



The Dynamic Interplay between Working Capital Management and Profitability: Empirical Insights from European Markets

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Abstract

This study aims to investigate the effect of working capital management on the profitability of manufacturing firms in Europe. To achieve the purpose of this research, we used a multiple regression approach on a balanced panel dataset of 39 European manufacturing firms listed on the Frankfurt and Oslo stock markets between 2017 and 2021. The findings illustrated that both return on assets (ROA) and return on equity (ROE) are negatively affected by days sales outstanding. Days payable outstanding have a negative and insignificant effect on ROA, but positive on ROE. Liquidity has a positive impact on both ROA and ROE. Debt to equity has a significant and negative effect on ROA, but a positive on ROE. Overall, managers should understand how to organize and manage working capital because it can be considered a crucial factor in determining the profitability of manufacturing firms.

Keywords

European Markets, Manufacturing Firms, Working Capital Management, Firm Profitability

I. Introduction

Working capital management (WCM) has gained a lot of attention and acceptance recently due to its significant contribution to increased business profitability (Baños-Caballero et al., 2012; Rey-Ares et al., 2021). According to Aldubhani et al. (2022) WCM can provide productivity and enough liquidity to support firms in fulfilling their immediate and future financial requirements arising from funding their operations to sustain the firm's growth and profitability. This is because WCM is related to current assets and current liabilities, which contribute a sizable portion of firms' assets.

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In addition, a study by Raheman and Nasr (2007) showed that maintaining higher levels of current assets results in a sustainable return on investment for the business. Nevertheless, firms that have significantly low levels of current assets will be more vulnerable to suffering from difficulties and problems, such as slow operation management, inability to pay short-term debt, and increased exposure to liquidity risk (Aldubhani et al., 2022; Van Horne and Wachowicz, 2000). Hence, making a balance between the components of working capital management is crucial for increasing business profitability and future success. In other words, by developing a decision on working capital policy, businesses can increase profitability and offer investors additional value (Nguyen et al., 2020; Fazekas and Becsky-Nagy, 2015). Therefore, it is obvious that WCM has an enormous effect on a firm's solvency, economic viability, efficiency in operation, and organizational value. In order to attain optimal management of working capital, firms should attempt to control the risks and rewards associated with investing in current assets (Tsagem et al., 2015).

Furthermore, inventory management, cash holding for daily operations of the business, payable, receivable, cash conversion efficiency, and cash conversion efficiency are all significant components of working capital management (Gill and Biger, 2013; Isshaq et al., 2009; Sawarni et al., 2021). The level of significance among those components can be underlined through the way in which the cost and method for funding assets are connected because current assets are normally financed by short-term loans (Ahmed, 2022; Ahmed et al., 2023a; Aldubhani et al., 2022). As a result, net working capital (NWC) can be viewed as the distinctions between current resources and current liabilities (Karaduman et al., 2010), and if financing through long-term borrowing is increasing, it will increase debt expenses and liabilities and as a result, it will negatively affect profitability (Ahmed et al., 2023b; Subramanyam, 2014). Nevertheless, the current COVID-19 pandemic has revealed an economic recession and a lack of liquidity that are similar to those encountered both before and after the 2007 financial crisis (Aldubhani et al., 2022). This proves that working capital management (WCM) is a driving force behind the success of manufacturing firms. According to Enqvist et al. (2014) these industries should provide the necessary liquidity to support their operations through both regular and short-term funding. Thus, working capital can be thought of as the lifeblood of the firm and one of the key factors affecting how long the business can continue to operate and in order to achieve the goal of the firm, effective working capital management is a necessary procedure.

The current study has two main objectives, first, it aims to explore the impact of days sales outstanding (DSO); days payable outstanding (DPO); and liquidity (LIQ) on return on assets (ROA) as a measurement of profitability for manufacturing firms that listed on Frankfurt and Oslo stock exchange. Secondly, it aims to investigate the effect of days sales outstanding (DSO); days payable outstanding (DPO); and liquidity (LIQ) on return on equity (ROE) as a measurement of profitability for manufacturing firms that are listed on Frankfurt and Oslo stock exchange. From the previous literature, numerous studies have investigated the association between WCM and profitability, such as (Aldubhani et al., 2022; Alvarez et al., 2021; Amponsah-Kwatiah and Asiamah, 2020; Basyith et al., 2021; Enqvist et al., 2014; Gonçalves et al., 2018; Karaduman et al., 2010; Laghari and Chengang, 2019; Mun and Jang, 2015; Pratap Singh and Kumar, 2014; Sawarni et al., 2021; Tsagem

et al., 2015). However, their results are mixed between positive, negative, and non-linear relationships. In addition, none of them have focused on European countries and specifically manufacturing firms. Although Germany and Norway have obtained great development in the manufacturing sector for many years, and can be seen as two industrialized countries, examining certain concepts and their problems from developed economies could add valuable insight and enhance the business management literature. Moreover, German and Norway have a sizable industrial sector that supports their country's economic growth. Hence, conducting research in this field could release valuable information to diverse groups of stakeholders, but mainly to investors, managers, creditors, debtors, and suppliers. The next section focuses on reviewing various related literature and developing the study hypothesis, while section three explains the material and method. Section four covers empirical analysis and discussion. Finally, conclusions and recommendations are exhibited in section five.

II. Reviewing Prior Studies and Hypothesis Development

Managing working capital management is a theory that aims to support a firm's daily operations by identifying the ideal balance between debtors, cash, inventories, liquidity, and funding them with current obligations at the absolute rate (Brigham and Houston, 2009; Fazekas and Becsky-Nagy, 2019). firms need to know how to handle and sustain quick resources since there is a difference in managing each of its fundamental parts, as well as a firm's profitability that is directly affected by the efficient management of each part. (Ehrhardt and Brigham, 2011).

Days sales outstanding and Profitability

The concept of "Days sales outstanding" refers to the average amount of time required for a business to convert its receivables into cash upon sales. It is calculated by dividing the receivables to the daily credit sales (Amponsah-Kwatiah and Asiamah, 2020; Ponsian et al., 2014). Thus, it can be used to measure the relationship between receivable and flowing cash. According to Aldubhani et al. (2022). The first stage in managing accounts receivable for the firm is deciding on its credit strategy. However, firms ought to have a system in place to verify that credit terms are applied and being followed. It is frequently necessary to take corrective action about particular credit strategies, and having an effective receivable monitoring system is a way to determine whether the condition is appropriate and under supervision and control (Ehrhardt and Brigham, 2011). From the previous literature, Alvarez et al. (2021); Amponsah-Kwatiah and Asiamah (2020); Jakpar et al. (2017); Sharma and Kumar (2011) found a positive association between accounts receivable and firm profitability. However, Bieniasz and Gołaś (2011); Enqvist et al. (2014); Jayarathne (2014) claimed a negative relationship between accounts receivable and profitability. They also conclude that a decrease in the time it takes to collect money from debtors would increase profitability. Therefore, the first hypothesis is developed as follows:

H1: Days sales outstanding significantly affect firms' profitability.

Days payable outstanding and Profitability

The payment cycle can be explained by the average time between the purchasing of raw materials and cash payment (Ponsian et al., 2014). The accounts payable involve accumulated expenses and trade credit, which gives continuous funding to enhance corporate activities (Bhattacharya, 2014). Any delays in payments to the suppliers may extend the payable period, which reduces the process of the cash conversion cycle and enhances the efficiency of using working capital (Deloof, 2003; Ponsian et al., 2014; Raheman and Nasr, 2007). Thus, accounts payable can be seen as an inexpensive and adaptable source of funding (Enqvist et al., 2014). Prior investigations, such as (Aldubhani et al., 2022; Alvarez et al., 2021; Gonçalves et al., 2018; Hsieh and Wu, 2013) found a positive connection between days payable outstanding and profitability. On the other hand, Deloof (2003); Enqvist et al. (2014); Tsagem et al. (2015) reported a negative and significant association between accounts payable and firms' profitability, while (Fernández-López et al., 2020; Vural et al., 2012) found non-significant association. As a result, the second hypothesis is developed as follows:

H2: Days payable outstanding significantly affect firms' profitability.

Liquidity and Profitability

A firm's liquidity is characterized by the amount of available cash, which can be obtained quickly to pay its debts (Ponsian et al., 2014). The management should understand how to manage and control working capital because it is significantly related to firms' profitability and their value. This means that the greatest management of working capital will deliver a useful level of liquidity to support the firm's activity by automatic funding, which can be seen as an important key due to less liquidity and credit issues from the crisis (Aldubhani et al., 2022). In this context, Karaduman et al. (2010); Raheman and Nasr (2007) suggested an adverse correlation between liquidity and profitability. However, Adekola et al., (2017); Azam and Haider (2011) have found a favorable association between a firm's liquidity and profitability. As a result, the fourth hypothesis is developed as follows:

H3: Firms' liquidity significantly affects profitability.

III. Material and Method

Sample and Data Collection

A sample panel data was contained from 39 listed manufacturing firms and originally they were 45, but 6 of them were removed due to missing financial data and other data collection obstacles. Balanced panel data was mainly gathered and collected from the published annual report of manufacturing firms that were listed on the Frankfurt and Oslo stock exchanges during the period of (2017–2021).

Dependent Variables

The current research considers profitability as a dependent variable, and theoretically, it is argued that working capital, an internal factor, directly affects firms' profitability. Following the guidance of prior literature, this paper has two dependent variables for measuring profitability, which are return on assets (ROA) and return on equity (ROE) (Ahmed et al., 2023a; Aldubhani et al., 2022; Alvarez et al., 2021).

Independent Variables

To investigate the effects of working capital management (WCM) on profitability, three indicators of WCM were used in this investigation and they are; Days sales outstanding (DSO), which is measured by average receivable divided by sales and multiplied by 365 days; Days payable outstanding (DPO), which is measured by average payable to cost of goods sold and multiplied by 365 days; liquidity (LIQ), which is measured by current ratio as current assets divided by current liabilities (Aldubhani et al., 2022; Alvarez et al., 2021; Amponsah-Kwatiah and Asiamah, 2020; Fernández-López et al., 2020; Gonçalves et al., 2018; Hsieh and Wu, 2013; Jakpar et al., 2017; Adekola et al., 2017; Azam and Haider, 2011; Sharma and Kumar, 2011).

Control Variables

In WCM literature, several investigations have applied different control variables to consider the firm-specific characteristics. Following the directions of previous literature, this study applied a control variable that related to the firm-specific characteristics, such as leverage ratio (Fernández-López et al., 2020; Padachi, 2006; Ahmed et al., 2023c). All variables are clearly defined in table 1.

Table 1: Definition of Variables

Variables	Abbreviation	Measurements
Dependent variables:		
Return on Assets	ROA	Net income / Total assets
Return on Equity	ROE	Net income / Total shareholders' equity
Exogenous variables:		
Days sales outstanding	DSO	(Receivable / Sales) * 365
Days payable outstanding	DPO	(Payable / Cost of goods sold) * 365
Liquidity	LIQ	Current assets / Current liabilities
Control variables:		
Leverage	DTE	Total debt / Total equity

Source: Elaborated by the authors

Based on the above explanation, the regression models are developed as follow:

Model 1:

$$ROA_{it} = a_0 + \beta_{-1}DSO_{it} + \beta_{-2}DPO_{it} + \beta_{-3}LIQ_{it} + \beta_{-4}DTE_{it} + e_{it}$$

Model 2:

$$ROE_{it} = a_0 + \beta_{-1}DSO_{it} + \beta_{-2}DPO_{it} + \beta_{-3}LIQ_{it} + \beta_{-4}DTE_{it} + e_{it}$$

Where, ROA_{it} is a return on assets from i at t time, ROE_{it} is a return on equity from i at t time; DSO_{it} is days sales outstanding from i at t time; DPO_{it} is days payable outstanding from i at t time; LIQ_{it} is liquidity from i at t time; DTE_{it} is debt to equity ratio from i at t time; a_0 is constant; $\beta_{-1} - \beta_{-5}$ is the coefficient for the parameters that correspond to the explanation and e_{it} is the error term.

IV. Results

Descriptive Statistics

Table 2 demonstrates the statistical summary of the dependent, independent, and control variables. The mean values of ROA and ROE are 3.66% and 8.87% with a deviation of 9.94 and 16.17 respectively. The minimum and maximum values of ROA are -56.49 and 29.21 respectively. The lowest and highest value ROE is -62.06 and 56.44 respectively. The standard deviation of DSO and DPO is 42.07 and 55.80 with a mean value of 79.76 and 66.38 respectively. The minimum and maximum values of DSO are 9.19 and 254.26 respectively. The lowest and highest values of DPO are 5.33 and 376.33 respectively. LIQ has a mean value of 2.65, with a standard deviation of 4.20. The minimum and maximum values of LIQ are 0.25 and 54.93 respectively. Finally, the mean value of DTE is 1.88 with a deviation of 2.85. The lowest value of DTE is 0.09 and the highest value is 22.25.

Table 2: Descriptive Statistics of the Variables

Variables	ROA %	ROE %	DSO	DPO	LIQ	DTE
Mean	3.66	8.87	79.76	66.38	2.65	1.88
Std. Dev.	9.94	16.17	42.07	55.80	4.20	2.85
Maximum	29.21	56.44	254.26	376.33	54.93	22.25
Minimum	-56.49	-62.06	9.19	5.33	0.25	0.09
Observations	195	195	195	195	195	195

Source: Computed by the authors

Correlation analysis

Table 3 indicates the Pearson correlation between WCM and profitability. The strong correlation between ROA and ROE is noted, which is 86.9%. DSO is negatively related to ROA and ROE with a value of -0.045 and -0.102 respectively. The relationship between DPO with ROA and ROE is significant and negative with a value of -0.619 and -0.490

respectively. LIQ has a negative and significant association with ROA and ROE with a value of -0.142 and -0.138 respectively. DTE as a control variable is negatively related to ROA at -0.105 , but positively to ROE at 0.192 .

Table 3: Correlation Analysis

	ROA	ROE	DSO	DPO	LIQ	DTE
ROA	1	0.869***	-0.045	-0.619***	-0.142**	-0.105
ROE	0.869***	1	-0.102*	-0.490***	-0.138*	0.192***
DSO	-0.045	-0.102*	1	-0.032	-0.023	-0.020
DPO	-0.619***	-0.490***	-0.032	1	0.334***	-0.055
LIQ	-0.142**	-0.138*	-0.023	0.334***	1	-0.142**
DTE	-0.105	0.192***	-0.020	-0.055	-0.142**	1

Source: Computed by the authors

Notes: *** Significant at 1% level; ** Significant at 5% level; and * Significant at 10% level

Moreover, this investigation employs cross-sectional balanced panel data for 39 manufacturing firms from 2017–2021. Thus, multicollinearity fears must be considered. To discover the collinearity issues among independent variables, the first correlation analysis has been examined to test the relationship between independent variables. According to (Gujarati and Porter, 2009; Wooldridge, 2015), multicollinearity problems may arise if the coefficient of correlation among explanatory variables (independent variables) is greater than 0.70. From the results of table 3, the highest correlation between independent variables is 0.33. Therefore, the issues of multicollinearity cannot be considered in this study. Secondly, the study further investigated the presence of multicollinearity problems using two additional widely used metrics “tolerance and variance inflation factor (VIF)”. A value of $VIF \geq 10$ and a tolerance value of less than 0.1 are considered multicollinearity problems (Nachane, 2006; Newbold et al., 2013). Table 4 notes that the highest value of VIF is 1.146 and the lowest tolerance value is 0.87. Therefore, the issue of multicollinearity is free in this study and can run the regression safely. This estimation is also tested by (Abebe Zelalem et al., 2022; Gujarati and Porter, 2009; Newbold et al., 2013).

Table 4: Variance Inflation Factor (VIF)

Variables	Tolerance Value	VIF Value
DSO	0.998	1.002
DPO	0.888	1.126
LIQ	0.873	1.146
DTE	0.979	1.022
Mean = 1.074		

Source: Computed by the authors

Regression Analysis and Discussion

To assess the robustness of the outcomes, the suggested hypotheses were tested using both fixed and random-effects estimators. As demonstrated by (Greene, 1997), the Hausman test was utilized in this study to determine whether fixed or random effect is more suitable (Naseem et al., 2017). The results of the Hausman test in table 5 show that the p-value in both models ROA and ROE is significant at 1%. This means that the study rejects the null hypothesis and runs the regression with a fixed-effect model because it is more appropriate. The results of table 5 also demonstrated that the adjusted R^2 of 0.79 for ROA and 0.69 for ROE illustrating that 79% and 69% of the variation in ROA and ROE are explained by the models. Both models are well-fitted, with an F-statistic value of 14.29 for ROA, statistically significant at 1%, and 8.10 for ROE, also statistically significant at 1%.

Table 5: Results of the fixed-effect model (FEM)-ROA and ROE

Variable	Model 1 (ROA)	Model 2 (ROE)
DSO	−0.043* (0.023)	−0.093** (0.046)
DPO	−0.004 (−0.004)	0.010 (0.031)
LIQ	0.267*** (0.110)	0.419* (0.225)
DTE	−0.437** (0.206)	0.684* (0.414)
C	7.523*** (1.870)	13.25*** (3.761)
R-squared	0.79	0.69
Adjusted R-squared	0.74	0.60
F-statistic	14.29	8.10
Prob(F-statistic)	0.000	0.000
Hausman Test	35.98***	21.101***
Durbin-Watson stat	2.09	2.05

Source: Computed by the authors

Notes: *** Significant at 1% level; ** Significant at 5% level; and * Significant at 10% level.

() Values in parentheses represent standard errors of the estimated coefficients.

The empirical findings demonstrate that the coefficient of DSO is negative and statistically significant in both models (ROA and ROE) with a value of −0.043 and −0.093 respectively. This means that a 1% increase in delaying receivable collection brings about a decrease in profitability that is measured through ROA and ROE by 0.04% and 0.09% respectively. In other words, firms' profitability is reduced when the receivable collection takes an extended period among German and Norway manufacturing firms. This is because when the customers return their outstanding bills late or take a long time, the firm's cash inflows are delayed. This brings a liquidity challenge for the firm because they may suffer difficulties fulfilling their financial commitments, such as paying vendors, funding operating costs, or repaying debt. Hence, manufacturing firms that have poorly managed days sales outstanding have low profitability. The above findings support the first hypothesis that days sales

outstanding significantly affect firms' profitability and are consistent with the results of (Bieniasz and Golaś, 2011; Enqvist et al., 2014; Fernández-López et al., 2020; Jayarathne, 2014).

Moving to the DPO, the findings show that the relationship between DPO and ROA is negative with a coefficient of -0.004 but positive in the case of ROE with a coefficient of 0.010 . However, these results are statistically insignificant. This means that an increase or decrease in days payable outstanding (DPO) does not have any influence on firms' profitability among German and Norway manufacturing firms. The firm's capacity to make revenue from its primary activities is not always impacted by the schedule of payments to vendors. Therefore, these findings reject the second hypothesis that days payable outstanding significantly affect firms' profitability and are similar to the arguments of (Fernández-López et al., 2020; Vural et al., 2012).

In addition, liquidity (LIQ) that is measured by the current ratio has a positive and significant effect on firms' profitability (ROA and ROE) with a coefficient value of 0.267 and 0.419 respectively. This clearly indicates that a 1% increase in LIQ results in an increase of profitability by 0.26% in the case of ROA and 0.41% in the case of ROE. In other words, firms with a relatively high rate of liquidity can cover their obligations without focusing on external financing. Thus, firms with effective working capital management are expected to have more returns and consequently improve profitability. Efficiency in operations is enhanced by excellent management of working capital, ensuring that the firm can continue operating daily and maintaining a smooth production period, which may have a beneficial influence on profitability. These findings support the third hypothesis that a firm's liquidity has a significant impact on profitability and consistency with the work of (Adekola et al., 2017; Azam and Haider, 2011), however, it contradicts with the study of (Karaduman et al., 2010; Raheman and Nasr, 2007).

Regarding the control variable, leverage that is indicated by DTE has a negative and significant impact on ROA with a coefficient value of -0.437 but has a positive influence on ROE with a coefficient of 0.684 . However, this relationship is significant at a 10% level in the case of ROE only. If other factors remain constant, this normally means that a 1% increase in DTE causes a reduction in ROA by 0.43% . Elevated debt amounts translate into increased interest costs, which consequently diminishes the ROA equation. A lower ROA, which indicates that the business is making less profit in relation to its total resources, may be the outcome of this decline in net revenue. However, a firm's ROE is impacted positively by excess return if they can generate a return on its resources that exceeds the cost of debt. When compared to a situation in which the firm uses funding from equity, this financing strategy may result in a higher return on equity. These findings are similar to the results of (Aldubhani et al., 2022; Amponsah-Kwatiah and Asiamah, 2020; Enqvist et al., 2014) who found that leverage as a firm-specific factor has a significant effect on profitability.

V. Conclusion

This paper examines the effect of working capital management (WCM) on the profitability of 39 manufacturing firms listed on the Frankfurt and Oslo stock exchange between (2017–2021). To obtain the research objective, Ordinary Least Square (OLS) with the fixed-effect model is employed to determine the above correlation. The dependent variable is profitability, and indicated by return on assets (ROA) and return on equity (ROE). Working capital management is an exogenous variable and is measured by three proxies, such as days sales outstanding (DSO), days payable outstanding (DPO), and liquidity (LIQ) through the current ratio.

Overall, the study found that managing working capital has a proportional influence on profitability in a way that DSO has a significant and negative effect on profitability, indicating that when the customers bring back their outstanding bills late, the delays in firm cash inflows are recorded. Hence, firms may suffer challenges to meet their financial commitments followed by lower profitability.

DPO affects ROA negatively but positively influences ROE. However, these results are statistically not significant. In addition, the association between LIQ with ROA and ROE is significant and positive demonstrating that firms who have a higher liquidity ratio can return their obligations confidentially without considering any external funding. Therefore, proper management of working capital might be necessary for manufacturing firms as they use larger assets for their operation compared with business organizations. The findings also show that leverage as a specific factor at the firm level significantly influences the above relationship. An increase in debt amount can bring an extra interest cost, which finally reduces return on assets, while a firm's return on equity is impacted positively by excess return if they can generate a return on its resources that exceeds the interest expenses. This paper enriches the business management literature empirically by examining how the management of working capital plays a significant role in regulating the firm profitability in emerging market such as German and Norway. The findings also demonstrate that by enhancing the impact of working capital management on maximizing business profitability, large firms, such as the manufacturing industry, have enormous value as they increase their assets step by step to obtain future opportunities. Moreover, the results of this study have several practical consequences for manufacturing firms, first, enhancing a firm's profitability requires careful working capital management in terms of managing cash flow, debtors, creditors, and efficient stock issuance. Secondly, it will be possible for policymakers to mandate operating guidelines and knowledge for proper working capital management for manufacturing firms. Lastly, the executives of manufacturing firms can obtain data about the receivable collections, return their obligations, and manage cash flow, which will help them to make a proper decision toward the management of working capital.

Like other studies, there are some limitations in this study that will require more investigation by future studies. The initial limitation relates to the population and sample size, which consists of 39 manufacturing firms from only two European countries due to the unavailability of data. There may be no guarantee to generalize these outcomes to be applied in different circumstances. For this reason, a comparable study needs to be carried out in other countries and industries to strengthen the validity of our conclusions. Additionally,

secondary data is applied in this study, however, primary data can also be used to obtain extra information by mixing both survey and reported data to compare the current findings with future study conclusions. Lastly, this study used three indicators of working capital management (WCM). Hence, future studies can use other proxies of WCM, such as cash conversion cycle, and days inventory outstanding that may have a significant effect on firm profitability.

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