

Linkage between Working Capital Management and Profitability: A Case Study of Oil and Natural Gas Corporation Ltd

Dr. Susanta Mitra*
Dr. Kartik Chandra Nandi**

[In this paper an attempt has been made to make an empirical study of Oil and Natural Gas Corporation Ltd. (ONGCL) for assessing the impact of working capital management on its profitability during a period of 11 years from 1998-99 to 2008-09. The impact of working capital management on profitability has been examined by computing Pearson's coefficient of correlation and multiple regression analysis between some selected ratios relating to working capital management and the important measure relating to profitability ratio (ROI).

Keywords : Working capital management, profitability, ratio analysis, correlation analysis, multiple correlation and regression analysis]

Introduction

Working capital plays a significant role in the success or failure of a business firm because of its impact on profitability as well as on its liquidity. It is worthy to be noted that a firm should have neither excess nor inadequate working capital as both the phenomena of over capitalization and undercapitalization generate adverse effects on both the profitability and the liquidity of the concerned firm. A firm must determine the exact requirement of working capital and maintain the same

evenly throughout the operating cycle. Excessive working capital refers to idle funds that do not generate any profit; instead, it downsizes the firm's rate of return on investments. On the other, inadequate amount of working capital not only underrate the credit worthiness of a firm but also disrupts the production process and impairs its earning capacity to a great extent. The effective working capital necessitates careful handling of current assets to ensure short-term liquidity and solvency of the business

* Associate Professor, Department of Commerce, Khandra College, Khandra, Burdwan, West Bengal

** Assistant Professor, Department of Commerce, B.B. College, Asansol, Burdwan, West Bengal

(Mukhopadhyay, 2004). Working Capital Management refers to the management of all aspects of CAs, CLs and the inter-relationship that exists between them. It aims at reducing the funds locked up in the working capital (WC) so as to get better the return on the capital employed i.e., profitability. It seeks to formulate proper policies for managing CAs and CLs as well as the choice of techniques for maximizing the benefits derived from it. The policies for managing the WC of a firm should be in a way that the firms can achieve its three important goals simultaneously: (i) to maintain adequate liquidity; (ii) to maximize profitability; and (iii) to minimize risk (Mandal and Hossain, 2010).

Literature Review

A number of earlier researches signify the relationship between working capital management and profitability of firm in different contexts. Vijaykumar and Venkatachalam (1995) in their study on Tamil Nadu sugar industry concluded that liquidity was negatively associated with profitability. Shin and Soenen (1998) found a strong negative relation between the cash conversion cycle and corporate profitability for a large sample of listed American firms for the period 1975-94. Rao & Rao (1999) studied the impact of working capital on profitability in Indian Cement Industry and found both positive as well as negative correlations between working capital

related ratios and profitability. Hyderabad (1999) found that long terms funds were used for working capital and observed that flexibility and adjustment in the requirement of working capital depends on the availability and the cost of working capital. Sur, Biswas and Ganguly (2001) revealed in their study of Indian aluminum producing industry, a very significant positive association between liquidity and profitability. Narware (2004), in his study of working capital management and profitability of NFL, a fertilizer company disclosed both negative and positive association. Bardia (2004) in his study on steel giant SAIL for the period from 1991-92 to 2001-02 concluded that there exists a positive relationship between liquidity and profitability. Mallik, Sur and Rakshit (2005) studied the relationship between working capital and profitability in the context of Indian pharmaceutical industry and concluded that no definite relationship can be established between liquidity and profitability. Raheman and Nasr (2007) have selected a sample of 94 Pakistani firms listed on Karachi Stock Exchange for a period of 6 years from 1999-2004 to study the effect of different variables of working capital management on the net operating profitability. From their study, it was evident that there was a negative relationship between variables of working capital management and profitability. Besides, they also indicated

that size of the firm, measured by natural logarithm of sales, and profitability had a positive relationship. Mandal and Hossain (2010) in their study concluded that the management of working capital is highly useful to ensure better productive capacity, sound liquidity and good profitability of an enterprise particularly in case of PSEs in India.

Objectives of the Study

The study has the following objectives:

To assess the significance of working capital by selecting a few important parameters such as, current ratio, quick ratio, current assets to total assets ratio, current assets to sales ratio, inventory turnover ratio, debtors' turnover ratio etc.

To examine the profitability position of the company under study through important profitability ratio i.e. return on investment (ROI).

To measure the degree of relationship between profitability (ROI) and each of some selected ratios relating to working capital management by computing Pearson's simple correlation coefficients and to test the significance of such correlation coefficients.

To assess the joint effect of the selected measures relating to working capital management on the profitability of the selected company under study with the help of multiple correlation and multiple

regression techniques and to test the significance of the multiple correlation coefficients and the partial regression coefficients.

A Brief Profile of the Company under Study

Oil and Natural Gas Corporation Limited (ONGC Ltd.) was incorporated on 23.6.1993 under the Companies Act, 1956. This was done by transforming the statutory commission namely Oil and Natural Gas Commission into a Public Company, through an Act of Parliament, so as to take over its business w.e.f. 01.02.1994. The vision of the company, is "to become a world class oil and gas company integrated in energy business with dominant Indian leadership and global presence". ONGC Ltd. is a schedule-'A'/ Navratna CPSE in Crude Oil sector under the administrative control of Ministry of Petroleum and Natural Gas. 74.14% shareholding is with the Government of India. Its registered office is at New Delhi and Corporate office at Dehradun, Uttarakhand. ONGC Ltd. is India's premier oil and gas corporate engaged in exploration and production of hydrocarbons to fulfill energy needs and to ensure long-term sustainable energy security of the nation. It produces value added products at its plants at Hazira and Ankleshwar in Gujarat; Uran in Maharashtra; and a Mini refinery at Tatipaka in Andhra Pradesh. It has two

principal Indian subsidiaries namely ONGC Videsh Ltd. (OVL) and Mangalore Refinery and Petrochemicals Ltd. and three major foreign subsidiaries through OVL, namely ONGC Nile Ganga BV, Netherland, ONGC Narmada Ltd. and ONGC Amazon Alaknanda Limited, Bermuda. The production of value added products was 3.425 MMT in 2005-06 but it became 3.257 MMT in the year 2007-08. Turnover during 2005-06 was Rs. 49244.39 crores and it increased to Rs. 59986.28 crores in 2009-10. On the basis of net sales its rank of all the CPSEs was 4th in the year 2009-10. On the basis of Gross Block (i.e. fixed assets plus capital work-in-progress) of all the CPSEs in India, ONGCL achieved the 1st rank during the period 2009-10. The value added by ONGC Ltd. stood at Rs. 4428494 lakhs in 2005-06 which was increased to Rs. 5258175 lakhs in 2007-08 showing an increase of 19%(18.74%) over 2005-06. The company achieved 1st rank out of top ten profit making CPSEs during 2009-10. ONGC Ltd. is the major listed company in the world to have all its operational facilities and onshore as well as offshore rigs, certified for Quality, Occupational Health & Safety and Environment Management System.

Methodology of the Study

This study is mainly based on secondary sources of information. The necessary

data have been collected from published Annual Reports of the ONGCL and also from the published Annual Reports of the Public Enterprise Survey by Ministry of Heavy Industries and Public Enterprises, Govt. of India over a period of 11 years i.e. 1998-1999 to 2008-09. Editing, classification and tabulation of the financial data collected from the above mentioned sources have been done as per requirement of the study.

For the analysis of data, a number of relevant ratios based on working capital management and also based on profitability have been calculated on the basis of data available of ONGC Ltd. The ratios which have been used for highlighting the efficiency of working capital management are Current Ratio (CR), Quick Ratio (QR), Current Assets to Total Assets Ratio (CATAR), Current Assets to Sales Ratio (CASR), Working Capital Turnover Ratio (WCTR), Inventory Turnover Ratio (ITR), Debtors Turnover Ratio (DTR) and Cash Turnover Ratio (CTR) and the important measure of profitability which has been selected is Return on Investment (ROI). An attempt has been undertaken to measure the degree of relationship between the measures of working capital management and the measure of profitability by applying correlation analysis taking into account their magnitudes by Pearson's simple correlation coefficient. For judging the

joint influence of the selected measures relating to working capital management on the profitability, multiple correlation analysis has been applied. In order to assess the joint effect of the selected measures of working capital management on the profitability, multiple regression analysis has been applied. Various statistical tests i.e., 't' test, 'F' test and Durbin-Watson (d) test have been applied in the appropriate places to test the significance of the findings in the study. In addition, to judge the effectiveness or the reliability of this relationship the multiple coefficient of determination (R^2) has been used and it is defined as the ratio of explained variation to the total variation of the dependent variable (ROI). All statistical computations have been done through SPSS 10.2 version.

Findings

I: Analysis of Ratios relating to Working Capital Management and the Measure of Profitability (ROI)

In Table 1, the ratios relating to working capital management and also relating to profitability of ONGC Ltd (ONGCL) have been analysed. This table shows that Current Ratio (CR) of ONGCL marked a fluctuating trend during the study period. It ranged between 1.82 in the year 1998-99 and 3.08 in the year 2005-06. It was found to be above the standard norm of 2:1 during whole of the

study period excepting in the first year of the study period. It gives a strong indication about the safety of funds for the short-term creditors. On an average, the CR was 2.56. Hence, it may be concluded that the ability of the company for meeting short-term obligations was quite satisfactory during the study period. It is also observed from Table-1 that the Quick Ratio (QR) of ONGCL registered a mixed trend throughout the study period and it fluctuated between 1.52 in the year 1998-99 to 3.22 in the year 2005-06 which was found to be above the standard norm of 1:1. The average QR was 2.51. It clearly shows that the quick short-term solvency position of ONGCL was considerably higher as compared to the standard norm during the study period. Comparing CR with QR, it may be said that the company possessed a healthy liquidity in the light of its short-term creditors. Table-1 exhibits that the Current Assets to Total Assets Ratio (CATAR) of the company showed more or less constant over time and its average was 0.77. It indicates that the ONGCL maintained 77 per cent level of current assets out of total fund invested in total assets. The study reveals that the company gave more emphasis on the investment in working capital as compared to the investment in long lived assets. It is also found that the Current Assets to Sales Ratio (CASR) of

ONGCL marked a fluctuating trend during the period under study with average value of 0.76 and the Working Capital Turnover Ratio (WCTR) of the company also showed a fluctuating trend during 1998-99 to 2004-05 and thereafter it remained constant up to the ultimate year of the study period. The Inventory Turnover Ratio (ITR) of the company showed an increasing trend up to the year 2002-03 and thereafter it fluctuated in the remaining years. The average ITR of ONGCL was 15.39 whereas its Debtors Turnover Ratio (DTR) showed a fluctuating trend throughout the study period with average DTR of 12.93. This table also depicts that the Cash Turnover Ratio (CTR) of the company fluctuated widely throughout the period under study and its mean for the period was 6.83. It is also observed from Table-1 that the Return on Investment (ROI) of ONGCL witnessed fluctuating trend during the study period. It was 25.30 per cent in the year 1998-99 which increased to 42.40 per cent in the year 2000-01 and thereafter it decreased and then it gradually improved in the year 2004-05. Again it declined and reached the level at 49.90 per cent. On an average, it was 46.88 per cent.

II: Working Capital Management & Profitability: Correlation Analysis

The correlation coefficients between the profitability (ROI) and the selected

ratios relating to working capital management have been shown in Table-2. Table-2 shows that the correlation coefficient between ROI and CR was 0.61 which indicates that there was a higher degree of positive association between the profitability and the current ratio of the company and the correlation coefficient was found to be statistically significant at 5 per cent level. This correlation coefficient implies that there was significant association between ROI and CR of the company and it was clear from these two ratios that the amount of current assets increased the risk as well as the profitability. Further, it is observed that the correlation coefficient between ROI and QR during the period under study was positive and was calculated at 0.81 which is found to be statistically significant at 1 per cent level. It also reveals that there was a very higher degree of positive relationship between the ROI and QR. It was evident from these two ratios that higher the company's margin of safety to the short-term creditors, the more will be the profitability of the company. Moreover, Table-2 highlights that the coefficient of correlation between ROI and CATAR during the study period is 0.92. It implies that there was a very high degree of positive correlation between the profitability of the company and the ratio of current assets to total assets. The coefficient of correlation

was found to be statistically significant at 1 per cent level during the study period. The generally acceptable principle is that the greater the CATAR, the lower will be the profitability of the company. The computed value of correlation coefficient between ROI and CATAR under study did not support this accepted principle. Table-2 also shows that the coefficient of correlation between ROI and CASR during the period under study is (-) 0.07 which was also found to be statistically insignificant both at 5 per cent and 1 per cent levels. It showed a very low degree of negative association between these two variables. Generally speaking, lower the current assets to sales ratio (CASR), the greater the efficiency of the employment of working capital and larger will be the scope of profitability and vice-versa. The calculated value of correlation coefficient between CASR and ROI conforms to this principle. Besides, it is seen from Table-2 that the correlation coefficient between ROI and WCTR is (-) 0.48 which implies that there was a moderate degree of negative relationship between these two variables. The calculated value of correlation coefficient was found to be statistically insignificant both at 5 per cent and 1 per cent levels. It is an accepted principle that faster the working capital turnover ratio (WCTR), the slower is the relative investment in

working capital and greater will be the profitability of the company. The computed value of correlation coefficient between ROI and WCTR under study was not in conformity with the said accepted principle. It is observed also from Table-2 that the correlation coefficients between ROI and ITR was positive and was computed at 0.82 during the period under study. This coefficient was found to be statistically significant at 1 per cent level. The most acceptable principle is that higher the ITR, the greater is the efficiency of inventory management and the larger will be the scope of profitability. The computed value of correlation coefficient between ROI and ITR under study was in conformity with the accepted principle. Table-2 also highlights that the correlation coefficient between ROI and DTR was positive and was computed at 0.37 during the period under study. It was found to be statistically insignificant at 5 per cent and 1 per cent levels of significance. The study of the relationship between the profitability (ROI) and the receivable management (DTR) conforms to the generally accepted rule that faster the DTR, the lower is the relative investment in receivable and the higher will be the profitability of the company. Apart from that, the correlation coefficient between ROI and CTR showed (from Table-2) a negative

association of 0.17 which was found to be statistically insignificant at 5 per cent and 1 per cent levels of significance. The acceptable principle is that higher the CTR, the greater will be the efficiency of cash management and larger will be the scope of improving profitability. The study of correlation coefficients between ROI and CTR reveals that the computed value of correlation coefficient corroborates this acceptable principle. Hence, the study of working capital management on profitability reveals both negative and positive impacts. The study of the relationship between the profitability and working capital management supports the accepted rule that larger turnover increases the profitability of the company.

III: Working Capital Management and Profitability: Multiple Correlation Analysis & Multiple Regression Analysis

For the purpose of selection of explanatory variables in this analysis Correlation Matrix has been constructed in Table-3. Table-3 exhibits that there was a very high degree of correlation between CR and QR (0.91) and that between QR and CATAR (0.81). It is an indication of the existence of multicollinearity. Theoretically, we know that when two independent variables are highly correlated, they basically convey the same information and logically only

one of the two variables could be used in the regression equation (Srivastava & Rego, 2008). For this reason QR and CATAR, have not been taken into account while fitting the regression line. The joint influence of the selected measures relating to working capital management on the profitability (ROI) of the selected company under study has been studied in Table-4. While fitting the regression equation, ROI has been taken as the dependent variable and CR, CASR, WCTR, ITR, DTR & CTR have been considered as the explanatory variables. The multiple regression equation which has been fitted in this study is: $ROI = b_0 + b_1.CR + b_2.CASR + b_3.WCTR + b_4.ITR + b_5.DTR + b_6.CTR$ where b_0 is the constant or intercept of the regression line, b_1, b_2, b_3, b_4, b_5 and b_6 are the respective partial regression coefficients. Table-4 depicts the multiple correlation coefficient (R), multiple coefficient of determination (R^2) and the regression coefficients of ROI on CR, CASR, WCTR, ITR, DTR and CTR showing the strength of relationship between dependent variable (ROI) and all the independent variables taken together and the impact of these six independent variables on the profitability of the ONGCL during the study period from 1998-1999 to 2008-09. It is observed from Table-4 (from the multiple regression equation of $ROI = 58.361 - 11.114.CR + 3.335.CASR$

16.430.WCTR + 1.963.ITR + 0.512.DTR + 1.939.CTR) that when CR was increased by one unit (keeping all other independent variables constant), the ROI was decreased by 11.114 units. This negative influence of CR on the company's profitability was found to be statistically insignificant at 10 per cent, 5 per cent and 1 per cent levels respectively. However for every additional unit in CASR (other independent variables remaining constant), the profitability (ROI) of the selected company was increased by 3.335 units. This positive influence of current assets to sales ratio (CASR) on the profitability was found to be statistically insignificant at 10 per cent, 5 per cent and 1 per cent levels. Table-4 also shows that for one unit increase in WCTR (all other independent variables remaining constant), the company's profitability (ROI) was decreased by 16.430 units. The adverse impact of working capital turnover ratio (WCTR) on profitability (ROI) was found to be statistically insignificant at 10 per cent, 5 per cent and 1 per cent levels during the study period. However, for one unit increase in ITR, DTR and CTR (keeping all other respective independent variables constant), the profitability of the company was increased by more than one unit in case of ITR & CTR and by less than one unit in case of DTR. The positive impact of debt management and cash

management on profitability (i.e. partial regression coefficient of DTR and CTR) were found to be statistically insignificant at 10 per cent, 5 per cent and 1 per cent levels respectively. While the positive impact of inventory management on the company's profitability was found to be statistically significant at 10 per cent level. The regression analysis results also showed that goodness of fit of the regression equation is statistically significant both at 5 per cent and 2.5 per cent levels. Table-4 highlights also the multiple correlation coefficient of ROI on CR, CASR, WCTR, ITR, DTR and CTR for the study period from 1998-1999 to 2008-09 is 0.966. It reveals that the profitability of the company was highly influenced by CR, CASR, WCTR, ITR, DTR and CTR. This multiple correlation coefficient was found to be statistically significant at 5 per cent level. It indicates that the joint influence of the selected measures relating to working capital management on the profitability had been satisfactory during the study period. It is also evident from Table-4 that the multiple coefficient of determination (R^2) is 0.933 which interprets that the 93.30 per cent of the total variation in ROI was explained jointly by the variation in the CR, CASR, WCTR, ITR, DTR and CTR. Therefore, it may be concluded that the contribution made by these six indicators of working capital management for

improving the profitability of the ONGCL is 93.30 per cent during the study period. It is also found from Table-4 that the calculated value of Durbin-Watson (d) does not fall either $0 < d < dL$, or $(4 - dL) < d < 4$ or $du < d < (4 - du)$ at 1 per cent and 5 per cent levels at (k, n) d. f. i.e. (6, 11) d. f. (where 'n' is the number of observation, 'k' is the number of explanatory variables, dL denotes lower boundary or left-sided critical values and du denotes upper boundary or right-sided critical values) it may be concluded that it falls in the inconclusive or indecisive zone (i.e. whether the autocorrelation does or does not exist between QR & CATAR). It is the most important drawbacks of Durbin-Watson (d) test. In this situation, one can use the following modified 'd' test so that $H_0: \rho = 0$ (No autocorrelation exists) against $H_1: \rho \neq 0$ (Autocorrelation exists), Reject H_0 at 2α level if $d < du$ or $(4 - d) < du$, that is there is statistically significant evidence of autocorrelation, positive or negative between QR & CATAR (Gujarati & Sangeetha, 2007).

Managerial Implication of the Study

The study of relationship between the selected measures relating to working capital management and the measure of profitability (ROI) reveals that there was a very significant relationship between working capital management and profitability of the selected company

under study. Again, most of the ratios relating to working capital management had the positive impact or influence on the company's profitability. Therefore, it is worthwhile to state that the profitability of the company had direct link with the management of working capital during the period of study.

Concluding Notes

The study of interrelationship between the selected measures relating to working capital management and profitability of ONGCL reveals both positive and negative correlations. Out of eight ratios relating to working capital management selected during the period under study, only two ratios namely, CASR and WCTR registered negative association with the selected profitability ratio (ROI) and the remaining ratios like CR, QR, CATAR, ITR, DTR and CTR witnessed positive association with the selected profitability ratio. Of the six positive coefficients, the coefficient between QR & ROI, CATAR & ROI and ITR & ROI were found to be highly significant at 1 per cent level and the coefficient between CR & ROI was found to be statistically significant at 5 per cent level. But there was no significant association between CASR & ROI, WCTR & ROI, DTR & ROI and CTR & ROI. The study of the partial regression coefficients in the regression equation of ROI on CR, CASR, WCTR, ITR, DTR & CTR (i.e.,

$ROI = 58.361 - 11.114.CR + 3.335.CASR + 16.430.WCTR + 1.963.ITR + 0.512.DTR + 1.939.CTR$

of the selected company under study showed how ROI changes with respect to changes in the independent variables. The slopes of ROI line associated with CR, CASR, WCTR, ITR, DTR and CTR revealed both positive and negative impact of the independent variables on the profitability of the company under study. Of the six partial regression coefficients of the ROI line, the partial regression coefficients of CR and WCTR were found to be negative indicating an adverse effect on the profitability and the remaining regression coefficients associated with CASR, ITR, DTR and CTR witnessed a positive impact on the company's profitability. All the positive and negative regression coefficients (excepting in case of regression coefficient of ITR where it was found to be statistically significant) were found to be statistically insignificant during the study period which signifies that there was no significant influence of working capital management on the profitability of the company. The study of multiple coefficient of determination (R^2) makes it clear that 93.30 per cent of the total variation in the profitability of the company was jointly explained by the six independent measures relating to working capital management.

In general, it may be concluded that these results can be further strengthened if the firms manage their working capital in more efficient ways since management of working capital means management of current assets and current liabilities and financing these in current assets. If the firms properly manage their cash, accounts receivables and inventories in a proper way, it will ultimately increase the profitability.

References :

- Bardia, S.C., Liquidity Management: A Case Study of Steel Authority of India Ltd, The Management Accountant, ICWAI, Kolkata, (June), 2004, pp 463-67.
- Bhayani, S. J., Working Capital and Profitability Relationship (A Case Study of Gujraj Ambuja Cements Ltd.), SCMS Journal of Indian Management, (April-June), 2004, p 98.
- Chander, S. and Kumar, R, An empirical analysis of some aspects of working capital management in small scale textile industry of Punjab, Accessed from myicwai.com / knowledge bank/ fm03, 2004.
- Govind Rao, D. and P.M. Rao., Impact of Working Capital on Profitability in Cement Industry A Correlation Analysis, Working Capital Management, Deep & Deep Publications Pvt. Ltd., New Delhi, 1999, pp 239-59.
- Gujarati, D. N. and Sangeetha, Basic Econometrics (4th Edition), Tata Mc Graw-hill Publishing Company Ltd., New Delhi, 2007, pp 480-81.
- Hyderabad, R. L., Managing liquidity

- and profitability, Deep and Deep Publications Pvt. Ltd., 1999.
- Mallik, A. K., Sur, D. and Rakshit, D., Working Capital and Profitability: A Study on their Relationship with Reference to Selected Companies in Indian Pharmaceutical Industry, GITAM Journal of Management, vol-3, 2005, pp 51-62.
 - Mandal, N. and Hossain, I, Some Aspects of Working Capital Management in relation to Liquidity, Profitability and Risk- A Case Study of Bharat Petroleum Corporation Ltd, Journal of Institute of Public Enterprise, vol-33, No- 3&4, Institute of Public Enterprise, Hyderabad, 2010, pp 56-79.
 - Mandal, N. and Hossain, I, op, cit.,2010.
 - Mathur, S. B., Working Capital Management and Control: Principles and Practice, New Age International (P) Limited, Publishers, New Delhi, 2003, pp 40-42.
 - Mukhopadhyay, D., Working Capital Management in Heavy Engineering Firms A Case Study, Accessed from myicwai.com / knowledge bank/ fm48, 2004.
 - Mukhopadhyay, D., op, cit, 2004.
 - Nandi, K. C., Performance Evaluation of selected Central Public Sector Enterprises (PSEs) in India through Value Added Income Concept, Ph. D Thesis, The University of Burdwan (W. B.), (April), 2010, pp 152-53.
 - Nañdi, K. C., op.cit., 2010, p 190.
 - Narware, P. C., Working Capital and Profitability An Empirical Analysis, Accessed from myicwai.com / knowledge bank/ fm46, 2004.
 - Raheman, A. and Nasr, M., Working Capital Management and Profitability: A Case of Pakistani Firms, International Review of Business Research, (Vol-3. No-1.) March, 2007, pp 279-300.
 - Sharma & Gupta, Financial Management: Problems and Solutions, Kalyani Publishers, New Delhi, 2003, p 20.16.
 - Shin, H.H., and L. Soenen, Efficiency of Working Capital and Corporate Profitability, Financial Practice and Education, 8(2), 1998, pp 37-45.
 - Singh, P.K., Working Capital Management in Lupin Laboratories Ltd. A Case Study, Accessed from myicwai.com / knowledge bank/ fm48, 2004.
 - Srivastava, T. N. and Rego, S., Statistics for Management, Tata Mc Graw-hill Publishing Company Ltd., New Delhi, 2008, p 9-19.
 - Sur, D., Inter-company profitability analysis of Indian general insurance industry, The Management Accountant (July), Kolkata, 1990, p 495.
 - Sur, D., Biswas, J and Ganguly, P., Liquidity Management in Indian Private Sector Enterprises: A Case Study of Indian Primary Aluminium Producing Industry, Indian Journal of Accounting, (June), 2001, p 814.
 - Surnedra, S. Yadav., Management of Working Capital A Comparative Study of India, Singapore and Thailand, Journal of Management and Change, Vol-5(2), 2001
 - Vijaykumar, A. and Venkatachalam, A., Working Capital and Profitability An Empirical Analysis, The Management Accountant, ICWAI, Kolkata, (June), 1995, pp. 748-50.

Table-1
Ratios relating to Working Capital Management and the measure of Profitability (ROI) of ONGCL during 1998-99 to 2008-09

Years	CR	QR	CATAR	CASR	WCTR	ITR	DTR	CTR	ROI (per cent)
1998-99	1.82	1.52	0.56	0.65	3.42	9.38	13.30	7.78	25.30
1999-00	2.36	2.05	0.65	0.99	1.75	7.66	6.95	3.57	34.10
2000-01	2.89	2.57	0.70	0.60	2.54	15.09	13.37	11.29	42.40
2001-02	2.62	2.41	0.76	0.77	2.09	15.72	10.15	4.65	39.20
2002-03	2.45	2.27	0.80	0.62	2.73	22.08	8.81	9.55	54.00
2003-04	2.79	2.88	0.83	0.86	1.70	13.51	14.03	5.83	45.80
2004-05	2.62	2.72	0.85	0.69	2.19	18.18	12.53	7.99	58.80
2005-06	3.08	3.22	0.83	0.77	1.81	15.86	13.01	11.26	57.50
2006-07	2.77	2.96	0.83	0.78	1.87	18.76	20.62	4.16	56.70
2007-08	2.47	2.63	0.83	0.83	1.87	17.28	13.79	3.76	52.00
2008-09	2.26	2.39	0.84	0.85	1.91	15.75	15.66	5.28	49.90
Mean	2.56	2.51	0.77	0.76	2.17	15.39	12.93	6.83	46.88
S.D	0.34	0.47	0.09	0.12	0.53	4.09	3.60	2.91	10.71
C.V. (per cent)	13.28	18.72	11.69	15.79	24.42	26.58	27.84	42.60	22.84
Growth rate (per cent)	1.40	4.12	3.47	1.40	-3.64	5.92	5.32	-2.81	6.38

Note: Growth rate has been computed by using Exponential trend $y = a.b^x$, Where 'a' and 'b' have been computed with the help of Least Square Method.

Source: Compiled and Computed from Annual Report of ONGCL.

Table-2
Simple Correlation Analysis between selected ratios relating to Working Capital Management and Return on Investment of ONGCL

Measures of Correlation Coefficient between	Calculated Value of Correlation Coefficient (r)	Calculated Value of t at (n-2) d. f.
CR & ROI	0.61*	2.309
QR & ROI	0.81**	4.144
CATAR & ROI	0.92**	7.043
CASR & ROI	-0.07	0.211
WCTR & ROI	-0.48	1.641
ITR & ROI	0.82**	4.298
DTR & ROI	0.37	1.195
CTR & ROI	0.17	0.518

Note: (i) Tabulated Values of 't' with (n-2) d. f., i.e. 9 d. f. both at 5 per cent and 1 per cent levels of significance for both tailed test are 2.26 and 3.25 respectively.

(ii) * Statistically significant at 5 per cent level & ** Statistically significant at 1 per cent level

Source: Table-1.

Table-3
Correlation Matrix of ONGCL for the study period from 1998-99 to 2008-09

Ratios	ROI	CR	QR	CATAR	CASR	WCTR	ITR	DTR	CTR
ROI	1.00								
CR	0.61	1.00							
QR	0.81	0.91	1.00						
CATAR	0.92	0.58	0.81	1.00					
CASR	-0.07	-0.02	0.11	0.13	1.00				
WCTR	-0.48	-0.57	-0.69	-0.64	-0.76	1.00			
ITR	0.82	0.40	0.51	0.74	-0.45	-0.07	1.00		
DTR	0.37	-0.19	0.43	0.37	-0.08	-0.15	0.28	1.00	
CTR	0.17	0.33	0.15	-0.06	-0.74	0.45	0.23	-0.11	1.00

Source: Table-1

Table-4

Analysis of Multiple Correlations and Multiple Regressions of ONGCL during 1998-99 to 2008-09

(Regression Equation of ROI on Working Capital Management:

$$ROI = b_0 + b_1 CR + b_2 CASR + b_3 WCTR + b_4 ITR + b_5 DTR + b_6 CTR)$$

Company	Constant (b ₀)	Partial Regression Coefficients						Multiple Correlation Coefficient (R)	Coefficient of Multiple Determination (R ²)	F
		CR (b ₁)	CASR (b ₂)	WCTR (b ₃)	ITR (b ₄)	DTR (b ₅)	CTR (b ₆)			
ONGCL	58.361	-11.114 (-0.778)	3.335 (0.044)	-16.430 (-0.919)	1.963 ^{***} (2.519)	0.512 (1.138)	1.939 (2.021)	0.966	0.933	9.300*
Significant (t) at	0.697	0.480	0.967	0.410	0.065	0.319	0.113	-	-	0.025
Durbin-Watson Test (d) = 1.645	Table Value of Durbin-Watson (d) for (k, n) at 1 per cent level d _{L(6,11)} & d _{u(6,11)} = 0.124 & 2.892 Table Value of Durbin-Watson (d) for (k, n) at 5 per cent level d _{L(6,11)} & d _{u(6,11)} = 0.203 & 3.005									

Note: i) Tabulated value of 'F' with {k, (n-k-1)} d.f. i.e. {6, (11-6-1)} = (6, 4) d.f. both at 5 per cent and 1 per cent levels are 6.16 & 15.21 respectively.

ii) Tabulated value of 't' with (n-k-1) d.f. i.e. (11-6-1) = 4 d.f. both at 10 per cent, 5 per cent and 1 per cent levels are 2.132, 2.78 & 4.60 respectively.

iii) Figures in the parentheses indicate calculated values of 't'.

iv) * Statistically significant at 5 per cent level, ** Statistically significant at 1 per cent level & *** Statistically significant at 10 per cent level.

Source: Table-1