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Relationship of Cash Conversion Cycle (CCC) and Profitability of the Firm: Evidence from Tehran Stock Exchange

Mohammad Khodaei Valahzaghard (Ph.D.)[1] , Tayebeh Falahati Ghalhari

Abstract:
This study examines the effect of Cash Conversion Cycle (CCC) and the deviation from optimal level of CCC on profitability of the firms in the Iranian capital market. A sample consisted of 97 listed companies on Tehran Stock Exchange (TSE) for the period 2005 to 2011 was subjected to this study. The results do not indicate any significant relationship between profitability, measured as the ratio of Net Operating Income (NOI) to sales, and Cash Conversion Cycle (CCC). But we do find that deviation from the optimal CCC level has an inverse and significant effect on profitability. That is to say, the further the company moves away from the optimal CCC level, the less profitable it becomes.

Keyword: *Conversion Cycle (CCC), Deviation from optimal level of Cash Conversion Cycle, profitability.*

1. Introduction

The process through which profitability of the firm is influenced by the changes in CCC in recent years has gained much attention among the researchers in different parts of the world. The studies have been predominantly focused on a linear relationship between CCC and different profitability indicators in the understudy firms, and mostly suggested a shorter CCC (or adoption of an aggressive working capital management policy) for increase of profitability in these firms. But such a "short-cut" might work counterproductive to the business operation, leading to decline

[1] . *Assistant Professor & Faculty Member, Department of Accounting, School of Management and Human Sciences, Tehran North Branch, Islamic Azad University (IAU), Tehran, Iran,* E-mail addresses: m_khodaei@iau-tnb.ac.ir

rather than increase of the firm profitability. For instance, when the firm embarks on reduction of inventory, it might soon face a shortage in inventories and lose some of its customers, or when it shortens its Collection Period, it might lose some of its good credit customers, or when it puts off or lengthens Payable Period or Days Payable Outstanding (DPO), it might risk its credit. Thus, the questions arises here as whether there is an optimal CCC level which allows the company to maximize its profitability by minimizing its Carrying Costs and Opportunity Costs, and if so, is there a significant association between deviation from optimal CCC level and profitability of companies?

This study, unlike the previous works, is primarily focused on the relationship between positive and negative deviation from optimal CCC level and profitability in the listed companies on the stock exchange.

2. Theoretical and empirical backgrounds

The ultimate goal of all enterprises is "value creation for their stakeholders", and "profitability" is one of the main constituents hereof. On the other hand, "liquidity maintenance" is also one of the chief objectives of the enterprise. But the point is that increase in earnings does not generally result in increase of liquidity and these two strategic objectives are not always aligned to each other in the same direction. If an increase in cash earnings is subject to spending, then the firm stands a great chance of serious problems in its financial position. Therefore, one should make a distinction between the two strategic objectives, and one objective should not be sacrificed for another. On the one side, if we don't care about profit, we won't be able to keep on operating for long, and on the other side, if we don't mind our liquidity level, we may soon end up with insolvency and bankruptcy.

One of the objectives of cash and liquidity management is to keep the least amount of idle cash holding in the business unit, so as management of accounts receivable (AR) and inventories, too, assist keeping level of the invested funds in these assets as low as possible. On the other hand, management of accounts payable (AP) tries to prolong the time of payment and to make the most of the temporary funds which actually belong to others. The period from the time of payment for the purchased materials or goods until collection of sales cash proceeds is called Cycle of Operation (Bozorgasl, 2005). This cycle is divided into two parts: the first part is the Inventory Sale Period, the period extending from Asset Acquisition Period until Inventory Sale Period; and the second part is from Inventory Sale Period to the period of receiving the sale proceeds known

as "Accounts Receivable Collection Period". The Cycle of Operation in fact represents a process which shows how a products moves through different accounts of current assets; it is initiated in the inventory account, then when it is sold, it turns into accounts receivable, and at last when its cash proceeds are received, it is converted into cash or liquid asset. In this process, the asset step by step gets closer to cash (Ross, Westerfield, and Jordan, 2008).

The period from inventory acquisition until payment of the price thereof is called "payment period". "Cash Conversion Cycle" refers to the process starting from cash payment for purchase of inventory and ending up to collection of sale cash proceeds. Note that cash conversion cycle (CCC) is the difference between cycle of operation and payment period (Ross et al, 2008). In other words, cash conversion cycle is the time period in which cash is spent by the company operation on production of a product item. Shortening this period means that for certain volume of production, less amount of cash is spent. CCC can be shortened by cutting down on either the average period in which cash is in the form of inventory, or the average accounts receivable collection period, or by lengthening the payment period (Jahankhani and Parsayeian, 2008). The change in CCC leads to alteration of asset turnover and eventually affects profitability of the business unit. Study of the process through which CCC and profitability are linked to each other in recent years has received much attention of researchers around the world. Caballero et al (2011) investigated the relationship of working capital management with profitability of small- to medium size Spanish firms. They used CCC as the indicator of working capital management, and operating ratio as the indicator of profitability. The results of this study indicated a non-linear quadratic relationship between the two variables, implying an optimum level of working capital for the companies, which maximizes their profitability and a deviation from this optimum level reduces their profit.

Deloof (2003) examined relationship of working capital management and profitability for a sample consisting of 1009 non-financial Belgian companies during 1992-1996. He used CCC as a comprehensive measure of working capital management and gross profit as the profitability measure. His findings did not confirm presence of a significant relationship between profitability and CCC, and indicated a significant negative association between accounts receivable collection period, inventory glow cycle, and payment period.

Gill et al (2010) using gross profit as the profitability indicator and CCC and its components as the indicator of working capital investigated the relationship between working capital and profitability in 88 selected companies from the New York Stock Exchange (NYSE) for the period 2005

through to 2007. Their findings were: a significant negative association between accounts receivable collection period and profitability, a significant relationship between CCC and profitability, and no significant relationship between inventory flow cycle and payment period (as the independent variables), and profitability (as the dependent variable). Safari (2010) in his master's thesis treated the relationship of capital management with profitability in the listed companies on TSE. In this study, CCC was held as the indicator of capital management, and ratio of gross operating income as the performance and profitability indicator. The results of this study, indicated a significant relationship between CCC and profitability, i.e. companies by reducing their CCC can realize higher profitability.

3. Methodology

3.1 Data gathering tools and methods

The information on the research theoretical background and literature was gathered using library research in which available sources at library, including books, journals, and dissertations on this topic as well as the relevant electronic articles in the Internet were searched and consulted. The actual data for conduction of this research were extracted from the financial statements and the notes to the financial statements of the understudy firms which were made available by the financial softwares Tadbir Pardaz, Rahavarde Novin, and the Internet sites of the Securities and Exchange Organization (SEO). The gathered information concerned 97 listed companies on TSE in the period 2005 to 2011.

3.2 Operational definition of the variables and the model formulation

The research main variables, their function, and the method of their calculation are summarized in the table below.

Table 1 – Introduction, function, and calculation methods of variables

Variable	Variable function	Variable calculation method
Cash conversion cycle (CCC)	Independent	(Inventory turnover in days) + (Accounts receivable collection period) – (payment period)
Net operating profit (PRO)	Dependent	$\frac{PRO}{Sales}$
Leverage (LEV)	Independent / Control variable	$\frac{Total\ debt}{Total\ asset}$
Sales growth (GROWTH)	Independent / Control variable	$\frac{Sales\ end\ of\ current\ period - Sales\ end\ of\ last\ period}{Sales\ end\ of\ last\ period}$
Cash flow (CF)	Independent / Control variable	$\frac{Operating\ cash\ flow}{Total\ asset}$
Firm size (SIZE)	Independent / Control variable	Natural logarithms of sales
Firm age (AGE)	Independent / Control variable	Natural logarithm of firm age
Investment in fixed assets (FA)	Independent / Control variable	$\frac{Tangible\ fixed\ assets}{Total\ asset}$
Return on Investment (ROI)	Independent / Control variable	$\frac{Operating\ profit}{Total\ asset}$

For test of hypotheses, the following models are constructed:

$$PRO_{i,t} = ß_0 + ß_1PRO_{i,t} - 1 + ß_2CCC_{i,t} + ß_3SIZE_{i,t} + ß4GROWTH_{i,t} + ß_5LEV_{i,t} + \varepsilon_t \quad (1)$$

$$CCC_{i,t} = \beta_0 + \beta_1CFLOW_{i,t} + \beta_2LEV_{i,t} + \beta_3GROWTH_{i,t} + \beta_4SIZE_{i,t} + \beta_5AGE_{i,t} + \beta_6FA_{i,t} + \beta_7ROA_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$PRO_{i,t} = \beta_0 + \beta_1PRO_{i,t-1} + \beta_2Deviation_{i,t} + \beta_3SIZE_{i,t} + \beta_4GROWTH_{i,t} + \beta_5LEV_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$PRO_{i,t} = \beta_0 + \beta_1PRO_{i,t-1} + \beta_2Deviation_{i,t} + \beta_3 (Deviation * AOD)_{i,t} + \beta_4SIZE_{i,t} + \beta_5GROWTH_{i,t} + \beta_6LEV_{i,t} + \varepsilon_{i,t} \quad (4)$$

3.3 Hypotheses

3.3.1 Main hypotheses

First hypothesis: Cash Conversion Cycle (CCC) is significantly associated to profitability of the company.

Second hypothesis: Deviation from optimal level of Cash Conversion Cycle (CCC) is significantly associated to profitability of the company.

3.3.2 Sub-hypotheses

First hypothesis: a positive deviation from optimal level of Cash Conversion Cycle (CCC) significantly affects profitability of the company.

Second hypothesis: a negative deviation from optimal level of Cash Conversion Cycle (CCC) significantly affects profitability of the company.

4. Data analysis

To eliminate the effect of the factors which may disturb measurement of the type and intensity of the CCC impact on profitability of the companies, in the footsteps of the prior research (Deloof, 2003, Caballero et al, 2007), the control variables firm size (SIZE), sales growth (GROWTH), and financial leverage (LEV) are introduced into the model. The two sub-hypotheses aim to show quality of changes in profitability of the business unit as a result of the negative and positive deviations from optimal level of CCC. We borrow Tong's two-step method (Tong, 2008) for the

purpose of data analysis. In the first step, deviations from the optimal level of CCC are obtained and in the next step, the way these deviations work out their effect on profitability of the companies are analyzed.

First step

In the style of Caballero et al (2011), we apply equation No.2 as the regression model to specification of the CCC length in the understudy companies on the stock exchange.

Second step

Like the way Tong (2008) did, since the deviation from the optimal CCC level can be both positive and negative, we define a variable as $Deviation_{i,t}$ which is the absolute value of the residuals obtained from equation 2. Thus, this variable measures deviations from optimum level of CCC. In addition, for test of the sub-hypotheses, we introduce a dummy variable as $AOD_{i,t}$ which takes on two values; 1 for positive residuals, and 0 for negative residuals. Thus, if actual CCC level is greater than optimum CCC level, $AOD_{i,t}$ is assumed 1, and if actual CCC level is smaller than optimum CCC level, $AOD_{i,t}$ is assumed 0.

To test the effect of the deviations from optimum level of CCC on profitability of the companies, equations 3 and 4 are used. All the independent and dependent variables in the two equations are the same as the variables used in equation 1, except variable CCC which is removed from the equation and variable Deviation comes in its place. In equation 3, β_2 represents the effect of deviations from the optimum CCC level on the firm profitability. Thus, $\beta_2 < 0$ indicates when the company moves away from optimum level of CCC, its profitability declines.

In equation 4, β_2 and $(\beta_2 + \beta_3)$ are the effects of the deviations below optimum level of CCC (AOD = 0) and the deviations above optimum level of CCC on the firm profitability, respectively. $(\beta_2 + \beta_3) < 0$, $\beta_2 > 0$ indicate both deviations below and above the optimum level reduce the firm profitability. Hence, the firm's operating profit increases only up to the point where its working capital reaches a certain level, and after that, its profit starts to decline. The first equation concerns the first main hypothesis which expresses the effect of the independent variable Cash Conversion Cycle (CCC), next to the explanatory variables (last period profitability, size, sale growth , and financial leverage) on profitability of the firm. The result of the regression equation (table 2) does not confirm the first hypothesis suggesting affectability of the firm profitability by extension or abridgement of CCC. Further, significance of F-statistic implies a linear relationship between at least one of the explanatory variables with the dependent

variable. The variables "last period profitability" and "firm size" have a direct and significant effect on profitability, but the relationship between "sale growth" and "financial leverage with profitability is not confirmed.

Table 2 – Results of the regression analysis for the effect of Cash Conversion Cycle (CCC) and other explanatory variables on profitability (equation 1)

Dependent variable: Profitability; Number of round: 7; Number of section: 97;

Number of healthy observation: 582

	Variable		Coefficient	St. error	t-statistic	Sig.
β_0	C	Constant factor	-7.098670	5.070046	-1.400120	0.1620
β_1	PRO (-1)	Last period profitability	0.783449	0.039016	20.08031	0.0000
β_2	CCC	Cash Conversion Cycle	-0.000810	0.001118	-0.724583	0.4690
β_3	SIZE	Firm size	1.864342	0.890404	2.093816	0.0367
β_4	GROWTH	Sale growth	0.021242	0.024220	0.877058	0.3808
β_5	LEV	Financial leverage	-1.748656	2.106071	-0.830293	0.4067
	Coefficient of determination (R^2)		0.660708	F-statistic		224.3303
	Adjusted R^2		0.657762	Durbin-Watson statistic		2.126928

PRO = -7.098 + 0.783*PRO (-1) - 0.0008*CCC + 1.864*SIZE + 0.0212424176391*GROWTH - 1.748*LEV

In the second and third regression equations, like the first equation, profitability is the dependent variable and the same control variables are included, except that the former ones examine the effect of the independent variable "*deviation from the optimum level of CCC*" on profitability. These equations are designed to test the second main hypothesis. The obtained result from the regression analysis indicates that deviation from optimum level of CCC has an inverse and significant effect on profitability.

Table 3 – Results of the regression analysis for the effect of deviation from optimal level of Cash Conversion Cycle (CCC) and other explanatory variables on profitability (equations 2 & 3)

Dependent variable: Profitability; Number of round: 7; Number of section: 97;

Number of healthy observation: 582

	Variable		Coefficient	St. error	t-statistic	Sig.
β_0	C	Constant factor	-4.787135	4.421502	-1.082694	0.2794
β_1	PRO (-1)	Last period profitability	0.776478	0.039571	19.62257	0.0000
β_2	DEVIATION	Deviation from optimal CCC level	-0.002993	0.001653	-1.810576	0.0707
β_3	SIZE	Firm size	1.515259	0.815097	1.858993	0.0635
β_4	GROWTH	Sale growth	0.029938	0.021759	1.375875	0.1694
β_5	LEV	Financial leverage	-2.112788	2.036936	-1.037238	0.3001
Coefficient of determination (R^2)			0.664879	F-statistic		228.5566
Adjusted R^2			0.661970	Durbin-Watson statistic		2.167365

PRO = -4.787 + 0.776*PRO2(-1) - 0.0029*DEVIATION + 1.515*SIZE + 0.0299*GROWTH - 2.112*LEV

In equation 4, the effect of deviation from optimum level of CCC (both positive and negative deviations) on the firm profitability is tested (the first and second sub-hypotheses). As is seen in table 4, a negative deviation from the optimum CCC level has an inverse and significant effect on profitability, whereas a positive deviation from the optimum CCC level does not significantly affect profitability of the company.

Table 4 - Results of the regression analysis for the effect of positive and negative deviation from optimal level of CCC and other explanatory variables on profitability

Dependent variable: Profitability; Number of round: 7; Number of section: 97;

Number of healthy observation: 582

	Variable		Coefficient	St. error	t-statistic	Sig.
β_0	C	Constant factor	-4.391420	3.963156	-1.108061	0.2683
β_1	PRO (-1)	Last period profitability	0.752592	0.041798	18.00566	0.0000
β_2	DEVIATION	Negative deviation	-0.006272	0.003216	-1.950304	0.0516
β_3	DEVIATION	Positive deviation	0.004198	0.003717	1.129361	0.2592
β_4	SIZE	Firm size	1.658268	0.748135	2.216534	0.0270
β_5	GROWTH	Sale growth	0.033068	0.016054	2.059762	0.0399
$_6\beta$	LEV	Financial leverage	-3.164312	2.086376	-1.516654	0.1299
Coefficient of determination (R^2)			0.658717	F-statistic		184.9700
Adjusted R^2			0.655156	Durbin-Watson statistic		2.123530

PRO = -4.39+ 0.75*PRO (-1) - 0.006*DEVIATION + 0.004*DVAOD + 1.65826777169*SIZE + 0.033*GROWTH - 3.164*LEV

5. Conclusion and suggestions

The overall results in this study based on test of the hypotheses do not suggest a significant relationship between Cash Conversion Cycle and ratio of Net Operating Profit (or Net Operating Income) as the indicators of profitability in the listed companies on TSE. This is consistent with the findings of Samilogue and Demirnes (2008) and Deloof (2003). However, our results, consistent with the results documented by Caballero et al (2011), indicate that deviation from optimum CCC level has an inverse working on profitability. That is to say, whenever the company moves away from its optimum CCC level, its profitability suffers. In addition, our

findings give evidence of only slight and insignificant effect of a positive deviation from optimum level of CCC on profitability of the companies, whereas a negative deviation from the optimum level exerts an inverse and significant impact on profitability.

In view of the research results, use of CCC information content in interpretation of working capital strategies for the purpose of higher profitability is not recommended to companies. Instead, for this purpose, management would rather pay attention to each individual component of CCC, i.e. payment period cycle, inventory flow cycle, and collection period cycle, in order to establish significance of the relation each single element might have with profitability. In addition, considering unreliability of accounting profit and its associated indicators, we recommend use of economic profit as an alternative for specification of working capital strategies which are subject to and determined by CCC. Further, based on test of the first sub-hypothesis, which suggests lack of significant association between positive deviation from optimum CCC level and profitability, managers are not expected to realize a higher profitability by simply extending the CCC which involves more investment in working capital. Despite the inverse and significant effect of negative deviation from optimum level of CCC found in test of the second sub-hypothesis, we don't believe that managers by reduction of CCC which involve less investment in working capital would be better off in terms of higher liquidity and profitability. As is shown in research results, adoption of such conservative strategies is likely to reduce profitability of the firm, because at the optimal level, all CCC components are optimized which given the firm liquidity and solvency result in maximum profitability.

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