Cash Conversion Cycle and Profitability: A Dynamic Model

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ABSTRACT

Profitability is outcome of all financial plans and policies of a company providing final answers to analysts on ways of company management. Profitability denotes that enterprise is healthy. Adopting appropriate policies on the cash conversion cycle results in maintaining an optimal level of cash and increased financial flexibility to respond to unforeseen profitable investment opportunities and increased profitability. Therefore, the main objective for the present study is to evaluate relationship between the cash conversion cycle and profitability. For this, the present research shed lights on the relationship between the profitability and cash conversion cycle using generalized method of moments (GMM). The sample consists of 83 companies listed in Tehran Stock Exchange from 2006 to 2012. Research findings indicate that there is a significant nonlinear relationship between the cash conversion cycle and profitability and this relationship is positive to a given point and then become negative.

INTRODUCTION

Enterprises have effective contribute to economic growth. Such effectiveness in financial terms is determined by two criteria liquidity and profitability. Profitability is a mark of firm's health and liquidity indicates the survival of the enterprise. In other words, if a company is not profitable, the sick, but has liquidity, its survival is in danger. Although both foregoing factors are important, but the liquidity has great deal of importance [1]. Firms listed in stock exchange may be delisted because the profitability in consecutive period according to the company's audited financial statements led to losses (Non-profitability). This study try to address a solution for increasing the profitability of companies listed in Stock Exchange. Working capital management is an essential element in company's profitability. As a comprehensive measure of working capital management, the cash conversion cycle taking all financial flows related to inventory, receivables and payable in to account. The association between the cash conversion cycle, profitability and value of the company is that alleviation of cash conversion cycle improves the profitability of the company by reducing the time in which cash involved in the value chain. This can realized by shortening the inventory conversion, by selling goods to customers and shorten the period of collection, expediting the receipt and with prolongation of the period of delay payable as well as delay in payment of suppliers[2]. On the other hand, short cash conversion cycle could hurt the company's profitability. Shorten the inventory conversion period in turn can lead to a reduction in period of collection of receivables from customers and this leads to losing company's major customers and low sale and profitability. Prolongation payable delay period damages credit reputation. Therefore, proper management of working capital and achieving the desired levels of cash conversion cycle results in profitability [3]. Previous research has shown that there is a linear relationship between the cash conversion cycle and profitability and according to the above argument; the present study suggests that there is a nonlinear relationship between the cash conversion cycle and profitability on which rare studies have been considered in the literature. Generalized method of moments (GMM) is used in order to test of hypothesis in the present study that is differs from that in previous research in this field.

Literature Review:

[4] studied effect of working capital management policies on the profitability and value of industrial companies listed on the Stock Exchange of Oman during the years 2009 to 2001 and found that working capital management strategy imposes a negative effect on profitability. At the same time he concluded that size, growth
and GDP growth has a positive impact on the company’s profitability and value. [5] examined the effects of working capital management on the Swedish firms. [5] considered the cash conversion cycle and business cycle as indicators for net working capital and operating gross profit as a measure of profitability. Results showed that by shortening cash conversion cycle and net trade cycle, firms can increase their profitability. A linear relationship between working capital management and profitability is seen in this study. The study also provided evidence that companies with an efficient management of working capital can increase their net cash flows and thereby add value to its shareholders. [6] showed a significant positive relationship between European company’s size and profitability. [7] evaluated the effect of working capital management of the firms listed in Tehran Stock Exchange. For this purpose, the working capital management was divided into four components (average collection period, inventory turnover period, and the average term debt and cash conversion cycle) and then evaluated the effects of each component on the profitability in presence of two control variables liquidity and firm size. The results indicate that there is a significant positive linear relationship between operational efficiency in working capital management and profitability implying the linear relationship between working capital management and profitability. As for control variables, firm size and liquidity, significant positive association between these two variables and profitability was found.

In investigating the effect of working capital management on company’s profitability in Iran, [8] took companies listed in Tehran Stock Exchange into account during 1998-2007 with 1356 year-company observations, showed that by lowering asset and number of days for collection, management leads to company’s profitability, i.e. profitability is negatively related to these factors. They found significant negative correlation between solvency of companies and profitability in linear manner. A study was done by [9] regard to the effect of working capital management on profitability of firms listed in Tehran Stock Exchange. The sample consisted of 92 companies studied between the years 1996 to 2005. In this study, net income on total asset was used as a measure of the profitability of the company. The results showed that there is a significant negative correlation between profitability of the companies with the collection of receivables, inventory turnover period, the creditors deposit period and cash conversion cycle.

The significant negative effect of working capital on the profitability of the company may be due to lack of suitable planning for cash conversion cycle and the working capital that lead to working capital surplus or deficit. For a company, optimal amount of working capital that must be maintained to achieve maximum profitability is of utmost importance. If working capital is kept excessively, therefore, company has invested too much in current assets and thus a missed opportunity cost is obtained. Also, if the company maintains working capital is less than the required amount, it may not be able to fulfill its obligations. Shorting (increasing) cash conversion cycle, increasing (decreasing) working capital. According to the above studies, increasing in working capital from shorting cash conversion cycle not necessarily lead to profitability. In other words, the shorting cash conversion cycle can increase profitability and also decrease it. Therefore, it can be supposed that there is no linear relationship between cash conversion cycle and profitability. In order to achieve the objective of this study, the research hypothesis is as follows:

Cash conversion cycle has a nonlinear effect on profitability

Methodology:
As in the present research data are obtained in order to test relationship between variables, it is a descriptive correlational study. All data were collected from financial statements of companies listed in Tehran Stock Exchange and for the analysis the software Stata was used. Sample research includes the companies listed in Tehran Stock Exchange in period from 2006-2012. In this study, systematic sampling method was adopted. For this purpose, companies characterized with following terms are selected and otherwise they will be deleted.

1. Listed in Tehran Stock Exchange before 2006 and not deleted from list since end of March 2010.
2. Their fiscal year is unchanged during the study period.
3. The sample companies’ fiscal year is ended to March 19.
4. Their shares have less than three-month suspension.
5. All required information is available and provided

To test this hypothesis, the following nonlinear equation is taken into account:

\[ \text{PRO}_{i,t} = \alpha_0 + \alpha_1 \text{PRO}_{i,t-1} + \alpha_2 \text{CCC}_{i,t} + \alpha_3 \text{CCC}_{i,t}^2 + \alpha_4 \text{SIZE}_{i,t} + \alpha_5 \text{GROWTH}_{i,t} + \alpha_6 \text{LEV}_{i,t} + \epsilon_{i,t} (1) \]

Where, PRO: the profitability of the company measured with operating gross profit (PRO) as follows:

\[ \text{PRO}= \frac{\text{[sales - cost of sales]/total assets]}{\text{sales}} \]

CCC: squared cash conversion cycle = (accounts receivable/sales) * 365 + (inventories/purchases) * 365 - (accounts payable/purchases) * 365.
CC: squared cash conversion cycles,
SIZE: firm size = natural logarithm of sales,
GROWTH: Sales growth = (sales$_{t}$- sales$_{t-1}$)/sales$_{t-1}$,
LEV$_{i,t}$: financial leverage = the ratio of debt to total assets for the ith company at the end of year t,
\(\alpha, \beta, \epsilon\) is the intercept, \(\beta\) is the estimated coefficient of the respective explanatory variable, \(\epsilon\) is the error term.
Here, generalized method of moments (GMM) was used as a method for testing the research hypothesis. This method is useful as it somewhat reduced and eliminated special effects companies to some extent. Dynamic panel method (GMM) will be used to solve autocorrelation and heterogeneity issues. As an alternative we could use random effects model described by [10] but endogeneity issues as explanatory variables still remain unresolved [11]. To estimate the model according to this method, first instrumental variables used in the model must be determined. GMM estimator’s compatibility varies upon validity of the assumption of no serial correlation of error terms and tools. This credit can be explained by two tests by [12]. First is Sargan test, a predetermined limits testing validity of the instruments. Second is Arellano-Bond test for testing second-order serial correlation in first-order differential error (AR(2)). Failure to reject the null hypothesis in both experimental denotes assumption of no serial correlation and validation tools. GMM estimators are compatible if the second-order serial correlation in the error terms is not derived from first order differential equation. Sargan test is predetermined limitation and is used to determine any correlation between the tools and the error. For these tools to be valid, there must not be a correlation between the tools and the error terms. Null hypothesis for this test is that the instruments are valid to the extent that they are not correlated with the errors in the first-order differential equation. Failure to reject the null hypothesis could provide evidence of appropriate tools. GMM model is compatible when there is no second order serial correlation in the residuals. If GMM estimators are compatible and their tools are valid, dynamic panel data model is valid too.

RESULTS AND DISCUSSION

Results of descriptive statistics from original data represent the deviation, skewness and kurtosis from zero. All three terms denotes on presence of non-normally distributed data and outliers. According to [13] if the z-score value of a case (data) is more than 3.29, the case will be considered as a univariate outlier. Multivariate outliers are identified based on Mahalanabis distance from regression model. Replacements are made to extreme values identified as univariate outliers then companies with multivariate outliers were omitted in accordance with [13]. The descriptive statistics showed the improved range of kurtosis after the outlier treatment. All skewness values were within the acceptable range while kurtosis values are near zero.

Correlation analysis was carried out to explain the strength and direction of the linear relationship between two variables as well as to identify problems of multicollinearity. Pearson correlation indicated insignificant correlation between dependent and independent variables. Insignificant correlation between two variables shows that the observed pattern between the two variables is nonlinear. It is worth mentioning that the existence of significant correlation does not guarantee the prediction of a variable by the other variable. Regression analysis was used for predicting a variable by the other variables in the next step. According to [14], multicollinearity problem was solved by centering the variables.

According to literature review, last year gross profit affects current year profitability. Therefore, the present study considered previous year gross profit (PRO1(-1)) as a explanatory variable. Considering PRO1(-1) as an explanatory variable may leads to endogenous problem. In static models, all regressors are assumed to be exogenous (e.g. regressors should be independent from the residuals) consequently, no correlation between the regressors and the residuals should exist. If we assume that all regressors are exogenous, this may violate the recently mentioned assumptions and lead to the coefficients (B’s) estimators that are unbiased and consistent, whereas the results might be inefficient. However, these conditions may result in underestimation of the standard errors of the estimators and higher values of T-statistics, therefore invalidity in the standard errors and the resulting tests can be observed. To reduce invalidity problems and produce more efficient estimators the use of GMM models are recommended. Table 1 reports the results from robust two step First-difference GMM model in testing the relationship between PRO with CCC, and CCC2.

PRO: the profitability of the company, PRO (-1) first lag of the profitability of the company, CCC: cash conversion cycle, CCC2: squared cash conversion cycles, SIZE: firm size, GROWTH: Sales growth and LEV: financial leverage

Since p-value for cash conversion cycle (CCC) and squared cash conversion cycle (CCC2) is less than error \((\alpha)\ 0.05\), the cash conversion cycle has a positive effect on the profitability. CCC and CCC2 have positive and negative coefficient respectively, it can be concluded that cash conversion cycle has positive effect on profitability, but after reaching a peak it becomes negative. There is inverted U-shaped nonlinear relationship between profitability and cash conversion cycle. Therefore, research hypothesis is accepted. The control variables, the financial leverage, firm size are positively related and there is negative relation between sales growth and profitability. Results of Table (1) indicate that the p-value of first lag of the profitability of the company (PRO (-1)) is less than error 0.05 (p-value ≤0.05), and given that the coefficient of this variable is positive, the profitability for previous period impose significant effect on current profitability.

Table (1) shows that the null hypothesis of the Sargan test (instrumental variables are not correlated with the residuals) cannot be rejected and therefore it can noted that instrumental variables used in the model are appropriate. The null hypothesis of serial correlation in which the error terms in regression do not show first
order differential second-order serial correlation cannot be rejected. The results from Arellano-Bond test for AR(2) in first differences confirm lack of autocorrelation in residuals. The results of Hansen tests indicate model correct specification because the null hypothesis represents the model validation is not rejected. The statistic probability of the Wald test indicates the significance of the regression estimates.

Table 1: Results of the estimation of robust two step First-difference GMM model to test the hypothesis (Dependent variable PRO).

<table>
<thead>
<tr>
<th>variable</th>
<th>coefficient</th>
<th>Z</th>
<th>probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRO (-1)</td>
<td>0.815</td>
<td>42.30</td>
<td>0.000</td>
</tr>
<tr>
<td>CCC</td>
<td>0.0148</td>
<td>2.41</td>
<td>0.016</td>
</tr>
<tr>
<td>CCC2</td>
<td>-0.00014</td>
<td>-2.13</td>
<td>0.033</td>
</tr>
<tr>
<td>SIZE</td>
<td>2.22</td>
<td>4.50</td>
<td>0.000</td>
</tr>
<tr>
<td>GROWTH</td>
<td>-0.662</td>
<td>0.019</td>
<td>0.000</td>
</tr>
<tr>
<td>LEV</td>
<td>0.136</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>C</td>
<td>0.299</td>
<td>0.019</td>
<td>0.000</td>
</tr>
<tr>
<td>Statiscal test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sargan Test</td>
<td>37.42</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond Test for AR(1)</td>
<td>-1.20</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond Test for AR(2)</td>
<td>0.92</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Wald Test</td>
<td>3.98</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Hansen</td>
<td>39.53</td>
<td>0.085</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion:
This study sought to shed lights on effect of cash conversion cycle on the profitability. Previous studies indicates linear relationship between cash conversion cycle on the profitability. This study investigated the nonlinear relationship between the two foregoing variables. As per results, positive and negative coefficient was reported for CCC and CCC² respectively, as after reaching a peak it becomes negative. There is inverted U-shaped nonlinear relationship between profitability and cash conversion cycle. The much longer cash conversion cycle, more investment in working capital is required. Longer cash conversion cycle may increase the company’s profitability because it leads to increased sales. In the other hand, increased cash conversion cycle reduces the profitability of the company. This condition occurs when the cost of increased investment in working capital is much than profit of holding inventories or credit to customers. The shorter cash conversion cycle can contribute to approach accrual profit to cash profit and increases the liquidity of the company. Nevertheless, short cash conversion cycle, lowered company’s customers and sales, and the company will be unable to meet its obligations [15]. Given the advantages and disadvantages of short term cash conversion cycle it should be kept in optimal level and for a firm, optimal level of the cash conversion cycle to achieve maximum profitability is of great importance. It is suggested that future studies deal with the optimal level and the cash conversion cycle.

REFERENCE