

THE INFLUENCE OF WORKING CAPITAL ON PROFITABILITY IN CONSTRUCTION INDUSTRY

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ABSTRACT

We examine the relationships between a group of representative liquidity variables and profitability in 33 Croatian construction companies during the period of 2012 - 2016. The impact of working capital on profitability is studied using correlation and regression analysis. Results of the analysis show that liquidity variables such as cash conversion cycle, current ratio and quick ratio along with control variables significantly affect profitability. Contrary to the findings of the relevant research, indicators such as receivables collection period, inventory conversion period and payables deferral period did not have a significant impact on profitability.

Key words: working capital, profitability, regression analysis

INTRODUCTION

Effective working capital management lies at the heart of successful company, playing a crucial role in the increase of shareholder wealth and the achievement of benefits from capital investment [15]. According to Pass & Pike [13] the two main objectives of working capital management are to increase the profitability of a company and to ensure that it has sufficient liquidity to meet short-term obligations. The twin goals of profitability and liquidity will often conflict since liquid assets provide the lowest return [15][2].

The building and construction industry is an important contributor to the development and growth of a nation's economy, and there is a complex interaction between the two. This is because the building and construction industry is particularly sensitive to, and its reactions often precede, turn-arounds in the general economy. The interaction is however two-way. There are direct relationships between the indicators in the economy and the performance of the industry. But there are also relationships between these indicators and the way the industry behaves [8].

In the last fifteen years, three cycles in the construction sector of Croatia can be identified - before recession (until 2008), during recession (2009-2014) and recovery (2015-2016). In the period 2000-2008 construction in Croatia experienced a boom. The share of construction in GDP increased from 4.2 to 7.2% and employment by 61%. However, starting with the mid 2008, the share of construction started to decline and it stood at 4.3 percent in 2014. The volume of construction works in 2014 decreased by 42.5% compared to 2008, while the number of employees decreased by 50 thousand or 56%. There was

a slight recovery in 2015-2016, although the value of construction works was still significantly lower compared to the pre-recession years (for example, HRK 19.9bn in 2016 vs HRK 34.9bn in 2008) [3].

The situation in the construction industry is a somewhat like a barometer of investment and overall economic activity, where there is a very high elasticity between the construction activity and economic growth [7]. The goal is to conduct a statistical analysis of working capital management in Croatian construction companies and thus examine the relationships that exist between a set of representative liquidity variables and profitability.

LITERATURE REVIEW

Charitou et al. [4] empirically investigate the effect of working capital management on firm's financial performance in an emerging market. Using multivariate regression analysis, their results indicate that the cash conversion cycle and all its major components; namely, days in inventory, days sales outstanding and creditors payment period - are associated with the firm's profitability. Lazaridis & Tryfonidis [9] investigate the relationship of corporate profitability and working capital management on a sample of 131 companies listed in the Athens Stock Exchange (ASE) for the period of 2001-2004. They found that there is statistical significance between profitability, measured through gross operating profit, and the cash conversion cycle. Gill et al. [6] investigate 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. They found statistically significant relationship between the cash conversion cycle and profitability, measured through gross operating profit. Mogaka Makori & Jagongo [10] analyze the effect of working capital management on firm's profitability in Kenya using balanced panel data of five manufacturing and construction firms. Their results show a negative relationship between profitability and number of day's accounts receivable and cash conversion cycle, but a positive relationship between profitability and number of days of inventory and number of day's payable. Nobanee [12] examines the relationship between the efficiency of working capital management and profitability of construction firms listed in the United Arab Emirates stock markets and found negative and significant relationship between net trade cycle for all construction firms and large construction firms.

STATISTICAL ANALYSIS OF THE INFLUENCE OF WORKING CAPITAL ON PROFITABILITY

The impact of working capital on profitability is presented in this paper using correlation and regression analysis using the statistical software for social science, SPSS. The aim of the research is to investigate the correlation of each of the liquidity variables with the profitability indicator, and to determine the extent to which the dependent variable will change if the independent variables change. The regression model can be used to predict data for which measurements are inaccessible or that are outside the observation range.

The data used in the survey was taken from the Register of Annual Financial Statements. For the purpose of conducting the survey, data were taken for enterprises classified according to the National Classification of Activities, classified in area F. Construction. Thirty three (33) enterprises were taken into the sample over a five-year period (2011 - 2016) according to revenue in 2016. The total assets of the companies in the sample are 10.4 billion and revenue in 2016 amounted to 9.7bn HRK. The assets of

all companies registered in sector F Construction amount to 206 billion HRK, and revenue of HRK 42 billion. Therefore it can be said that the companies in the sample constitute 5 percent of the total assets of the entire construction sector and 23 percent of the revenue.

Variable selection and regression model specification

After reviewing the available literature we made a choice of variables that would represent working capital, liquidity and profitability. The variables selected to measure the impact of working capital management on profitability are: 1. Receivables collection period (AR); 2. Inventory conversion period (INV); 3. Payables deferral period (AP); 4. Cash Conversion Cycle (CCC); 5. Current ratio (CR) and 6. Quick ratio (QR). Control variables are defined as: 1. Firm's size measured by sales (LnSales) and 2. Fixed asset coverage ratio (FACR). The dependent variable is Gross operating profit (GOP) (see for example [5] [9]).

For independent variables, receivables collection period, inventory conversion period, cash conversion cycle, current ratio and quick ratio, they are all expected to be in a negative relationship with the profitability indicator. Namely, the more money is immobilized in receivables and inventories and the longer the money transformation cycle, the lower the profitability. On the other hand, for payables deferral period a positive impact on profitability is expected as more money is retained in the company for more profitable purposes.

In terms of control variables, the size of the firm is used in many studies. Some research papers measure company size through the natural logarithm of company asset size, while in the most them the size of the firm is measured by the natural logarithm of sales size [5] [6] [9] [1][14].

The impact of working capital on profitability will be investigated using the equation of the multiple linear regression model, which has the following standard form:

$$y = a + b_1x_1 + b_2x_2 \dots b_nx_n \quad (1)$$

Where:

a - represents the constant (in case other variables have no value

b - represents a coefficient showing the average change in the dependent variable (y) when a variable (x_1, \dots, x_n) changes by a unit measurement (with other variables held constant in the equation).

By including the above variables in the equation we obtain the following expression:

$$GOP = a + b_1 Ln Sales + b_2 FACR + b_3 AR + b_4 INV + b_5 AP + b_6 CCC + b_7 CR + b_8 QR \quad (2)$$

Results of statistical analysis

Results of the correlation matrix (table 2) show that revenue has a positive and significant influence on profitability measured by gross operating margin (GOP), while inventory conversion period, payables deferral period and cash conversion cycle (cash gap) have a negative effect on GOP. Variables whose correlation with profitability is not significant are fixed asset coverage ratio, receivables collection period, current ratio and quick ratio.

Table 2. Correlation matrix

		GOP	LogRev	FACR	RCP	ICP	PDP	CCC	CR	QR
Pearson Correlation	GOP	1.000								
	Log Revenue	.264	1.000							
	Fixed asset cov.r.	.002	-.159	1.000						
	Receivables coll.p.	-.156	-.160	.002	1.000					
	Inventory conv.p.	-.416	-.277	.092	.033	1.000				
	Payables deferral p.	-.239	-.170	-.016	.663	.501	1.000			
	Cash conver. cycle	-.439	-.315	.123	.142	.929	.334	1.000		
Current ratio	-.013	-.092	.018	-.014	-.084	-.209	.019	1.000		
Quick ratio	.125	-.015	.003	.018	-.277	-.240	-.181	.946	1.000	

*For bolded values correlation is significant

Table 3 shows two regression models. For both models we provide coefficients of multiple correlation, R; coefficient of determination, R-square and the measures of statistical significance, F. The first model considers only control variables to see if they significantly predict the result in the dependent variable. The correlation between the control variables and the dependent variable is modest (0.267). R Square Change equals 0.072 or 7.2% and shows how much variance of the dependent variable is explained by the control variables. The first model is statistically significant (Sig. F. Change .003, i.e. control variables significantly explain the dependent variable).

The second model, in addition to the control variables, takes into account the independent variables. R Square is 0.266 meaning that independent variables relative to control variables further explain 19.5% of the variance of the dependent variable compared to model 1. In total, dependent and control variables explain 26.6% of the variance of the dependent variable. Determination coefficient ranges that determine the representativeness of the model are as follow: < 0.1 weak, 0.11 – 0.30 modest, 0.31 – 0.50 moderate and > 0.50 strong representability [11]. Following those, it can be said that the coefficient of determination of the second model, which is 0.266, indicates modest representability.

Table 3: Regression model statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.267 ^a	.072	.060	.30135954	.072	6,202	2	161	.003
2	.516 ^b	.266	.233	.27213200	.195	8,288	5	156	.000001

a. Predictors: (Constant), Fixed asset coverage ratio, Log Revenue

b. Predictors: (Constant), Fixed asset coverage ratio, Log Revenue, Quick Ratio, Receivables collection period, Cash Conversion Cycle, Payables deferral period, Current ratio

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1,126	2	.563	6,202	.003 ^b
	Residual	14,622	161	.091		
	Total	15,748	163			
2	Regression	4,195	7	.599	8,093	.000 ^c
	Residual	11,553	156	.074		
	Total	15,748	163			

a. Dependent Variable: Gross operating profit; b. Predictors: (Constant), Fixed asset coverage ratio, Log Revenue

c. Predictors: (Constant), Fixed asset coverage ratio, Log Revenue,

Quick Ratio(I), Receivables collection period(I), Cash Conversion Cycle(I), Payables deferral period(I), Current ratio(I)

According to joint test, both models are statistically significant. However, it must be further determined which of the variables within the model explain significantly the variance of the dependent variable and.

Table 5 gives the coefficients (beta column) that relate to each of the predictors. The coefficients represent the parameters of the direction equation and are determined by the least squares method. The method determines the line (direction) that will best approximate the points on the scatterplot. It is evident that operating income is a significant variable in explaining the dependent variable while the coefficient of financial stability (fixed asset coverage ratio) is not. In the second model, no control variable is statistically predictive of explaining the dependent variable. As for the independent variables in the second model, cash conversion cycle and current and quick ratio are significant in explaining the dependent variable, while receivables collection period and payables deferral period are not significant. Regarding the variable inventory conversion period (days of inventory tying), due to multicollinearity with other variables, it was not taken into account when defining the model coefficients.

Table 5: Model coefficients, single test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.540	.543		-2.834	.005
	Log Operating Revenue	.230	.065	.271	3.522	.001
	Fixed asset coverage ratio	.003	.005	.046	.592	.555
2	(Constant)	-.363	.533		-.680	.497
	Log Operating Revenue	.103	.063	.122	1.644	.102
	Fixed asset coverage ratio	.004	.004	.059	.847	.398
	Receivables collection period	.000	.000	-.101	-1.051	.295
	Payables deferral period	.000	.000	-.046	-.453	.651
	Cash Conversion Cycle	.000	.000	-.212	-2.237	.027
	Current ratio	-.144	.049	-.801	-2.928	.004
	Quick ratio	.166	.055	.837	3.003	.003

Source: Results are obtained using SPSS

Based on the results and applying the coefficients for the significant variables in Table 5, the statistical model would look as follows:

$$GOP = -0.363 - 0.212 CCC - 0.801CR + 0.837 QR$$

As can be seen from the equation, there is no fixed asset coverage ratio, operating revenue, receivables collection period and payables deferral period that are significant in explaining the profitability indicator (GOP) variance by this statistical model. The above equation shows that there is a negative correlation between cash conversion cycle and current ratio with profitability and a positive correlation between quick ratio and profitability.

CONCLUSION

A research based on a sample of 33 companies in the construction industry found that liquidity variables such as cash conversion cycle, current ratio and quick ratio along with control variables significantly affect profitability, in this case represented by Gross Operating Profit. Contrary to the results of most literature reviewed, indicators such as receivables collection period, inventory conversion period and payables deferral period did not have a significant impact on the gross operating profit.

Due to the numerous bankruptcies of large construction companies, especially in civil engineering, the common practice of quantifying performance through volume and complexity of work, turnover or income has already changed in favor of measurable business indicators, notably working capital. This paper sought to contribute to such awareness because looking at the performance of construction companies through such indicators leads to a more realistic picture of how much we lag behind the

performance of typical construction companies in all segments, all in order to make progress by relying on the practice and experience of more successful ones.

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