NON LINEAR ANALYSIS OF CASH CONVERSION CYCLE AND PROFITABILITY: AN EMPIRICAL EVIDENCE FROM PAKISTAN

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Abstract

This paper investigated the relationship between working capital management and firm's profitability for a sample of 17 listed cement sector companies of Pakistan by controlling for unobservable heterogeneity and possible endogenity, for the period from 2007 to 2016. Eempirical results show that there is a concave (nonlinear) relationship between working capital level and firm's profitability. Our results direct that firm's working capital in cement sector of Pakistan have an optimal level of 33 days that balances the risk and returns and, hence, maximizes firm's profitability. Therefore, we suggest based on our empirical findings that management should avoid adverse effects on firm's profitability owing to additional financing expenses, loss of sales and loss of discounts for early payments to suppliers.

1. Introduction

In modern developing economies construction sector is considered to be the most effective accelerator of economic growth and employment. Cement industries are one of the allied sectors boosted by construction activities. Rapid urbanization in Pakistan has created a backlog of 7.5 million housing units which is accumulated by 0.3 million per year (World Bank, 2009). The global financial crisis of 2008 had severely shattered the economic activities in Pakistan; the current revival of cement industries after 5 years has raised the industry hope of a long-awaited turnaround. Pakistan cement industry dispatched 27.99 million tons of cement in which 21.30 million tons of local market and 6.69 million tons of export (Economic Survey of Pakistan, 2013-14). Pakistan cement industry has a potential to export cement to neighboring countries like Afghanistan, India, UAE and Central Asian States.

To achieve the long run survival of firm, it is necessary for financial managers to manage not only the long-term operations, but also manage the firm's short-term operations efficiently and effectively. Well-organized use and management of resources in the short term is a key area of financial affairs.

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Effective management of working capital, current assets to meet its ongoing obligations, produces good results.

Working Capital Management (WCM) is defined as the "management of a company's current assets and current liabilities" (Schall and Haley, 1991). According to Smith (1980), working capital management is highly important because it affects both firm's profitability and risk, and, consequently, its value. Low investment in working capital (aggressive working capital management policy) is related to higher return and higher risk, while higher investment in working capital (conservative working capital management policy) is supposed to have lower returns and lower risk. Working capital management consists of all the methods and procedures which eliminate the risk of loss of sales and lack of ability in paying short term liabilities and also prevent over investment without profitable use in these assets, through planning and controlling short term assets and ongoing liabilities (Lazaridis & Tryfonidis, 2006).

Previous studies on working capital management and firm profitability like Jose (1996), Shin & Soenen (1998), Deloof (2003), Rehman and Nasir (2007), Karaduman et al. (2010) and Ray (2012) suggests that low level of investment in operating working capital improves the firm profitability, however, ignore the high risk associated with the low level of investment in working capital. For example, the risk of loss of sales and disturbance occurs in the production process due to low investment in working capital. There might be a level of working capital at which a reduction in working capital affects a firm's profitability negatively (Baños-Caballero et al., 2012; Nurein et al., 2015; Wang & Li, 2015). There might, be nonlinear (concave) relationship between the working capital and the profitability of the firm's, rather than linear. This study empirically tests the nonlinear relationship between the working capital management and firm's profitability in order to test the trade-off between risk and return.

Earlier work on working capital management and firm profitability demonstrate competing views, high investment in working capital allows the business firms to increase their volume of sales and obtain higher discounts for early payments made to suppliers and, hence, may improve the value of the firm (Deloof, 2003). However, high investment in working capital increase firm financing expenses. These additional financing expenses may lead towards bankruptcy. These positive and negative effects lead to the prophecy of concave (inverted U-shaped) relation between firm profitability and investment in working capital. According to the findings of Wang (2002) higher values firms in Japan and Taiwan hold lower investment in working capital than the lower values firms.

High investment in inventories and extending trade credits might improve the profitability of the firm by several reasons. Blinder and Maccini (1991) argued that high investment in inventories can prevent interruptions in the production process, supply costs, price fluctuations and loss of business resulting from scarcity of products. According to Schiff and Lieber (1974) it allows business firms to prevent themselves from high production costs resulting from high fluctuating in production. Extending trade credit might increase sales of the firm; it also strengthens the relationship between supplier and customer (Ng et al., 1999). According to Shipley & Davies (1991) and Deloof & Jegers (1996) it is an important criterion of

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selection when it is difficult to differentiate products. However, high investment in working capital negatively affects the firm's profitability, keeping extra inventories supposes certain cost, for example cost of insurance, where house rent and security expenses. High investment in inventories needs to be financed, over investment in working capital increases financial and opportunity costs (Kim & Chung, 1990). High investment in working capital lead firm toward bankruptcy and financial distress. According to Deloof (2003) high investment in working capital means locked huge amount of funds, which results in hampering the firm ability to take up valuable projects.

It is expected that there is a trade-off exist. Subsequently, it is expected that there is an optimal level of working capital, which balances these benefits and cost and maximizes the value of the firm. Deviation from this optimal level from both sides negatively affects the firm profitability.

Cash conversion cycle is used as a comprehensive measure of working capital in the literature. For the manufacturing firms cash conversion cycle can be defined as, "a cycle in which company purchases raw material (inventory), sell finished goods on account and then collect receivable from customers." In other words cash conversion cycle is a model focuses on the time span between when the firm makes payments to creditors and when it receive cash from customers resulting from credit sales of goods (Brigham and Ehrhardt, 2005). Longer cash conversion cycle required larger investment in current assets.

Cash Conversion Cycle = RCP + ICP – PDP

Where, Cash Conversion Cycle = Measure of working capital

RCP = Receivable Collection Period

ICP = Inventory Conversion Period

PDP = Payable Deferral Period

The rest of this paper is organized as follows. Research objectives and hypothesis for the study are discussed in section 2. Section 3 describes research methodology. Results are discussed and analyzed in section 4. Section 5 concludes.

3.1 Hypothesis

Model design to test the nonlinear relationship between working capital management and the firm's profitability presents a breakpoint which can be obtained by taking the first derivative of the GOP (gross operating profit) with respect to CCC variable and putting the answer of first derivative equal to zero"0".

By solving we obtained the breakpoint is $CCC_{i,t} = [-\beta_2 / 2\beta_3]$. The main hypotheses will be verified that there is an inverted U-shaped relationship between working capital management and the firm's profitability, and, hence, there is an optimal level, if this should be a maximum. This is maximum only if the answer of second partial of firm's profitability with respect to cash conversion cycle is $(2\beta_3)$ is negative. So, the co-efficient of β_3 should be negative.

4. Methodology and Data

The data consists of annual observations of all cement companies listed on Karachi Stock Exchange from

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2007 to 2016. Annual reports will be collected from website of Karachi stock exchange and from websites of companies. Correlation analysis will be used to test the statistical significance of the association. Generalized method of moment (GMM) proposed by Arellano and Bond (1991) will be used to check the relationship between working capital management and firm's profitability. GMM is useful in the following circumstances:

- The presence of lag. Dependent variable in the model like $GOP_{i,t-1}$ which give rise to autocorrelation problem.
- Dynamic panel data where time dimension (T=7) is short and companies dimension (N=17) is larger.
- It also helpful in solving the endogenity problems if causality runs in both directions.
- It provides better estimation when demographic and geographic characteristics (fixed effects) are correlated with independent variables.

4.1 Research Model

The following model will be used to examine the nonlinear relationship between dependent, independent and control variables:

$$GOP_{i,t}=\beta_0+\beta_1 GOP_{i,t-1}+\beta_2 CCC_{i,t}+\beta_3 CCC^2{}_{i,t}+\beta_4 GROWTH_{i,t}+\beta_5 SIZE_{i,t}+\beta_6 LEV_{i,t}+\varepsilon_{i,t} \quad (1)$$

$$NOP_{i,t}=\beta_0+\beta_1 NOP_{i,t-1}+\beta_2 CCC_{i,t}+\beta_3 CCC^2{}_{i,t}+\beta_4 GROWTH_{i,t}+\beta_5 SIZE_{i,t}+\beta_6 LEV_{i,t}+\varepsilon_{i,t} \quad (2)$$

This study uses two proxies to measure the profitability of the firm. Where;

GOP is calculated by gross operating income [(sales – cost of goods sold)/ total assets]

NOP is calculated by gross operating income [(sales – cost of goods sold – Dep. & Amortization)/ total assets].

CCC and CCC² are the operating variables used in this model. Cash conversion cycle (CCC) is calculated by (accounts receivable/sales) x 365 + (inventories/cost of goods sold) x 365 – (accounts payable/ cost of goods sold) x 365.

SIZE is measured as the natural logarithm of sales.

GROWTH is measured by the ratio $(sales_1 – sales_0) / sales_0$.

LEV (Leverage)ratio of debt to total assets.

5. Results and Analysis

Before we present and discuss the main regression results, it would be useful to shed some light on the descriptive statistics to get some understanding about the data. Table 1 reports descriptive statistics of the data to be used in the analysis.

Table 1: Descriptive Statistics

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Variables	Obs.	Mean	Std. Dev.	Min	Max
GOP	119	0.1242	0.1582	-0.5109	0.8350
Lagged GOP	119	0.0218	0.1377	-0.5950	0.8350
CCC	119	-45.7532	52.1218	-288.4715	90.8501
Growth	119	0.1437	0.3131	-0.8700	0.9800
Size	119	3.6665	0.4793	2.1622	4.8053
Leverage	119	0.6135	0.3770	0.1814	2.9797

Table 1 shows descriptive statistics of all the variables under consideration. Descriptive statistics includes the number of observation, mean, standard deviation, minimum and maximum values of the variable used in this study. It is observed that average gross operating profit (GOP) is 12.42% with a minimum of -51.09% and maximum of 83.50%. The standard deviation is 15.82% displaying an extensive variation in gross operating profit across the listed cement firms in Pakistan.

CCC (cash conversion cycle) which is used as a proxy of working capital management shows negative mean value -45.75 with a standard deviation of 52.12. Negative mean of cash conversion cycle shows that Cement Sector firms working in Pakistan finance their working capital through delay in accounts payables. Growth has a mean value of 14.37% with a minimum value of -87% and maximum value is 98%. Its standard deviation is 31.31%. Size (log of sales) has a mean of 3.66 with minimum of 2.16 and maximum of 4.80. Its standard deviation is 0.47. Leverage shows that an average 61.35% debt has been used by the cement sector firms to finance their assets. Its standard deviation is 37.70%.

In the next step, the correlation matrix is shown to check the possibility of the presence of high correlation. Table 2 shows the correlation between the variables.

Table 2: Correlation Matrix

	GOP	GOP (-1)	CCC	SIZE	GROWTH	LEV
GOP	1.0000					
GOP (-1)	0.5563***	1.0000				
CCC	0.1824**	0.0716	1.0000			
SIZE	0.6364***	0.1843**	0.0664	1.0000		
GROWTH	0.2629***	0.3753***	-0.0381	0.3194***	1.0000	
LEV	-0.1262	0.0837	-0.073	-0.1697*	0.1706*	1.0000

Notes: GOP, Gross operating income; CCC, Cash conversion cycle; SIZE, size of the firm; GROWTH, the growth of sales and LEVERAGE, the leverage.*** Indicates 1% significance. ** Indicates 5% significance and * Indicates 10% significance.

We present in Table 2 the correlation between all the variables used to examine the relation between

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working capital and firm's profitability. The results show that GOP (-1), Size, and growth have a high positive and significant relationship with GOP. The positive correlation between growth and firm's profitability indicates that more growth opportunities improve firm's profitability. Leverage shows a negative correlation with firm's profitability. Size has a significant positive correlation with gross operating profitability. The higher value in correlation matrix is 0.6364 which is between GOP and size, indicating that there is no multicollinearity problem. Further, we have also provided results for the presence of the possibility of multicollinearity. Table 3 contains results for the tests of multicollinearity.

Table 3: Multicollinearity Test (VIF and Tolerance Factor):

Variable	VIF	Tolerance Factor (1/VIF)
CCC 2	3.47	0.288413
CCC	3.26	0.307179
Size	1.39	0.717014
Growth	1.33	0.753319
Lag. GOP	1.19	0.840863
Leverage	1.11	0.899638

Variance Inflation factor and Tolerance Factor for each independent variable used in our model are checked to ensure that whether or not there is multicollinearity or not. The largest value of Variance Inflation Factor is 3.47, which is the value of CCC square. The values of VIF vary from 1.11 to 3.47, which indicate that there is no multicollinearity problem in our analysis because the 3.47 is far below from 5 Studenmund, (1997). Moreover, 0.28 is the lowest tolerance coefficient of CCC square. The tolerance coefficient is 0.89 which is highest. The tolerance factor fluctuates from 0.28 to 0.89 which shows lack of multicollinearity because all the values of tolerance factor are greater than 0.10.

Having done with the descriptive statistics, we are moving towards our main regression results. Main regression results are reported in Table 4

Table 4: Generalized Method of Moment Results for the Gross Operating Profit and Net Operating Profit with Drift and without Drift

Variables	Without Drift		With Drift	
	Equation 1	**Equation 2**	**Equation No.1**	**Equation No.2**
NOP(-1)	------	1.41224***	------	0.3707222***
		(4.49)		(4.38)
GOP(-1)	1.382046***	--------	0.4387842***	--------
	(4.93)		(5.09)	
CCC	0.0000423	-0.0000131	0.0011907***	0.0011337***

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	(0.04)	(-0.01)	(3.2)	(3.05)
CCC 2	-0.000000649	-0.000000724	0.00000304*	0.0000028*
	(-0.16)	(-0.17)	(1.84)	(1.7)
Growth	0.279229***	0.2797421***	0.1504103***	0.140794***
	(3.53)	(3.31)	(4.28)	(4.02)
Size	-0.028606	-0.027769	0.1369856***	0.1329285***
	(-1.27)	(-1.17)	(5.64)	(5.7)
Leverage	0.0437135	0.0432146	0.0948666***	0.0757155**
	(0.75)	(0.66)	(3.25)	(2.32)
F-test	27.03	17.51	34.59	27.91
F-test p-value	0.000	0.000	0.000	0.000
Hansen	10.90	9.80	10.90	64.94
Hansen p-value	0.619	0.710	0.619	0.0000
m1	-2.65	-2.58	-2.79	-2.59
m2	0.60	0.53	0.63	0.39
m1 p-value	0.008	0.010	0.005	0.010
m2 p-value	0.546	0.597	0.530	0.697
Firms	17	17	17	17
Observation	170	170	170	170

Notes: *** Indicates 1% significance. ** Indicates 5% significance and * Indicates 10% significance. Table shows the results of Equation 1 & 2. The dependent variable in Eq.1 is gross operating profit (GOP) and in Eq.2 is net operating profit (NOP). Z statistics are given in parenthesis. Hansen test is used for over identified restrictions distributed asymptotically under the null hypothesis of exogeneity of instruments is satisfied. For serial correlation m1 and m2 test is used using the residuals of first difference, distributed asymptotically N (0, 1) under the null hypothesis of no serial correlation.

5.2. Discussion on Main Regression Results

The results of this study indicate that the CCC (cash conversion cycle) variable is statistically insignificant with a co-efficient of 0.0000432. The results shows that the relationship between CCC and firms profitability is positive ($\beta_2 > 0$) and CCC^2 variable is also insignificant with a negative co-efficient of -0.000000649($\beta_3 < 0$).Optimal level of 33 days has been derived that balances the risk and returns and, hence, maximizes firm's profitability by using $CCC_{i,t} = [-\beta_2 / 2\beta_3]$.

The results of positive CCC indicates that investment in working capital below its optimal level is positively associated with firm's profitability due to higher sales resulting from granting more trade credits to customers which stimulates sales (Smith J. K. 1987; Long e al., 1993; Lee & Stowe, 1993), strengthens customer and supplier relationship Wilner, (2000). It also provide purchasers to verify the

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quality of goods before payment Smith J. K., (1987), it is a very important selection criteria when it is difficult to make decision to differentiate goods.

Conversely, a negative relationship between CCC^2 and firms profitability indicates that high investment (above optimum level) in working capital is negatively associated with firms profitability due to increase in financial and opportunity costs and also the cost of keeping stocks available e.g. rent of where house, security and insurance expenses.

So, the negative relationship between CCC^2 and firm's profitability that is $-\beta_3$ validates our hypotheses that there is an inverted (Concave) relationship between working capital and firm's profitability, which balances the risk and return and consequently, maximizing the firm's value.

Lagged profitability is significant at 1% significant level. It shows that one percent increase in lagged profitability leads to 1.41 increase in gross operating profit.

The results of this study also indicate that growth is significant. There are many studies supporting our results namely Jang & Park (2011), Baños-Caballero et al. (2012), Baños-Caballero et al. (2014), Nurein et al. (2015) and Wang & Li (2015). The growth is significant at 1% level. It shows that one percent increase in growth leads to 0.279 improvement in gross operating profit of Cement Sector manufacturing firms. More growth opportunities increase firm's profitability.

The Results shows that management make consumer centered strategies to satisfy their needs and wants in a right time and at a right place with respect to consumer perception about organizations. The findings also suggest that firm's working in Cement Sector of Pakistan used advanced technology and modern techniques to increase quality and efficiency of their products which ultimately increases their products demand and hence, profitability rises with the increase in demand. Management also involves employees in decision making, give them proper training and provide job security which increases production. High production of goods decrease production cost per unit. That's why the relation between growth and firm's profitability is positive and significant.

The results of Equation 2 also shows that the relation between working capital management and firm profitability is nonlinear because the co-efficient of β_3 is negative. Results shows that NOP (-1) variable is significant with 1% significant level. It means that one percent increase in NOP (-1) will increase net operating profit by 1.41224.

6. Conclusion

The foremost objective of this study is to test the nonlinear relationship between working capital management and firm's profitability. The findings of this empirical study provide new evidence on the relation between working capital and firm's profitability. Unlike previous findings, the results of this study disclose that there is a concave (nonlinear) relationship between working capital level and firm's profitability, which the literature has not reflected yet.

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The outcomes of this study support the idea that high investment in working capital can increase firm's sales and discounts for early payments to suppliers. However, higher investment from optimum level begins to be negative due to additional financing and opportunity costs and hereafter, credit risk and the probability of bankruptcy rises.This empirical study highlighted the role and importance of efficient management of working capital due to the costs of under and over investment in working capital.

6.1Policy Implications

- It is necessary for the management to keep the optimum level of working capital and try to evade deviation from that optimal level either positive or negative in order to upturn the profitability of the firm.
- Opposing effect of lost sales and discount received from supplier for early payment or further financing cost should be avoided.
- This study provides new understandings on the relationship between working capital management and firm's profitability, that there is an inverted (U-shaped) relationship between working capital and firm's profitability rather than linear and hence, future research studies should use the quadratic relationship.

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