WORKING CAPITAL MANAGEMENT VS. PROFITABILITY OF MILK PROCESSING COMPANIES

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Abstract

This paper analyzes the relationships between the efficiency of working capital management and the return on assets of milk processing companies. Working capital management was assessed for efficiency based on the Days Sales of Inventory (DSI), Days Sales Outstanding (DSO), Days Payable Outstanding (DPO) and the Cash Conversion Cycle (CCC). The study was based on micro-data for dairy companies from 2007–2016 retrieved from the EMIS database. Based on panel regression models, it was concluded that an improvement in working capital management has a positive effect on the return on assets. The parameters of the models clearly showed that an increase in the DSI, DSO, DPO and CCC resulted for the dairy companies in a reduction in the return on operating assets.

Key words: *working capital, return on assets, panel models, milk processing*

INTRODUCTION

The economic and financial condition of companies is determined by a number of factors, including the policy for working capital management as an aspect of major importance. As shown by multiple studies, an excessive level of current assets inflates the costs of liquidity, and therefore has an adverse impact on profitability. Conversely, if insufficient, current assets may result in a considerable increase in the risk of losing financial liquidity and, as a consequence, in a series of barriers to smooth business operations [4, 27, 29]. This means that each company should optimize the amount of, and the sources of financing for, current assets. The above also involves the need for working capital management, i.e. making decisions to find the right balance between two contradictory objectives: the capacity to generate value for the owners, and the liquidity of the company [1, 4, 11, 15, 25, 26, 27].

Therefore, the purpose of this paper is to assess the efficiency of working capital management, as illustrated by the example of the domestic food companies active in milk processing. The following steps will be taken in the pursuit of that goal: reviewing the literature on the subject; describing the source materials and research methods; and analyzing the differences between the metrics of current capital management and their quantitative relationships with the profitability of dairy companies.

Literature review

The Cash Conversion Cycle by Richards and Laughlin [24] is commonly used in assessing the efficiency of the working capital. That concept is underpinned by the analysis of three sub-metrics, i.e. the Days Sales of Inventory (DSI), Days Sales Outstanding (DSO) and Days Payable Outstanding (DPO) which are combined into a single synthetic measure, the CCC. The above indicators (cycles) were used in the vast majority of empirical research as the basis for assessing the productivity of working capital.

The relationships between working capital and profitability in the Belgian economy were investigated into by Deloff [9] who used a panel analysis of non-financial companies and panel regression methods to prove that companies with long CCC, DSI, DSO and DPO periods attained lower rates of return (measured with operating profit) than those

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with shorter cycles. Similar conclusions were drawn by Lazaridis and Tryfonidis [16]. Their study revealed a statistically significant and negative relationship between profitability and the duration of all of the above cycles except for Days Payable Outstanding (DPO).

The objective of research undertaken by Gill et al. [14] in the US was to enhance the findings by Lazaridis and Tryfonidis [16]. Generally, they ended up with similar conclusions which confirmed the negative relationship between longer cycles and the profitability and value of businesses.

A reference to the findings by Lazaridis and Tryfonidis [16] was also made by Dong and Su [11] who compared them against the outcomes of their own research into Vietnamese companies. Once again, it confirmed the negative impact of long DSI, DSO and CCC periods, and a positive relationship between DPO and firms profitability.

A strong negative relationship between the determinants of working capital management and business profitability was also indicated by Raheman and Nasr [22]. Based on a multidimensional analysis of Egyptian companies, they found that an extension in the CCC results in a decline in profitability. In turn, in the group of Indian entrepreneurs, the relationships between the duration of working capital cycles and profitability were examined by Ramachandran and Janakiraman [23]. Based on estimated regression parameters, they found profitability to be positively correlated to Days Sales Outstanding (DSO) and Days Payable Outstanding (DPO), and negatively correlated to Days Sales of Inventory (DSI) and the Cash Conversion Cycle (CCC).

The purposefulness of research into the trends followed by working capital management and their impact on financial performance of companies is also strongly emphasized by Padachi [21] who analyzed this issue using the example of the small and medium enterprises sector in various parts of the economy. As shown by his research, a high level of stocks, receivables and payables involved lower rates of return on assets.

In turn, Mohamad and Saad [18] focused their analyses on the variation in the market value, return on capital and return on assets in the context of working capital cycles. They found both positive and negative relationships between the variables used and the value and profitability of companies. However, the general conclusion was that the extension of the Cash Conversion Cycle had a negative impact on the assessment on financial standing measured with various profitability ratios.

A research into the productivity of working capital was also carried out in Japan [19] and extended over production, trade and service companies. The researchers demonstrated a negative relationship between the conversion cycle and the return on investments in small, medium and large companies and in all industries, except for trade and consumption services. This served as a basis for concluding that capital managers should seek to improve profitability by shortening the Cash Conversion Cycle, through a more efficient conversion of and/or reduction in receivables, and by extending the deadlines for supplier payments.

Generally, quite similar conclusions were drawn from the research by Lyroudi and Lazaridis [17] carried out with Greek food companies. Their findings clearly indicated a significant, positive and non-linear relationship between the Cash Conversion Cycle and the rates of return.

MATERIALS AND METHODS

The literature review presented above suggests that a significant and generally positive relationship exists between the efficiency of working capital management (measured with the Cash Conversion Cycle) and financial performance at company level. This paper verifies the above hypothesis based on 2007–2016 financial reports of 98 Polish milk processing companies [20], as published in the Emerging Markets Information Service (EMIS) database [12]. The analysis of the efficiency of working capital management was based on

management efficiency ratios for stocks, receivables, operating payables and on the cash conversion ratio, calculated as follows [4, 30]:

$$DSI_{j,t} = \frac{\text{average level of inventory} \times 365}{\text{operating costs}}$$

$$DSO_{j,t}$$
$$= \frac{\text{average amount of short} - \text{term receivables} \times 365}{\text{sales proceeds}}$$

$$DPO_{j,t} = \frac{\text{average amount of payables} \times 365}{\text{operating costs}}$$

$$CCC_{j,t} = DSI_{j,t} + DSO_{j,t} - DPO_{j,t}$$

where:
$DSI_{j,t}$ - Days Sales of Inventory,
$DSO_{j,t}$ - Days Sales Outstanding,
$DPO_{j,t}$ - Days Payable Outstanding (refers to operating payables for supplies and services),
$CCC_{j,t}$ - Cash Conversion Cycle (in days).
In turn, the financial performance of companies was assessed based on the return on operating assets ($ROA_{j,t}$), calculated as follows:

$$ROA_{j,t} = \frac{EBITDA_{j,t} \times 100}{\text{average amount of } OA_{j,t}}$$

where:
$EBITDA_{j,t}$ - operating profit + depreciation in company j in year t;
$OA_{j,t}$ - operating assets (property, plant and equipment + intangible assets + long-term receivables + long-term deferred charges + short-term receivables + stocks).
The Days Sales of Inventory (*DSI*) is the number of days between subsequent stock replenishment operations, or the number of days cash is tied up in stocks [4, 27, 30]. When interpreting that ratio, limit values are not specified because the *DSI* is usually characteristic of the industry concerned. However, the shorter the DSI for different types of stocks, the better the assessment of corporate management efficiency [4, 27, 30]. In turn, the Days Sales Outstanding (*DSO*) means the number of days between sale and payment; in other words, it shows the degree to which the company credits its customers.

The *DSO* depends on many factors and therefore standard values are usually not defined. Nevertheless, some authors attempt to do so. It is estimated that the *DSO* for Polish industrial companies should be ca. 60 days [27].
In turn, the Days Payable Outstanding is a metric of the deadline for payables; from the perspective of liquidity risk, it should preferably be extended as it reduces the demand for working capital. However, in a well functioning company, rather than being extended without reason, the deadline should be synchronized with the operating cycle. According to the relevant literature, a company finds itself in an advantageous situation if the *DPO* is ca. 55 days [10], although in practice it varies strongly across industries.
The operating cycle defined as the Days Sales of Inventory plus Days Sales Outstanding (in a case where sales receivables are not financed with payables) determines the Cash Conversion Cycle in a company [4, 10, 27, 30]. A positive trend in the *CCC* is not as pronounced as in the case of other cycles; it is favorable when fluctuating around zero [30]. A short conversion cycle may result from a situation where the operating cycle is short while the *DPO* is quite long. For the company, these are beneficial circumstances since it is financed by its suppliers [4, 10, 27, 30]. However, an excessive delay in payments could result in a situation where the company does not have enough cash to meet its maturing liabilities. In turn, a long conversion cycle caused by the combination of a long operating cycle and a short *DPO* could have the following consequences: growing volumes of stocks kept in warehouses; problems involved in debt recovery; and the suppliers being unwilling to grant credit to the company, which could result in bankruptcy [4, 27, 30].
Regression analysis tools were also used in assessing the efficiency of working capital management. Their purpose was to determine the strength and direction of impact of particular sub-cycles and of the synthetic cycle of working capital on the efficiency of

dairy companies measured with the return on non-financial assets (*ROA*). Panel regression methods were used, and the parameters of regression equations which address separately the *DSI*, *DSO*, *DPO* and *CCC* were estimated in order to determine the strength and direction of impact of working capital management on the return on assets. Also, a set of control variables which are generally regarded as important determinants of operational profitability of businesses were used in testing this relationship. According to the literature, these are usually variables referring to the return on sales, sales volume, assets structure, financial liquidity, company age and company size, and the variability of various other financial indexes [cf. 4, 5, 9, 13, 16, 19, 21, 28].

The system method proposed by Arellano and Bover [2] and Blundell and Bond [6], based on the generalized method of moments, was used to estimate the parameters of dynamic models. The concept of that method consists in estimating a system of equations, i.e. equations with variables both in level and in difference. Structural parameters will be estimated using a dedicated observation matrix which replaces the independent variables correlated to the random effect with adequately defined instruments [6, 7, 8].

In the case of first-order difference equations and level equations, these are the lagged variables and lagged first differences, respectively [3].

Models estimated as shown above are assessed with the Sargan test and the Arellano–Bond test [3, 7, 8].

The Sargan test verifies the suitability of introducing additional instruments. The null hypothesis is the absence of correlation between instrumental variables and the random effect. If the correlation does not exist, the model can be found to be specified correctly. In turn, the Arellano–Bond test is used to verify the hypothesis on the absence of autocorrelation of second-order random effect in first-order difference equations [2, 3, 6, 7, 8].

Dynamic panel regression methods were used to determine the strength and direction of impact of working capital management on the return on assets of dairy companies.

An estimation was performed of four regression equations which take into account the cycles of different components of working capital (stocks, receivables, payables) and the cash conversion cycle which provides a synthesis of the management policy for working capital.

Also, the following set of control variables $(x_{jt}^T \beta)$ was used in testing the relationship between financial performance and working capital management performance:

$ROS_{j,t}$ - return on sales in company *j* in year *t*,

$CR_{j,t}$ - current ratio in company *j* in year *t*,

$TA_{j,t}$ - logarithmized value of assets in company *j* in year *t*,

$SFA_{j,t}$ - share of property plant and equipment in assets of company *j* in year *t* in (%),

$AGE_{j,t}$ - age of company *j* in year *t* ,

$\Delta S_{j,t}$ - growth rate of sales proceeds in company *j* in year *t/(t–1)* (%)

The inclusion of the above variables had an effect on the structure and estimation of the following dynamic regression models for the return on operating assets:

$$ROA_{j,t} = \alpha_0 + \gamma ROA_{j,t-1} + x_{jt}^T \beta + DSI_{j,t} + (\alpha_j + \varepsilon_{jt}), \quad j = 1, \dots \dots N, \ t = 1, \dots \dots T.$$

$$ROA_{j,t} = \alpha_0 + \gamma ROA_{j,t-1} + x_{jt}^T \beta + DSO_{j,t} + (\alpha_j + \varepsilon_{jt}), \quad j = 1, \dots \dots N, \ t = 1, \dots \dots T.$$

$$ROA_{j,t} = \alpha_0 + \gamma ROA_{j,t-1} + x_{jt}^T \beta + DPO_{j,t} + (\alpha_j + \varepsilon_{jt}), \quad j = 1, \dots \dots N, \ t = 1, \dots \dots T.$$

$$ROA_{j,t} = \alpha_0 + \gamma ROA_{j,t-1} + x_{jt}^T \beta + CCC_{j,t} + (\alpha_j + \varepsilon_{jt}), \quad j = 1, \dots \dots N, \ t = 1, \dots \dots T.$$

where:
$x_{jt}^T \beta$ - set of control variables,
α_j: group effect (constant over time),
ε_{jt}: random effect.

RESULTS AND DISCUSSIONS

Table 1 shows the basic descriptive statistics for the level and variation in working capital cycles in dairy companies covered by this study. The data suggests that the average duration of the Cash Conversion Cycle did not exceed 2 weeks (13.2 days) in the study period. This means that generally, dairy companies quite quickly recovered the amounts of money invested in their business operations. Another finding is that the Days Payable Outstanding (41.8 days) and the Days Sales of Inventory (21 days) had, respectively, the strongest and the weakest impact on the conversion cycle.

Table 1. Differences in the working capital cycle (days) and return on assets (%) between dairy companies covered by this study[1]

Working capital cycles	Descriptive statistics[1]						
	$\bar{x}$	Min	Max	V	Med	Q_1	Q_3
DSI	21.0	4.2	266.9	78.4	17.7	12.5	22.9
DSO	33.9	4.5	125.6	39.1	31.4	25.2	40.7
DPO	41.8	6.2	393.5	55.1	37.9	32.0	45.9
CCC	13.2	-319.6	162.9	187.1	12.9	3.1	23.1

[1]DSI - Days Sales of Inventory (days), DSO - Days Sales Outstanding (days), DPO - Days Payable Outstanding (days), CCC - Cash Conversion Cycle (days), $\bar{x}$ – mean, Min - minimum value, Max - maximum value, V - coefficient of variation (%), Med - median, Q_1 - first quartile , Q_3 - third quartile.
Source: own calculations.

However, the descriptive statistics shown in Table 1 also reflect considerable differences in working capital cycles between dairy companies. This is especially true for the Cash Conversion Cycle and the Days Sales of Inventory. The above conclusion is supported by the analysis of minimum and maximum values and, most of all, by the coefficient of variation (V) which is as much as 187% for the Cash Conversion Cycle and 78.4% for the Days Sales of Inventory. In turn, as regards the median, the conclusion is that all cycles of the working capital - other than the Cash Conversion Cycle - were longer than the average duration. These relationships reflect a right-side asymmetry in the distribution of objects in the sample, i.e. the prevalence of DSI, DSOs and DPOs with an above-average duration.

Table 2 presents the estimation results for the equations of return on operating assets. The two-step generalized method of moments was used for that purpose. The Arellano–Bond autocorrelation test results presented in the Table clearly show that moment conditions used in the estimation process are correct for all models. The empirical values of that test (AR-2) indicate that second-order autocorrelation is not present in the model. Therefore, the instruments used in estimations are adequate. The Sargan test which verifies the suitability of additional instruments also indicates that the model was specified correctly. This is because the data suggests that correlation between instrumental variables and the random effect does not exist in any of the models, which is consistent with the null hypothesis.

The analysis of structural parameters of the above regression models allows the following conclusions to be drawn:

(1)Negative regression coefficients of the Days Sales of Inventory (DSI), Days Sales Outstanding (DSO), Days Payable Outstanding (DPO) and Cash Conversion Cycle (CCC) clearly suggest a negative impact of the extension of these periods on the return on operating assets in milk processing companies.

(2)The regression parameters for variables corresponding to particular cycles of the working capital suggest a similar, quite moderate but negative impact of the extension of these periods on the return on assets. A 10-day extension of the Days Sales of Inventory (DSI) and of the Days Sales Outstanding (DSO) had a similar effect on the return on operating assets of dairy companies, resulting in a reduction by 0.44 to 0.49 percentage points, on average. Conversely, extending the

deadline for operating payables had a relatively smaller impact on the reduction of the return on assets: a 10-day extension translated into a reduction by only 0.6 percentage points.

Table 2. Parameters of dynamic models of return on operating assets[1]

Variables and tests	Model 1	Model 2	Model 3	Model 4
ROA_{t-1}	-0.029 (0.000)	-0.031 (0.000)	-0.029 (0.000)	-0.025 (0.000)
Constant	6.945 (0.000)	5.713 (0.000)	5.787 (0.000)	5.368 (0.000)
TA	-0.237 (0.000)	-0.204 (0.049)	-0.223 (0.002)	-0.232 (0.001)
SFA	-8.126 (0.000)	-7.371 (0.000)	-7.994 (0.000)	-7.396 (0.000)
CR	-0.284 (0.022)	-0.289 (0.034)	-0.286 (0.032)	-0.208 (0.049)
ROS	2.818 (0.000)	2.823 (0.000)	2.815 (0.000)	2.791 (0.000)
AGE	0.010 (0.002)	0.013 (0.000)	0.016 (0.000)	0.015 (0.000)
ΔS	3.651 (0.000)	4.288 (0.000)	4.681 (0.000)	4.868 (0.000)
DSI	**-0.044 (0.000)**			
DSO		**-0.049 (0.000)**		
DPO			**-0.006 (0.038)**	
CCC				**-0.025 (0.000)**
AR-2 test	-0.529 (0.597)	-0.563 (0.573)	-0.534 (0.593)	-0.518 (0.604)
Sargan test	34.46 (0.399)	40.89 (0.194)	38.04 (0.290)	37.27 (0.321)

[1]The values in brackets indicate the level of significance of the variables or tests. AR-2 is a serial correlation test of second order using residuals of first differences, asymptotically distributed as N(0,1) under null hypothesis of no serial correlation. Sargan test is a test of over-identifying restrictions distributed asymptotically under null hypothesis of validity of instruments such as *Chi*-squared.
Source: own calculations.

(3)Similar conclusions can be drawn from the analysis of the regression coefficient for the Cash Conversion Cycle (*CCC*), i.e. the variable which synthetically reflects the efficiency of working capital management. In the light of estimation results, a 10-day extension of the Cash Conversion Cycle translated into a reduction of the return on operating assets of dairy companies by 2.5 percentage points.
(4)Changes in other factors, i.e. control variables, had the strongest and diversified impact on the return on operating assets in the milk processing sector. Also, it is fairly clear that these variables had a much stronger impact on the return on assets than the DSIs.
(5)The direction of the impact of control variables on the return on assets is largely consistent with other empirical studies which clearly suggest that this category of financial performance is strictly and positively correlated with the return on sales (*ROS*), company age (*AGE*) and growth in sales proceeds (*ΔS*). Furthermore, as confirmed by model parameters, an excessive company size (measured as the value of assets, *TA*); inflexible assets characterized by a large share of property, plant and equipment (*SFA*); and a conservative liquidity management policy (whose characteristics include a high current ratio, *CR*) also have an adverse effect on the improvement in the return on assets.

CONCLUSIONS

The level of current assets determines both the profitability and liquidity of a company, and should therefore be reasonably managed and aligned with the financing capabilities. This means the need for an effective working capital management process which consists in shortening the operating cycle and the Cash Conversion Cycle. The quantitative relationships between the duration of cycles of working capital components and the return on assets clearly suggest that the shorter the cycles, the higher the rates of return. The Days Sales of Inventory and Days Sales Outstanding had the strongest impact on the return on operating assets in dairy companies, whereas the Days Payable Outstanding had the smallest impact. This means that in the dairy industry, a rational stock management policy and the policy for granting credit to

customers are the main drivers of improvement in working capital efficiency.

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