase corporate profitability by reducing the number of day's accounts receivable and inventories.

Ghosh and Maji [8, p. 1] attempted to examine the efficiency of working capital management of Indian cement companies during 1992 - 93 to 2001 - 2002. They calculated three index values - performance index, utilization index, and overall efficiency index to measure the efficiency of working capital management, instead of using some common working capital management ratios. By using regression analysis and industry norms as a target efficiency level of individual firms, Ghosh and Maji [8] tested the speed of

achieving that target level of efficiency by individual firms during the period of study and found that some of the sample firms successfully improved efficiency during these years.

Eljelly [9] empirically examined the relationship between profitability and liquidity, as measured by current ratio and cash gap (cash conversion cycle) on a sample of 929 joint stock companies in Saudi Arabia. Using correlation and regression analysis, Eljelly [9] found significant negative relationship between the firm's profitability and its liquidity level, as measured by current ratio. This relationship is more pronounced for firms with high current ratios and long cash conversion cycles. At the industry level, however, he found that the cash conversion cycle or the cash gap is of more importance as a measure of liquidity than current ratio that affects profitability. The firm size variable was also found to have significant effect on profitability at the industry level.

Lazaridis and Tryfonidis [1, p. 26] conducted a cross sectional study by using a sample of 131 firms listed on the Athens Stock Exchange for the period of 2001 - 2004 and found statistically significant relationship between profitability, measured through gross operating profit, and the cash conversion cycle and its components (accounts receivables, accounts payables, and inventory). Based on the results analysis of annual data by using correlation and regression tests, they suggest that managers can create profits for their companies by correctly handling the cash conversion cycle and by keeping each component of the conversion cycle (accounts receivables, accounts payables, and inventory) at an optimal level.

Raheman and Nasr [2, p. 279] studied the effect of different variables of working capital management including average collection period, inventory turnover in days, average payment period, cash conversion cycle, and current ratio on the net operating profitability of Pakistani firms. They selected a sample of 94 Pakistani firms listed on Karachi Stock Exchange for a period of six years from 1999 - 2004 and found a strong negative relationship between variables of working capital management and profitability of the firm. They found that as the cash conversion cycle increases, it leads to decreasing profitability of the firm and managers can create a positive value for the shareholders by reducing the cash conversion cycle to a possible minimum level.

Garcia-Teruel and Martinez-Solano [3, p. 164] collected a panel of 8,872 small to medium-sized enterprises (SMEs) from Spain covering the period 1996 - 2002. They tested the effects of working capital management on SME profitability using the panel data methodology. The results, which are robust to the presence of endogeneity, demonstrated that managers could create value by reducing their inventories and the number of days for which their accounts are outstanding. Moreover, shortening the cash conversion cycle also improves the firm's profitability.

Falope and Ajilore [10, p. 73] used a sample of 50 Nigerian quoted non-financial firms for the period 1996 -2005. Their study utilized panel data econometrics in a pooled regression, where time-series and cross-sectional observations were combined and estimated. They found a significant negative relationship between net operating profitability and the average collection period, inventory turnover in days, average payment period and cash conversion cycle for a sample of fifty Nigerian firms listed on the Nigerian Stock Exchange. Furthermore, they found no significant variations in the effects of working capital management between large and small firms.

Mathuva [11, p. 1] examined the influence of working capital management components on corporate profitability by using a sample of 30 firms listed on the Nairobi Stock Exchange (NSE) for the periods 1993 to 2008. He used Pearson and Spearman's correlations, the pooled ordinary least square (OLS), and the fixed effects regression models to conduct data analysis. The key findings of his study were that: i) there exists a highly significant negative relationship between the time it takes for firms to collect cash from their customers (accounts collection period) and profitability, ii) there exists a highly significant positive relationship between the period taken to convert inventories into sales (the inventory conversion period) and profitability, and iii) there exists a highly significant positive relationship between the time it takes the firm to pay its creditors (average payment period) and profitability.

In summary, the literature review indicates that working capital management impacts on the profitability of the firm but there still is ambiguity regarding the appropriate variables that might serve as proxies for working capital management. The present study investigates the relationship between a set of such variables and the profitability of a sample of American manufacturing firms.

Table 1 below summarizes the definitions and theoretical predicted signs. Note that previous studies provide no clear-cut direction of the relationship between any of the variables and firm's profitability.

Table 1: Proxy variables definition and predicted relationship.

Proxy Variables	Definitions	Predicted sign
AR	Accounts receivables divided by sales and multiplied by 365 days	+/-
AP	Accounts payables divided by cost of goods sold and multiplied by 365 days	+/-
INV	Inventory divided by cost of goods sold and multiplied by 365 days	+/-
CCC	No. of days A/R plus No. of days inventory minus No. of days A/P	+/-
LnS	Natural logarithm of firm's sales, lagged one year period	+/-
FD	Short-term loans plus long-term loans divided by the total assets	+/-
FFA	Fixed financial assets divided by the total assets	+/-

AR = Accounts receivables

AP = Accounts payables

INV = Inventory

CCC = Cash conversion cycle

LnS = Firm size

FD = Financial debt ratio

FFA = Fixed financial asset ratio

3. Methods

3.1 Measurement

To remain consistent with previous studies, measures pertaining to working capital management and profitability were taken from Lazaridis and Tryfonidis's [1, p. 28] study. They used cross sectional yearly data and measured the variables as follows:

No. of Days A/R = (Accounts Receivables/Sales) x 365

No. of Days A/P = (Accounts Payables/Cost of Goods Sold) x 365

No. of Days Inventory = (Inventory/Cost of Goods Sold) x 365

Cash Conversion Cycle = (No. of Days A/R + No. of Days Inventory) – No. of Days A/P

Firm Size = Natural Logarithm of Sales

Financial Debt Ratio = (Short-Term Loans + Long-Term Loans)/Total Assets

Fixed Financial Asset Ratio = Fixed Financial Assets/Total assets

Profit = (Sales - Cost of Goods Sold) / (Total Assets - Financial Assets)

We used all the above variables. Firm size, financial debt ratio, and fixed financial asset ratio were used as control variables. In order to obtain dependent variable (gross operating profit), we subtract cost of goods sold from total sales and divide the results with total assets minus financial assets. The reason for using this variable instead of earnings before interest tax depreciation amortization (EBITDA) or profit before or after tax is that we want to associate operating "success" or "failure" with an operating ratio and relate this variable with other operating variables (e.g., cash conversion cycle). Furthermore, we want to exclude the participation of any financial activity from operating activity that might affect overall profitability. Therefore, we subtracted financial assets from total assets.

The study applied co-relational and non-experimental research design. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.

3.2 Data Collection

A database was built from a selection of approximately 300 financial-reports that were made public by publicly traded companies between January 1, 2005 and December 31, 2007. The selection was drawn from Mergent Online [<http://www.mergentonline.com/compsearch.asp>] to collect a random sample of manufacturing companies. Out of approximately 300 financial-reports announced by public companies between January 1, 2005 and December 31, 2007, only 88 financial reports

were usable. We used cross sectional yearly data in this study. Thus, 88 financial reports resulted to 264 total observations. Since random sampling method was used to select companies, we consider the sample as a representative sample.

For the purpose of this research, certain industries were omitted due to the type of activity. For example, we omitted all the companies from the service industry. In addition, some of the firms were not included in the data due to lack of information for the certain time.

3.3 Descriptive Statistics

Table 2 provides descriptive statistics of the collected variables. All variables were calculated using balance sheet (book) values. The book value was used because the companies did not provide any market value related to the variables that we used in this study. In addition, the measurement of profitability could only be based on income statement values, not on so-called market values. The explanatory variables are all firm specific quantities and there is no way to measure these variables in terms of their 'market value.' Furthermore, when market values are considered in such studies, there is always a rather legitimate question of the date for which the 'market values' refer. This is rather arbitrary. Hence, we relied on 'book values' as of the date of the financial reports.

Total observations come to $88 \times 3 = 264$. The credit period granted by companies to their clients ranged at 53.48 days while they paid their creditors in 49.50 days on average. Inventory took on an average 78.63 days to be sold. Overall, the average cash conversion cycle ranged at 89.94 days.

The average firm size measured by logarithm of sales came to 6.41 million and firms that we included in our sample had an average of 30 percent gross operating profit. The average financial debt ratio came to 32 percent and the fixed financial asset ratio came to 4 percent.

Table 2: Descriptive Statistics of Independent, Dependent, and Control Variables (2005-2007).

Descriptive Statistics (N = 264)				
	Minimum	Maximum	Mean	Std. Deviation
AR	11.60	126.88	53.48	19.98
AP	7.32	258.54	49.50	33.03
INV	13.02	304.62	78.63	47.46
CCC	13.38	301.34	89.94	50.75
LnS	3.87	8.89	6.41	0.83
FD	0.02	0.73	0.32	0.17
FA	0.00	0.18	0.04	0.04
Profit	0.01	0.89	0.30	0.18

N = Number of observations

Table 3 provides the Pearson correlation for the variables that we used in the regression model. Pearson's correlation analysis is used for data to find the relationship between working capital management and gross operating profit. We found that the gross operating profit is negatively correlated with the accounts receivables. The negative correlation between accounts receivables and gross operating profit indicates that if the average collection period increases it will have a negative impact on the profitability.

Table 3: Pearson Bivariate Correlation Analysis.

	Profit	AR	AP	INV	CCC	LnS	FD	FA
Profit	1	-0.315**	0.013	0.143	0.022	0.180	-0.138	-0.069
AR		1	0.147	0.318**	0.558**	0.007	-0.119	-0.347*
AP			1	0.239*	0.061	-0.006	-0.035	-0.141
INV				1	0.869**	0.002	-0.052	-0.093
CCC					1	0.053	-0.214	-0.211
LnS						1	-0.114	-0.149
FD							1	-0.122
FA								1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

3.4 Regression Analysis

In this section, we present the empirical findings on the relationship between working capital management and profitability of the American manufacturing firms. We used the weighted least square model with cross section weight of five industries (health care manufacturing, industrial products manufacturing, chemical products manufacturing, energy products manufacturing, and food production). When we use the pooled data and cross sections, there may be a problem of heteroskedasticity (changing variation after short period) [2, P. 292). To counter this problem, we used the general least square with cross section weights. In this regression, the common intercept was calculated for all variables and assigned a weight.

Table 4: WLS Regression estimates on factors affecting profitability. ^{a, b, c, d}

R ² = 0.373; S.E.E. = 0.085; F = 4.767								
Regression Equation (A): Gross Operating Profit = 0.480 – 0.003 AR + 0.019 LnS – 0.442 FD – 1.113 FA								
	Un-standardized Coefficients		Standardized Coefficients ^d		t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta				Tolerance	VIF
(Constant)	0.480	0.257			1.869	0.071		
AR	-0.003	0.001		-0.396	-2.349	0.025	0.688	1.453
LnS	0.019	0.028		0.111	0.684	0.499	0.749	1.335
FD	-0.442	0.135		-0.588	-3.281	0.003	0.610	1.640
FA	-1.113	0.587		-0.319	-1.898	0.067	0.694	1.441

^a Dependent Variable: Gross Operating Profit

^b Independent Variables: AR, LnS, FD, and FA

^c Weighted Least Squares (WLS) Regression - Weighted by Weight for PROFIT from WLS, MOD_10 INDUSTRY** -1.000

^d Linear Regression through the Origin

S.E.E. = Standard Error of the Estimate

The results of regression equation "A" indicate that the coefficient of accounts receivable is negative; that is, the increase or decrease in average collection period will significantly affect the profitability of the firm.

We used financial debt ratio as a proxy for leverage; it shows a significant negative relationship with the dependent variable, which means that, when leverage of the firm increases, it will adversely affect its profitability.

The ratio of fixed financial assets to total assets also has negative relation with gross operating profit, but only marginally significant.

We examined the extent to which the use of alternative proxies for working capital management might provide different results. To this end, we replaced the average days of accounts receivable variable (AR) by the average days of accounts payable (AP). We also used in another regression the variable average days of inventory held (INV) instead of AR or AP. Finally, we used the variable Cash Conversion Cycle (CCC) as a proxy for working capital management.

Using the average days of accounts payable in the regression provided very poor results (Table 5). None of the variables turned out to be statistically significant. The same applies for the regression where average days of inventory held was used as a proxy for working capital management (Table 6).

Table 5: WLS Regression estimates on factors affecting profitability. ^{a, b, c, d}

$R^2 = 0.216$; S.E.E. = 0.115; F = 2.204								
Regression Equation (B): Gross Operating Profit = 0.040 + 0.000 AP + 0.049 LnS – 0.242 FD – 0.386 FA								
	Un-standardized Coefficients		Standardized Coefficients ^d		t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta				Tolerance	VIF
(Constant)	0.040	0.239			0.169	0.867		
AP	0.000	0.001	-0.020		-0.124	0.902	0.983	1.017
LnS	0.049	0.032	0.260		1.525	0.137	0.845	1.183
FD	-0.242	0.137	-0.306		-1.764	0.087	0.816	1.225
FA	-0.386	0.581	-0.110		-0.664	0.511	0.887	1.128

^a Dependent Variable: Gross Operating Profit

^b Independent Variables: AP, LnS, FD, and FA

^c Weighted Least Squares Regression - Weighted by Weight for PROFIT from WLS, MOD_11 INDUSTRY** -.500

^d Linear Regression through the Origin

Table 6: WLS Regression estimates on factors affecting profitability. ^{a, b, c, d}

$R^2 = 0.282$; S.E.E. = 0.110; F = 3.138								
Regression Equation (C): Gross Operating Profit = -0.015 + 0.001 INV + 0.043 LnS – 0.201 FD – 0.216 FA								
	Un-standardized Coefficients		Standardized Coefficients ^d		t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta				Tolerance	VIF
(Constant)	-0.015	0.228			-0.064	0.949		
INV	0.001	0.001	0.269		1.717	0.096	0.917	1.090
LnS	0.043	0.031	0.228		1.394	0.173	0.837	1.194
FD	-0.201	0.133	-0.254		-1.510	0.141	0.791	1.264
FA	-0.216	0.560	-0.062		-0.386	0.702	0.872	1.147

^a Dependent Variable: Gross Operating Profit

^b Independent Variables: INV, LnS, FD, and FA

^c Weighted Least Squares Regression - Weighted by Weight for PROFIT from WLS, MOD_12 INDUSTRY** -.500

^d Linear Regression through the Origin

When we used the cash conversion cycle (CCC) as the proxy for working capital management, the coefficient of the variable CCC is positive and significant. Thus, the higher the cash conversion cycle, the higher the profitability of the firm (Table 7).

Table 7: WLS Regression estimates on factors affecting profitability. ^{a, b, c, d}

$R^2 = 0.264$; S.E.E. = 0.159; F = 2.600							
Regression Equation (D): Gross Operating Profit = $-0.218 + 0.001 \text{ CCC} + 0.051 \text{ LnS} + 0.045 \text{ FD} + 0.176 \text{ FA}$							
	Un-standardized Coefficients		Standardized Coefficients ^d	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-0.218	0.259		-0.840	0.408		
CCC	0.001	0.001	0.442	2.376	0.024	0.734	1.362
LnS	0.051	0.034	0.255	1.491	0.147	0.867	1.153
FD	0.045	0.152	0.058	0.298	0.768	0.679	1.472
FA	0.176	0.580	0.054	0.303	0.764	0.800	1.250

^a Dependent Variable: Gross Operating Profit

^b Independent Variables: CCC, LnS, FD, and FA

^c Weighted Least Squares Regression - Weighted by Weight for PROFIT from WLS, MOD_13 INDUSTRY** .500

^d Linear Regression through the Origin

Test for multi-collinearity were performed for all four regressions. All the variance inflation factor (VIF) coefficients are less than 2 and tolerance coefficients are greater than 0.5.

4. Discussion

Previous research predicts negative relationship between accounts receivables and corporate profitability [1, 2, 5, 10, 11]. Our results are in line with these findings. The finding indicates that slow collection of accounts receivables is correlated with low profitability. Managers can improve profitability by reducing the credit period granted to their customers. Regarding the average days of accounts payable previous studies reported negative correlation of this variable and the profitability of the firm [1, 2, 3]. We found no statistically significant relationship between these variables. Examining the relationship between the average number of days the inventory is held and the profitability, Raheman and Nasr [2] and Lazaridis and Tryfonidis [1] found that the relationship is negative. We found no significant relationship in our sample. Previous theoretical research predicts negative relationship between cash conversion cycle and corporate profitability [1, 2, 3, 5, 7, 9, 10]. We found a positive relationship between cash conversion cycle and gross operating profit. Finally, we found no significant relationship between firm size and its gross operating profit ratio.

This paper adds to existing literature such as Deloof [5], Lazaridis and Tryfonidis [1], Raheman and Nasr [2], Falope and Ajilore [10], and Mathuva [11] who found negative relationship between accounts receivables and corporate profitability. We observed i) a negative relationship between profitability (measured through gross operating profit) and average days of accounts receivable and ii) a positive relationship between cash conversion cycle and profitability. Therefore, it seems that operational profitability dictates how managers act in terms of managing accounts receivables. Thus, the findings of this paper suggest that managers can create value for their shareholders by reducing the number of days for accounts receivables. In addition, the negative relationship between accounts receivables and firm's profitability suggest that less profitable firms will pursue a decrease of their accounts receivables in an attempt to reduce their cash gap in the cash conversion cycle. On the basis of findings of this paper, we conclude that profitability can be enhanced if firms manage their working capital in a more efficient way.

4.1 Limitations

This study is limited to the sample of American manufacturing industry firms. The findings of this study could only be generalized to manufacturing firms similar to those that were included in this research. In addition, the sample size is small.

4.2 Future Research

Future research should investigate generalization of the findings beyond the American manufacturing sector. The scope of further research may be extended to the working capital components management including cash, marketable securities, receivables, and inventory management.

5. Competing Interests

The authors declare that they have no competing interests.

6. Authors' Contributions

AG developed the framework, gathered data, carried out the final estimations and statistical analysis, and drafted the manuscript. NB and NM edited the final draft.

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