WORKING CAPITAL AND ITS IMPACT ON BUSINESS PERFORMANCE

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Abstract: *A number of studies indicate that the decision on the level of working capital affects business performance. Managing optimal working capital brings businesses sustained reduction of working capital, improves liquidity and increases profitability through effectively managed capital. The aim of this paper is to conduct empirical research of Czech companies on the relationship between working capital and the performance of a company. An OLS model is used that can calculate quadratic regression for calculating the optimum amount of working capital. Models are created that describe the dependency of earnings on the components that determine working capital. By deriving the quadratic function of performance, an inflection point is found, indicating a theoretical net trade cycle of 134 days for Czech companies with inventory and 70 days for Czech companies with no inventory. However, there is a level of working capital at which a higher working capital begins to be negative in terms of profitability due to the additional interest expenses and, hence, the higher probability of bankruptcy and credit risk of firms. Thus, firm managers should aim to keep as close to the optimal level as possible and try to avoid deviations from it that destroy profitability.*

Keywords: *Working Capital, Net Trade Cycle, Ordinary Least Squares (OLS) Method*

JEL Classification: *M21.*

Introduction

Research conducted by the PricewaterhouseCoopers consultancy (PwC, 2012) highlighted the inefficient management of working capital in the practice of European businesses. The research was based on comparing working capital with a percentage of the sales performance of businesses, and included the 4000 largest European companies from 34 countries, including the Czech Republic, during the years 2007 - 2011. The research found that the largest European businesses lost about 400 billion EUR due to inefficient management of working capital. This is equivalent to about a third of their earnings. Companies in southern Europe could gain up to 40% of their earnings, with British and Irish companies gaining 22%. The results confirmed that, on the contrary, companies that are able to manage working capital effectively are doing better.

The authors Madhou, A., Moosa, I. & Ramiah, V. (2015), Kim and Chung (1990) seem to think that the decision about the amount of working capital affects corporate performance. Managing an optimal working capital provides businesses with (PWC, 2007) a sustained reduction of working capital, improving liquidity and increasing return on assets through effectively managed capital.

1 Statement of a problem

Terminology in the definition of working capital is unclear, as different Czech authors often use two terms – "working capital" and "net working capital" - interchangeably.

In the narrower sense, some, such as Hrdý & Krechovská (2013), define working capital as current assets and net working capital after deducting short-term liabilities.

Due to the terminology of foreign authors, the term working capital will be used in this paper for the difference between current assets and short-term liabilities.

As has been said, working capital is defined as the difference between current assets and short-term liabilities. It is a part of long-term financial resources that is used to cover short-term assets. It serves to finance the normal day-to-day operation of a business (Jindřichovská, 2013).

Investments in receivables and inventories represent a significant proportion of a company's assets, while liabilities to suppliers are a significant source of funding for most businesses. Research (Honková, 2016) carried out in 2014 found that 48 % of the total capital were commitments to suppliers. In the UK, the business loan represents about 41 % of the total debt of medium-sized enterprises (Baňos, 2014). Working capital should achieve positive values because of the positive effect on the liquidity of a company (Fazzari & Petersen, 1993). According to the authors Blinder and Maccini (1991), larger inventories can minimize delivery costs and price fluctuations and act as a means of preventing production breaks and losses due to lack of material or products. It enables businesses to provide better customer service and protects from increased production costs (Schiff& Lieber, 1974). Kroflin & Kratz (2015) traditionally show high attention to liquidity. Authors Ding, S., Guariglia, A. & Knight, J. (2013) display high sensitivities of investment in working capital to cash flow and low sensitivities of investment in fixed capital to cash flow. On the other hand, if businesses provide trade credit, they can increase their sales (Brennan, Maksimovic, & Zechner, 1988); trade credit enables customers to check and use the goods or services prior to payment and strengthens supplier-customer relationships (Wilner, 2000, Smith & Tirell, 1987). Trade credit also reduces the information inequality between the buyer and the seller. Shipley and Davis (1991) believe that trade credit is also an important criteria for choosing a supplier if it is otherwise difficult to differentiate the product.

The positive level of working capital has, of course, a However, working capital is not purely maximizing, as there are arguments that criticize too high a working capital. Storing too many goods increases warehouse and inventory insurance costs (Kim & Chung, 1990). A large amount of working capital raises the need for additional capital and therefore additional capital costs. Interest costs and credit risk are increasing. (Kieschnick, LaPlante, & Moussawi, 2011). There are also financial constraints that complicate the financing of working capital. Fazzari and Petersen (1993) believe that investments in working capital are more sensitive than fixed capital investments. Hill, Kelly and Highfield (2010) show that businesses with lower financial constraints achieve higher levels of working capital. Financial constraints include paid dividends (Faulkender and Wang, 2006), size and interest coverage (Whited, 1992), cash flow (Moyen 2004) and financial costs (Fazzari, Hubbard & Petersen, 1988).

There is also a conflict between liquidity and return. Increasing short-term liabilities leads to a reduction of liquidity; on the other hand, short-term liabilities have lower financing costs than long-term instruments. Flexibility is definitely an advantage of short-term commitments, with another advantage being lower funding costs. The disadvantage is the fact that their costs are not fixed in the long term and that they may sometimes be unavailable. (Jindřichovská, 2013)

Thus, it can be generally said that the more the enterprise invests in working capital, the greater the liquidity, however the lower the return on assets. If we were looking at return on assets as a determinant of improving the performance of a business, we could at first glance say that the lower the working capital, the more the enterprise increases its value. However, efforts to minimize working capital could lead to many problems.

The studies listed in Tab.1 show the relationship between working capital and return on assets.

Tab. 1: Studies focusing on the relationship between working capital and return on assets

Author, Country	Period	Profit measure	Results NTC on profitability
Jose et al. (1996), USA	1974-1993	ROE	NTC↓
Shin & Soenen (1998), USA	1975-1994	ROA	NTC↓
Wang (2002), Japan	1985-1996	ROE	NTC↓
Deloof (2003), Belgium	1992-1996	Gross oper. profit	NTC→
Lazaridis &Tryfonidis (2006), Greece	2001-2004	Gross oper. profit	NTC↓
Meyer & Lüdtke (2006), Germany	2003	ROCE	n/a
García-Teruel & Martínez-Solano (2007), Spain	1996-2002	ROA	NTC↓
Raheman & Nasr (2007), Pakistan	1999-2004	Net oper. profit	NTC ↓
Karaduman et al. (2010), Turkey	2005-2008	ROA	NTC↓
Banos & Caballero et al. (2012), Spain	2002-2007	ROA	Concave
Enqvist et al. (2012), Finland	1990-2008	Gross oper. profit	NTC↓
Wöhrmann et al. (2012), Germany	2007-2010	ROCE	NTC↓

Source: (own)

Working capital management studies usually have two views. The first view states that higher amounts of working capital allow companies to increase their sales and therefore their business performance. Authors Fazzari and Petersen (1993) suggest in their analysis, that investing in working capital is more sensitive to funding limitations than investing in fixed capital. Alternative studies state that higher working capital needs increased funding and hence other financial costs that reduce profitability and can lead to bankruptcy. (Wang, 2002, Faulkender & Wang, 2006) The combination of these positive and negative effects of working capital on the performance of a business leads to the prediction that there is no direct linear relationship between the working capital and the value of a business. It can be assumed that the reduction of working capital may increase the performance of a business to some extent, but after achieving its optimum, further reduction of working capital would lead to a reduction in the value of a business. Therefore, it can be assumed that the influence of working capital on the performance of a company is a function in the form of the inverted U, i.e. a concave quadratic function, by means of which an optimal level of working capital can be found. Thus, raising working capital to a certain level increases the company's performance, but once

the optimal level is reached, the relationship between working capital and business performance becomes negative.

In terms of performance measurement, we turn to the return on equity (ROE) indicator, based on the Du point analysis. There is a model that calculates the performance of a company, primarily in terms of working capital from Shin & Soenen (1998) and others by Agrawal & Knoeber (1996), Himmelberg, Hubbard & Palia (1999), Thomsen, Pedersen & , Kostakis & Ozkan (2009) and Wu (2011):

$$Q_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC^2{}_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \beta_5 ROA + \lambda_t + \eta_i + \varepsilon_{i,t} \quad (1)$$

where:

Q_{it} is business performance as expressed by the ROE indicator.

Working capital is expressed in this model using the net trade cycle (NTC) (Shin & Soenen (1998). Because of the mentioned quadratic function, the NTC is considered in the first and second powers. Other variables that affect business performance are according to the previous mentioned researches: size (SIZE), leverage (LEV) and return on assets (ROA).

The NTC is calculated as (accounts receivable/sales) * 365 + (inventories/purchases) *365 – (accounts payable/purchases) * 365. Thus, NTC deals with the management of accounts receivable, the management of inventories and the trade credit received, with a shorter NTC indicating a more aggressive working capital policy. Previous publications report the importance of considering there three components at the same time because they influence each other as well as profitability and value. Schiff and Lieber (1974), for example, indicate the importance of taking into account the interrelationship between inventory and accounts receivable policies. We regress the profitability and against NTC and its square. The inclusion of these two variables allows us to test both the profitability and risk effects. The quadratic relation proposed in Eg.1 presents and breakpoint that can be derived by differentiating the firm´s profitability variable with respect to the NTC variable and making this derivative equal to 0. Since we expect NTC and corporate performance to relate positively at low levels of working capital and negatively at higher levels, the hypothesis is that β2 is negative, because it would indicate that firms have an optimal working capital level that balances the costs and benefits of holding working capital and maximizes their performance.

We measure firm size (SIZE) as the natural logarithm of sales; leverage (LEV) by the ratio of total debt to total assets; and the measurement of return on assets (ROA) is through the ratio earnings before interest and taxes over total assets. The parameter λt is a time dummy variable that aids to capture the influence of economic factors (e. i. GDP, inflation, unemployment, political and legislative background) that may also affect corporate performance but with companies cannot control. ηi is the unobservable heterogeneity or the firm´s unobservable individual effects, so we can control for the particular characteristics of each firm. Finally, εi,t is the random disturbance. We also control for industry effects by introducing industry dummy variables.

The aim of this paper is to determine the coefficient β0 and the variables β1 - β5, thus creating a model of influence of working capital on the company's performance.

In contrast to Shin & Soenen (1998), Agrawal and Knoeber (1996), Himmelberg, Hubbard & Palia (1999), Thomsen, Pedersen & Kvist, models are created separately for

no-inventory businesses and for inventory-holding businesses, as the most significant component of NTC's working capital is substantially influenced by inventory. The aim is to create a profit maximization model using an optimal level of net trade cycle.

2 Methods

The data in this paper is from the MagnusWeb database. It is a database of Czech companies of 2016 and 2015. All enterprises that keep their accounts and have published their financial statements in the monitored years were included in the research. This is a significant indicator for calculating working capital. The companies were divided according to whether or not they held inventory. A sample of companies with inventory was 3254. A sample of companies with no inventory was 1190. Due to incomplete data, this number was reduced to 1953 companies with inventory and 958 companies without inventory. Due to the sufficient number of samples, the assumption of the normality of distribution was assumed.

The data was edited in MS EXCEL and subsequently exported to the GRETL program, where statistical calculations were performed.

As mentioned in the previous chapter, the function of the influence of working capital on the company's performance is a function in the form of inverted U, i.e. a concave quadratic regression. Quadratic regression is the case of polynomial regression where the degree of polynomial Pk is equal to two. As such, this is a special case of linear regression. The set of values is interleaved (approximated) by the quadratic function (parabola). Polynomial coefficients (parabola) are calculated using the Ordinary Least Squares (OLS) method.

Data are interleaved with a parabola, or a second order polynomial P 2(x)= ax^2+bx+c. The sum of deviations squares ei = yi − P2(xi) function F depends on parameters a, b, c in particular β0-β5. The minimum of the functional F can be found by partial derivations (at the local extreme are equal to zero):

$$\frac{\partial F}{\partial \beta_0} = \frac{\partial F}{\partial \beta_1} = \frac{\partial F}{\partial \beta_2} = \frac{\partial F}{\partial \beta_3} = \frac{\partial F}{\partial \beta_4} = \frac{\partial F}{\partial \beta_5} = 0 \tag{2}$$

The multiple regression model works with more than one explanatory variable, in our case (1). The task is to estimate parameters β0, β1, β2, β3, β4, β5. These parameters indicate how much, on average, the estimated value Qi,t increases, if an explanatory variable increases by one, assuming that the other variables do not change.

3 Problem solving

Using the OLS method, multiple regression was calculated , where the dependent variable was the ROE indicator representing the performance of the business. Equations (3) and (4) represent a function of profit depending on the items that determine working capital. Equation (3) is for businesses with inventory and equation (4) for businesses with no inventory. Companies with inventory put a greater emphasis on NTC and ROA, companies with no inventory on size and financial leverage.

$$Q_{i,t} = -54{,}5751 + 0{,}0205 NTC_{i,t} - 7{,}6146\, e - 0{,}5\, NTC^2{}_{i,t} + 3{,}7335\, SIZE_{i,t} + 0{,}0773\, LEV_{i,t} + 0{,}7162\, ROA + \lambda_t + \eta_i + \varepsilon_{i,t} \tag{3}$$

$$Q_{i,t} = -67{,}0733 + 0{,}0146 NTC_{i,t} - 1{,}0336\, e - 0{,}4\, NTC^2{}_{i,t} + 5{,}6722\, SIZE_{i,t} + 0{,}3284\, LEV_{i,t} + 0{,}1794\, ROA + \lambda_t + \eta_i + \varepsilon_{i,t} \quad (4)$$

Except the sq_NTC variable and the coefficient β0, all variables are positively dependent on the profit, which means that the profit increases with increasing variables.

We test the hypothesis β = 0, that the model generally explains the ROE well. Critical t-test values fall into critical areas in the following cases: for businesses with inventories for all indicators except for the ROA indicator, for non-inventory enterprises these are const, NTC and sq_NTC constants (Tab 2 and Tab. 3).

Tab. 2: OLS Statistical Values - Businesses with inventories

The mean value of the dependent variable	−0,230163
Determinative deviation of the dependent variable	473,1739
Sum of squares of residues	7,23e+08
Determinative error of regression	471,9309
Determination coefficient	0,006776
Adjustment Determination Coefficient	0,005247
F(5,)	4,431652
P-value(F)	0,000503
Logarithm of credibility	−24648,56

Source: own

Tab. 3: OLS Statistical Values - Businesses without inventories

The mean value of the dependent variable	6,650177
Determinative deviation of the dependent variable	186,4057
Sum of squares of residues	31557071
Determinative error of regression	182,0664
Determination coefficient	0,050999
Adjustment Determination Coefficient	0,046015
F(5,)	10,23211
P-value(F)	1,44e-09
Logarithm of credibility	−6342,122

Source: own

ANOVA scattering analysis contains estimated values using the SSR model, unexplained random portion (SSE), and total SST sum (Tab 4. a Tab. 5). The created model is better for businesses with no inventory.

Tab. 4: ANOVA Analysis – Businesses with inventories

	Sum of squares	df	Middle quadrate
Regression (SSR)	4,93506e+006	5	987012
Residue (SSE)	7,23391e+008	3248	222719
Full (SST)	7,28326e+008	3253	223894

Source: own

Tab. 5: ANOVA Analysis – Businesses without inventories

	Sum of squares	df	Middle quadrate
Regression (SSR)	1,69588e+006	5	339176
Residue (SSE)	3,15571e+007	952	33148,2
Full (SST)	3,3253e+007	957	34747,1

Source: own

The problem that arises when testing model parameters is multi-collinearity. It results from a correlation between independent variables. The easiest way to determine if there is a strong correlation between the variables is to look at the correlation matrix. As can be seen in our model (Tab. 6 and Tab. 7), the values are not high as to not cause multi-collinearity problems. According to (Koop, 2008) the value is binding if there is a correlation in an absolute value greater than 0.9.

Tab. 6: Correlation Analysis - Businesses with inventories

ROA	ROE	Leverage	l_SIZE	NTC	
1,0000	0,0768	0,0007	0,0770	0,1006	ROA
	1,0000	0,0159	0,0236	0,0084	ROE
		1,0000	0,0219	-0,0054	Leverage
			1,0000	0,1356	l_SIZE
				1,0000	NTC

Source: own

Tab.7: Correlation Analysis - Businesses without inventories

ROA	ROE	NTC	Leverage	l_SIZE	
1,0000	0,2013	0,0484	0,0026	0,0791	ROA
	1,0000	0,0331	0,0309	0,0804	ROE
		1,0000	-0,1011	0,0554	NTC
			1,0000	0,0169	Leverage
				1,0000	l_SIZE

Source: own

T-test is used to test the significance of variables (Tab. 8 and Tab. 9). It tests whether it is possible to reject the hypothesis that $\beta = 0$ and therefore say that statistically, the given coefficient is not insignificant at the chosen materiality level.

Tab. 8: T-test Businesses with inventories

Variable	Coefficient	95 confidential interval
Const	-54,5761	(-128,648, 19,4960)
ROA	0,716165	(0,397802, 1,03453)
l_SIZE	3,73353	(-1,84715, 9,31420)
NTC	0,0204506	(-0,0244794, 0,0653806)
sq_NTC	-7,61461e-007	(-2,11102e-005, 1,95873e-005)
Leverage	0,0773368	(-0,123213, 0,277887)

Source: own

Tab. 9: T-test Businesses without inventories

Variable	Coefficient	95 confidential interval
const	-67,0733	(-119,024, -15,1225)
ROA	1,17940	(0,808187, 1,55061)
Leverage	0,328362	(0,0418209, 0,614904)
NTC	0,0146489	(-0,00741492, 0,0367126)
l_SIZE	5,67215	(1,05438, 10,2899)
sq_NTC	-1,03395e-006	(-1,10953e-005, 9,02744e-006)

Source: own

4 Discussion

How above mentioned, working capital should achieve positive values but it is not purely maximizing because of additional costs (Kim and Chung, 1990) (Kieschnick, LaPlante, & Moussawi, 2011). On the one hand, there is liquidity, continuity of production and lower financial constraints and on the other hand profitability. Both of these influences act against one another. Working capital includes return on assets (ROA) and liquidity. Both of these influences act against one another. Thus, the ROE profit maximization function with working capital is a concave quadratic function. The more the company invests in short-term assets, the better the liquidity of the company. The company may invest in short-term assets to improve its liquidity - cash and securities - but these assets generate a small return. Therefore, the company can reduce the risk of insolvency (low liquidity) only by reducing return on assets and vice versa (Jindřichovská, 2013).

Since we expect NTC and corporate performance to relate positively at low levels of working capital and negatively at higher levels, the hypothesis is that β2 is negative, because it would indicate that firms have an optimal working capital level that balances the costs and benefits of holding working capital and maximizes their performance. Models (3) and (4) that were developed describe the dependence of profit (ROE) on components determining working capital (net trade cycle, size, leverage, ROA). The concavity of this function was proved by negative parameters in models (3) and (4).

Model (1) allows us to determine when profit maximization occurs by derivation the inflection point becomes as -β1 / 2β2. For the model (3) "Businesses with inventories" it is calculated as:

$$NTC_{optimal} = \frac{-0,0205}{-2*0,000076146} = 134\ days \quad (5)$$

a for the model (4) "Businesses without inventories" it is calculated as:

$$NTC_{optimal} = -\frac{-0,0146}{-2*0,00010336} = 71\ days \quad (6)$$

For model (3) – "businesses with inventories", the optimal level of net trade cycle is calculated as 134 days. For model (4) "businesses with no inventory", the optimal level of net trade cycle is calculated as 70 days.

Conclusion

The aim of this paper was to conduct empirical research into the relationship between working capital and business performance (ROE). A number of studies, generally agreeing that the amount of working capital affects the performance of a business, researches the relationship between the amount of working capital and business performance. Model (1) shows this dependence. The variables include net trade cycle, size, leverage and ROA of the business. On a representative sample of Czech companies, a model (3) was created for enterprises that do not have stocks and a model (4) for enterprises with stocks. These models show the dependence of working capital, enterprise size, indebtedness and ROA profitability on the resulting ROE profitability. While the dependence of these variables on ROE is statistically insignificant for the purposes of ROE maximization (since ROE depends on many other variables), the data from these models were used to calculate the optimum working capital, ie, net trade cycle at which highest profitability (ROE).

The OLS model was used, which calculated a quadratic regression of calculating the optimal amount of working capital.

The developed models (3) and (4) describe the dependence of profit on components determining working capital. However, it was calculated that except the sq_NTC variable and the coefficient β0, all variables are positively dependent on the profit, which means that the profit increases with increasing variables. The negative value sq_NTC has confirmed the concave shape of this quadratic working capital function. The inflection point was derived from this quadratic function, indicating a theoretical net trade cycle of 134 days for Czech companies with inventory and 70 days for Czech companies with no inventory.

However, there is a level of working capital at which a higher working capital begins to be negative in terms of profitability due to the additional interest expenses and, hence, the higher probability of bankruptcy and credit risk of firms. Thus, firm managers should aim to keep as close to the optimal level as possible and try to avoid deviations form it that destroy profitability.

Results suggest that managers should be concerned about working capital level because it seems to affect the corporate performance.

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Received: 19. 04. 2019, reviewed: 10. 06. 2019
Approved for publication: 26. 06. 2019