

TRENDS IN LIQUIDITY MANAGEMENT AND THEIR IMPACT ON PROFITABILITY: A CASE STUDY

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Abstract:

*This paper makes an attempt to assess the trends in liquidity management and their impact on profitability of **Bharat Heavy Electrical Ltd. (BHEL)** for a period of 11 years (i. e. from 1999-2000 to 2009-10). An attempt has been undertaken to observe the trend values of liquidity position of the company and to study the correlation between liquidity and profitability. An attempt has also been made to establish the linear relationship between liquidity and profitability with the help of a multiple regression model. The study is based on secondary data collected from published annual reports of BHEL and from published annual report of Public Enterprise Survey. The available data have been analyzed by using some important managerial and statistical tools. Various statistical tests viz. t-test, F-test and Durbin-Watson test and Chi-square (χ^2) test have been applied in order to test the significance of the results obtained. On the basis of overall analysis, it is therefore important to state that the selected company always tries to maintain adequate amount of net working capital in relation to current liabilities so as to keep a good amount of liquidity throughout the study period.*

Keywords: Liquidity, Components of Working Capital, Trend Analysis, Correlation and Regression Analysis

INTRODUCTION

For a successful business enterprise two types of assets are very important i.e. fixed assets and current assets. Fixed assets viz., land & building, plant & machinery, furniture etc. are not purchased for the purpose of sale but for the purpose of earning profit for a long period in the future. On the other hand, current assets viz., stock, debtors, bills receivable, cash and bank balance etc. are purchased for the production of goods and sales of those goods through the process of working capital cycle i.e. conversion of raw material into work-in-progress, work-in-progress into finished goods, finished goods into debtors and debtors are converted into cash or bills receivable. The fixed assets are used in order to increase the production of an organization and the current assets use the more fixed assets in day to day working. The management of this working capital is known as working capital management (Pandey & Jaisal, 2011). Working capital plays an important role in firm's growth and profitability and is tightly interlinked with the concept of liquidity. This liquidity-profitability relationship is associated with the maintenance of the proper level of working capital. Liquidity and profitability are the two important and vital aspects of corporate business life. No firm can survive without liquidity. Without making any profit a firm may be considered as sick but one having no liquidity may soon meet its downfall and ultimately die. As a matter of fact, liquidity is a pre-requisite for the survival of a business firm. Thus, the liquidity management has become a basic and broad aspect of judging the performance of a corporate entity (Bardia, 2001).

EXISTING LITERATURE SURVEY

The term 'Liquidity' refers to the ability of a firm to meet its short-term maturing obligations within one year. The Liquidity resources of a firm may be kept in various forms: cash in hand and cash at bank in current assets, reserve drawing power under a cash credit or overdraft arrangement and short term deposits. Cash balances in current account provide the highest degree of liquidity. The term liquidity may be defined as a firm can maintain liquidity if it holds assets that could be shifted or sold quickly with minimum transaction cost and loss in value. The test of liquidity is the ability of the firm to meet its cash obligations when they are

due and to exploit sudden opportunities in the market. Whenever one speaks of a firm's liquidity, one tries to measure firm's ability to meet expected and unexpected cash requirements, expand its assets, reduce its liabilities or cover any operating losses. Few research studies have been undertaken on the areas of liquidity management in India. Some of the significant studies are highlighted below.

Mukhopadhyay (2004) conducted a study on working capital management in heavy engineering firms to investigate into the effectiveness of working capital management of an organization with particular reference to its short term liquidity and solvency and its impact on commercial operations of that organization. Eljelly (2004) examines the relationship between profitability and liquidity, as measured by current ratio and cash gap (cash conversion cycle) on a sample of joint stock companies in Saudi Arabia. The study found significant negative relationship between the firm's profitability and its liquidity level, as measured by the current ratio. Singh and Pandey (2008) suggested that, for the successful working of any business organization, fixed and current assets play a vital role, and that the management of working capital is essential as it has a direct impact on profitability and liquidity. They studied the working capital components and found a significant impact of working capital management on profitability for Hindalco Industries Limited. Chakraborty (2008) studied the relationship between working capital and profitability of Indian pharmaceutical companies. His study suggested that there were two distinct schools of thought on this issue: according to one school of thought, working capital is not a factor of improving profitability and there may be a negative relationship between them, while the other school of thought argues that investment in working capital plays a vital role to improve corporate profitability, and unless there is a minimum level of investment of working capital, output and sales cannot be maintained -- in fact, the inadequacy of working capital would keep fixed asset inoperative. Bhunia and Brahma (2011) conducted a study to examine and evaluate the importance of liquidity management on profitability as a factor accountable for poor financial performance in the private sector steel Industry in India.

PROFILE OF THE COMPANY

Bharat Heavy Electrical Ltd. (BHEL) was incorporated on 13.11.1964 with an objective to have indigenous Heavy Electrical Equipment industry in India. It is a Schedule-A/ listed Navratna CPSE in Heavy Engineering sector under the administrative control of Ministry of Heavy Industries and Public Enterprises, Department of Heavy Industries with 67.72% shareholding by the Government of India. Its Registered and Corporate office is at New Delhi. BHEL is the largest engineering and manufacturing enterprise of India in the energy & infrastructure related sectors. In Power generation segment, BHEL is the largest manufacturer in India supplying wide range of products & systems for thermal, nuclear, gas and hydro-based utility and captive power plants. Currently, 74% of the total power generated in the country and 80% of the Nuclear power generated in the country is through BHEL sets. BHEL is amongst world's rarest few who have the capability to manufacture entire range of power plant equipment. Since its inception, BHEL is maintaining a consistent track record of growth, performance and profitability. The Company registered an increase of Rs. 6435.15 crore in total income during 2007-08 which went up to Rs. 35296.38 crore in 2009-10 from Rs. 28861.23 crore during 2008-09. The net profit of the company increased to Rs. 4310.65 crore, an increase of Rs. 1172.44 crore over the previous year due to increase in turnover. BHEL was ranked as the number one company in terms of filing patents and second highest investor in R&D in India by Economic Times Intelligence Group. The company won the coveted CII-Thompson Reuters Innovation Award-2010 in the 'Hi Tech Corporate' category in recognition of its innovation and entrepreneurship in India.

OBJECTIVES OF THE STUDY

The main objective of the study is to examine and evaluate the overall efficiency of the management of working capital in terms of liquidity trends of the selected company. This study

focuses how the liquidity management affects the profitability of the selected company under study. More specifically it seeks to dwell upon mainly the following issues:

- i) To analyze the amount tied-up in various components of working capital and to understand the overall quantum of liquidity maintained by the selected company under study.
- ii) To study the indices and trends of working capital, current assets (CA) and current liabilities (CL) as well as test of competency of the working capital.
- iii) To observe the different patterns of liquidity position and area of weakness if any, of the selected company under study.
- iv) To measure the closeness of association between liquidity and profitability by computing Pearson's simple correlation co-efficient and also to test the significance of such correlation co-efficient.
- v) To assess the joint effect of the selected measures of liquidity management on the profitability of the selected company by applying multiple correlation and multiple regression technique and to test the significance of the multiple correlation coefficients and the partial regression coefficients.
- vi) To offer necessary suggestions to improve the efficiency of liquidity management in BHEL.

DATA COLLECTION AND METHOD OF THE STUDY

This study is based on secondary data. The data required for this study have been collected from the published annual reports of Bharat Heavy Electricals Ltd. (BHEL) and also from the public enterprise survey reports published by the Ministry of Heavy Industries & Public Enterprises, Govt. of India. The study covered a period of eleven years starting from 1999–2000 to 2009–2010. This study covers mainly the following aspects of the Liquidity Management (i) Components of Working Capital, (ii) Trends of Working Capital, (iii) Trends of Current Assets (CA) and Current Liabilities (CL) with their indices, (iv) Financing of Working Capital, (v) Impact of liquidity management on Profitability. In order to assess the relationship between liquidity and profitability the ratios which have been applied for highlighting the efficiency of liquidity management are Current Ratio (CR), Quick Ratio (QR), Working Capital Turnover Ratio (WCTR), Inventory Turnover Ratio (ITR), Debtors Turnover Ratio (DTR), Cash Turnover Ratio (CTR), Working Capital to Total Assets Ratio (WCTAR) & Debt-Equity Ratio (DER) and the measure of profitability which has been selected is Return on Capital Employed (ROCE). For the purpose of establishing definite relationships between selected ratios relating to liquidity management and profitability ratio, some statistical techniques like, Arithmetic Mean, Trend Analysis, Pearson's simple correlation analysis, Multiple Correlation and Regression analysis and Multiple Coefficient of Determination have been applied. In addition, some statistical tests i.e. 't' test, 'F' test, Chi-square (χ^2) test and Durbin-Watson test have been applied at the appropriate places. All statistical computations have been done through SPSS 10.2 version.

FINDINGS OF THE STUDY

Analysis of Different Components of Working Capital

The various components of current assets and current liabilities along with annual growth rate of net working capital have been presented in Table-1. It is highlighted from Table-1 that the total of current assets (i.e. gross working capital) registered an upward trend throughout the study period. The amount of gross working capital was Rs. 700238 lakh in the year 1999-2000 which increased continuously and reached up to Rs. 4271727 lakh in the year 2009-10 indicating 610.04% increase over the first year. The amount of cash and bank balance

also increased continuously (excepting in 2000-01) from Rs. 36060 lakh in 1999-2000 to Rs. 1031467 lakh in 2008-09 which shows that it was simply 5.15% (i.e. Rs. 36060 out of Rs. 700238) of gross working capital in the year 1999-2000 that increased to 28.09% (i.e. Rs. 1031467 out of Rs. 3671918) in the year 2008-09 with average of Rs. 425112 lakh showing the second highest contributor to the gross working capital. The amount of inventories and debtors also registered increasing trend over the study period with average of Rs. 396247 lakh and Rs. 845047 lakh respectively. The average amount of Rs. 131397 lakh was contributed by the loan & advances. So far as the total current liabilities & provisions are concerned it is observed from Table-1 that there is an increasing trend of current liabilities and of provisions in the total current liabilities & provisions with average of Rs. 1054475 lakh and 203232 lakh respectively. The amount of net working capital also recorded a rising trend with positive balance throughout the study period excepting in the year 2001-02 in which there is a negative growth rate of 2.77% as compared to the year 2000-01. It was Rs. 242786 lakh in the year 1999-2000 which goes to Rs. 1027555 lakh in the year 2009-10 showing growth rate of 22.53%. On an average it was Rs. 553967 lakh.

Analysis of Working Capital Trend (Time Series Analysis)

Working Capital trend is one of the important techniques for measuring the profitability of the enterprises. As a measuring rod of efficiency or otherwise of the trend analysis of liquidity, the analysis of working capital trend is highly relevant as it presents the composite indication of the trend values of current assets and current liabilities. The direction of change in working capital position throughout the study period is a sign of the effectiveness or ineffectiveness of the working capital management (Bhunia, 2010). The amount of net working capital, their indices and trend values of net working capital of the BHEL are shown in Table-2. Table-2 depicts that as amount of net working capital registered a rising trend with positive balance throughout the study period excepting in the year 2001-02 in which there is a negative growth rate of 2.77% (shown in Table-1) as compared to the year 2000-01, its indices also recorded an increasing trend from 100 (taking base year as 1999-2000) to 423.23 in 2009-10.

From the trend line equation (i.e. $Y_c = 553967.09 + 73500.17X$) of net working capital fitted by least square method we can easily see estimated values of working capital in the future periods. From the above equation it is seen that the net working capital increases 73500.15 lakh in each year. Therefore, the estimated values of net working capital were positive with an upward trend during the whole of the study period. The difference between actual working capital and the estimated values of working capital were negative from the years 2001-02 to 2006-07 and 2008-09 while they were positive in the remaining years. The negative deviations were significant due to a decrease in current assets and also a simultaneous increase in current liabilities. The actual values of working capital and estimated values of working capital are shown in Figure-1.

In order to test the significance of the difference between the actual values and trend values of working capital of the company under study, Chi-square (χ^2) test has also been applied. The tabulated value of χ^2 at 5% level of significance with (n-1) d.f. i.e. 11-1 = 10 degrees of freedom is (\pm) 18.31 for both tailed test. On the other hand calculated value of Chi-square (χ^2) is 81822.40 by using the formula $\chi^2 = \sum \frac{(Y - Y_c)^2}{Y_c}$ (at (n-1) d.f. Since the calculated value of χ^2 is more than the tabulated value of χ^2 , it may be concluded that the difference between the actual values and trend values of working capital is statistically significant at 5% level.

Figure-1 : Actual & Estimated Working Capital

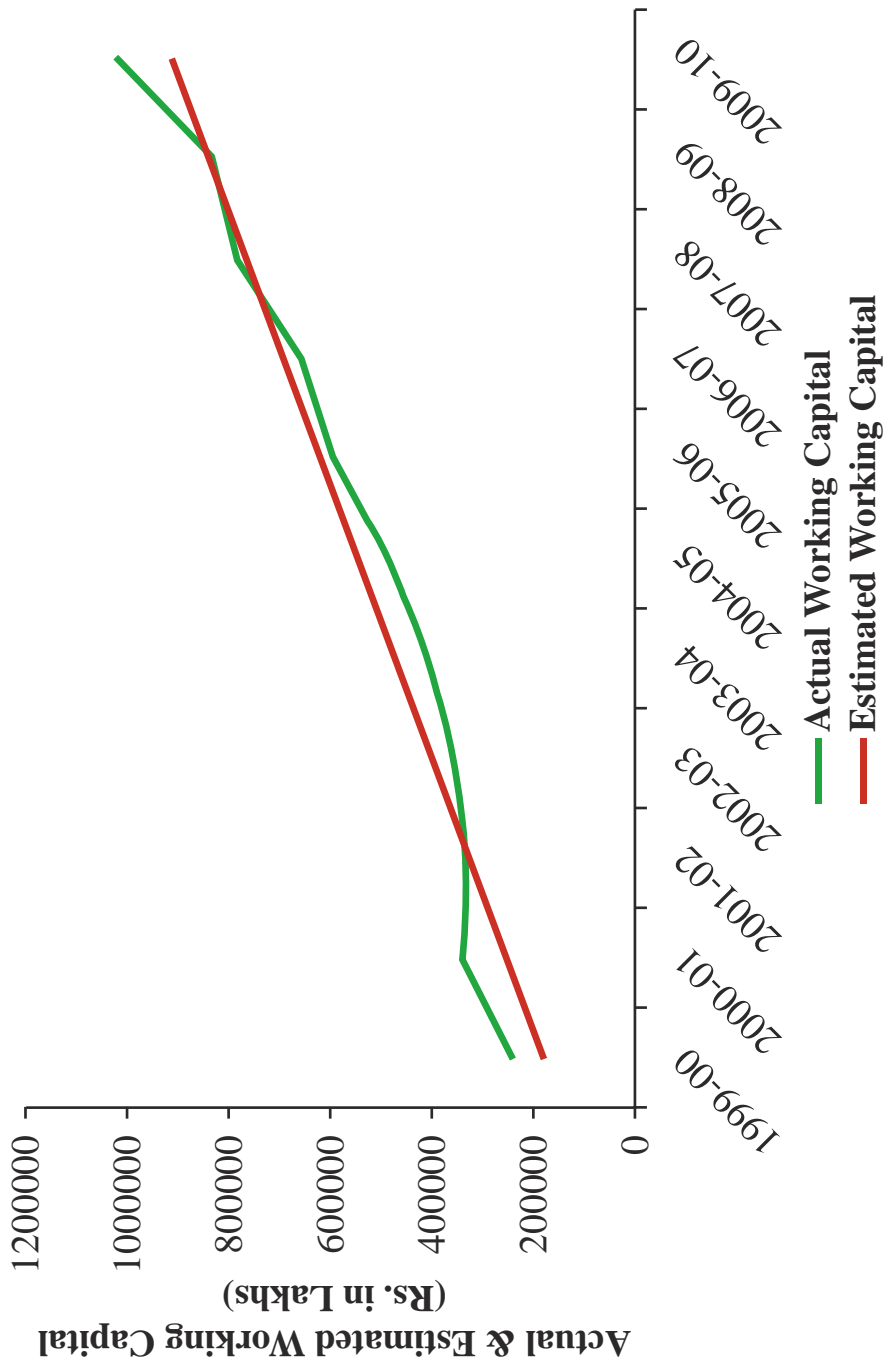


Table-1
Components of Working Capital of BHEL for the period from 1900-2000 to 2009-10

Year	Current Assets and Loans & Advances (Rs. in Lakh)						Gross Working Capital (6) = (1+2+3+4+5)	Current Liabilities & Provisions (Rs. in Lakh)		Net Working Capital (9) = (6 - 7 - 8)	Annual Growth Rate (%)
	Inventories (1)	Sundry Debtors (2)	Cash & Bank (3)	Other Current Assets (4)	Loans and Advances (5)	Current Liabilities (7)		Provisions (8)			
1999-00	176628	403730	36060	50	83770	700238	341583	115869	242786	-	
2000-01	203474	417430	33304	48	103364	757620	355745	60551	341324	40.59	
2001-02	199423	458419	47659	76	99876	805453	408888	64698	331867	-2.77	
2002-03	200106	407578	132091	100	94965	834840	394960	80646	359234	8.25	
2003-04	210388	460848	265964	1351	103919	1042470	519691	113994	408785	13.79	
2004-05	291611	597214	317786	4718	122969	1334298	712044	132545	489709	19.80	
2005-06	374437	716806	413398	8450	119987	1633078	880775	151227	601076	22.74	
2006-07	421767	969582	580891	19970	114087	2106297	1189787	252224	664286	10.52	
2007-08	573640	1197487	838602	42109	118634	2770472	1657645	324439	788388	18.68	
2008-09	783702	1597550	1031467	35021	224178	3671918	2335732	497558	838628	6.37	
2009-10	923546	2068875	979008	40685	259613	4271727	2802374	441798	1027555	22.53	
Average	396247	845047	425112	13871	131397	1811674	1054475	203232	553967	16.05	

Source: Computed and Compiled from published Annual Report of BHEL and from Public Enterprise Survey Report (Vol-3).

Table-2

Analysis of Working Capital Trend of BHEL for the period from 1999-00 to 2009-10

(Figure expressed in Rs. Lakh)

Year	Current Assets (Rs.) (1)	Current Liabilities (Rs.) (2)	Net Working Capital (Rs.) (Y) (3) = (1 - 2)	Indices (4)	Trend Values (Y _c) (5)	Difference (Y - Y _c) (6) = (3 - 5)
1999-2000	700238	457452	242786	100.00	186466.24	56319.76
2000-01	757620	416296	341324	140.59	259966.41	81357.59
2001-02	805453	473586	331867	136.69	333466.58	-1599.58
2002-03	834840	475606	359234	147.96	406966.75	-47732.75
2003-04	1042470	633685	408785	168.37	480466.92	-71681.92
2004-05	1334298	844589	489709	201.70	553967.09	-64258.09
2005-06	1633078	1032002	601076	247.57	627467.26	-26391.26
2006-07	2106297	1442011	664286	273.61	700967.43	-36681.43
2007-08	2770472	1982084	788388	324.73	774467.60	13920.40
2008-09	3671918	2833290	838628	345.42	847967.77	-9339.77
2009-10	4271727	3244172	1027555	423.23	921467.94	106087.06

Note: Y_c indicates estimated values of Working Capital by using Least Squares Method to fit trend line equation in the form of Y_c = a + bX, where the equation so fitted is Y_c = 553967.09 + 73500.17X (taking 2004-05 is the origin and 1 unit of x = 1 Year).

Source: Computed and Compiled from published Annual Report of BHEL and *Public Enterprise Survey Report (Vol-3)*.

ANALYSIS OF TREND VALUES OF CURRENT ASSETS & LIABILITIES

In addition to analysis of trend values of working capital, it is very important to discuss the change in the trend values of current assets and current liabilities of the selected company under study during the study period. Furthermore, the existing values of current assets and current liabilities with their indices have also been examined. Table-3 gives the detailed analysis of actual values of CA and CL with their indices and trend values of them of the BHEL during the period from 1999-2000 to 2009-10. It is seen from Table-3 that the value of current assets increased gradually from the beginning to the end. Its indices were very high as compared to the base year due to increase in various components of current assets especially for inventories, debtors and cash & bank throughout the study period. On the other hand, the value of current liabilities & provisions also marked an upward trend during the whole of the study period excepting in the year 2000-01 in which the indices was less than the base year 1999-2000 while in the remaining years its indices were more than the base year. It occurred due to increase in current liabilities.

From the trend line equation of current assets (i.e. Y_c = 1811673.83 + 350392.87X) and current liabilities (i.e. Y_c = 1257706.64 + 276892.70X) it indicates clearly that the current assets and current liabilities are increased by yearly 350392.87 lakh and 276892.70 lakh respectively. From the above two equations we can easily calculate the estimated value of CA and CL in any year in the future periods. The difference between actual values and trend values of CA and CL are not significant in any year of the study. Both the differences are negative from the years 2002-03 to 2007-08 while in the remaining years the differences are positive. The actual values and estimated values of both CA and CL are presented in Figure-2.

To judge the significance of the difference between the actual values and trend values of CA and CL of the company under study, Chi-square (2) test has also been applied. The calculated value of Chi-square (2) is 7887013.04 while the tabulated value of 2 at 5% level of significance with 10 degrees of freedom is (±) 18.31 for both tailed test. By comparing the

calculated value of χ^2 with the tabulated value of χ^2 , it may be concluded that the difference between the actual values and trend values of CA is statistically significant at 5% level. In case of CL, the calculated value of Chi-square (χ^2) is (-) 1407882.41 while the tabulated value of χ^2 at 5% level of significance with 10 degrees of freedom is (\pm) 18.31 for both tailed test which indicates that there is a significant difference between actual and trend values of CL during the study period.

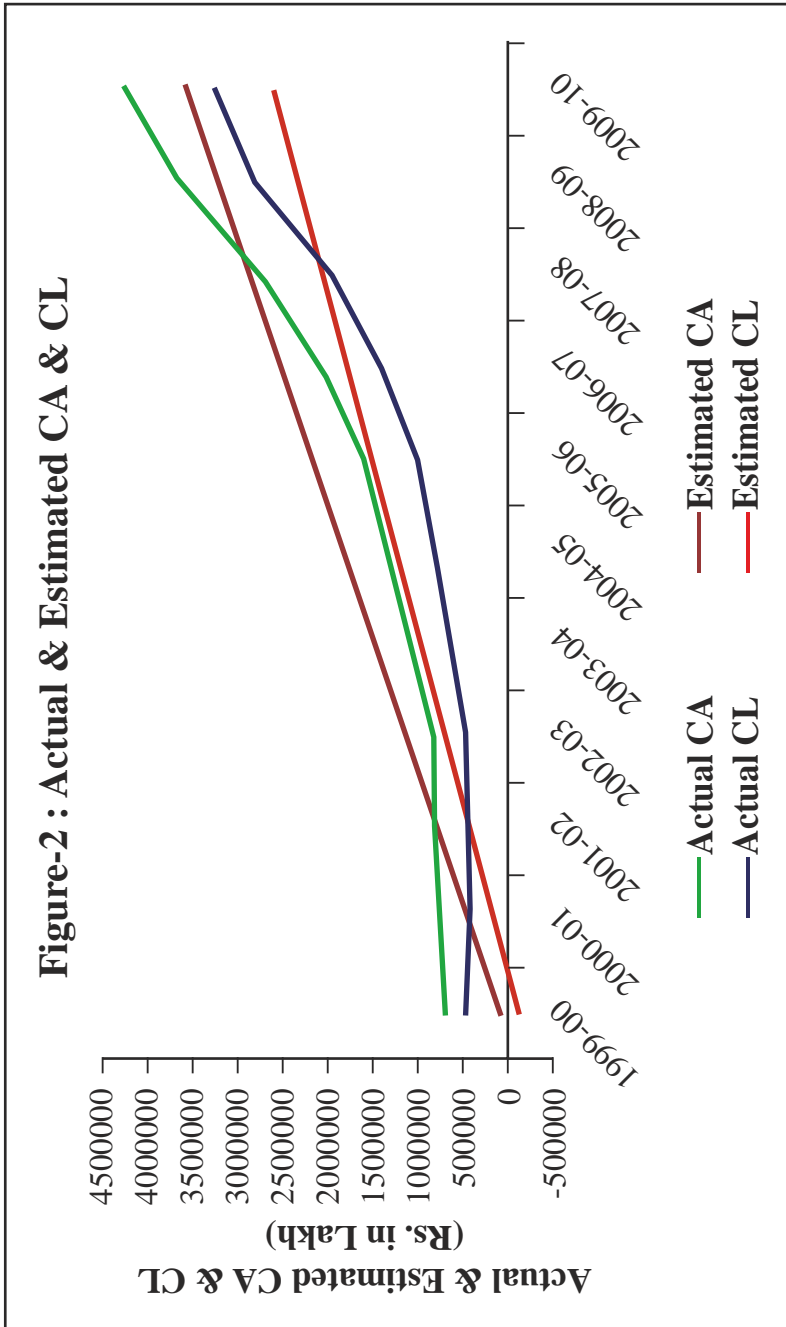


Table-3

Analysis of Trend values of Current Assets and Current Liabilities of BHEL for the period from 1999-2000 to 2009-10

Analysis of Trend Values of Current Assets (CA)					Analysis of Trend Values of Current Liabilities (CL) & Prov.				
Year	Actual CA (Y)	Indices	Trend Values (Y _c)	Difference (Y - Y _c)	Year	Actual CL (Y)	Indices	Trend Values (Y _c)	Difference (Y - Y _c)
1999-00	700238	100.00	59709.48	640528.52	1999-00	457452	100.00	-126756.86	584208.86
2000-01	757620	108.19	410102.35	347517.65	2000-01	416296	91.00	150135.84	266160.16
2001-02	805453	115.03	760495.22	44957.78	2001-02	473586	103.53	427028.54	46557.46
2002-03	834840	119.22	1110888.09	-276048.09	2002-03	475606	103.97	703921.24	-228315.24
2003-04	1042470	148.87	1461280.96	-418810.96	2003-04	633685	138.52	980813.94	-347128.94
2004-05	1334298	190.55	1811673.83	-477375.83	2004-05	844589	184.63	1257706.64	-413117.64
2005-06	1633078	233.22	2162066.70	-528988.70	2005-06	1032002	225.60	1534599.34	-502597.34
2006-07	2106297	300.80	2512459.57	-406162.57	2006-07	1442011	315.23	1811492.04	-369481.04
2007-08	2770472	395.65	2862852.44	-92380.44	2007-08	1982084	433.29	2088384.74	-106300.74
2008-09	3671918	524.38	3213245.31	458672.69	2008-09	2833290	619.36	2365277.44	468012.56
2009-10	4271727	610.04	3563638.18	708088.82	2009-10	3244172	709.18	2642170.14	602001.86

Note:(i) Y_c indicates estimated values of Current Assets by using Least Squares Method to fit trend line equation in the form of Y_c = a + bX, where the equations so fitted is Y_c = 1811673.83+ 350392.87X (taking 2004-05 is the origin and 1 unit Year).

(ii) Calculated value of Chi-square (χ²) is 7887013.04 with help of the formula χ² = $\sum \frac{(Y - Y_c)^2}{Y_c}$ at (n-1) d. f.

Note:(i) Y_c using Least Squares Method to fit trend line equation in the form of Y_c = a + bX, where the equations so fitted is Y_c = 1257706.64 + 276892.70X (taking 2004-05 is the origin and 1 unit of x = 1 Year).

(ii) Calculated value of Chi-square (χ²) is (-) 1407882.41 with help of the formula χ² = $\sum \frac{(Y - Y_c)^2}{Y_c}$ at (n-1) d. f.

Source: Computed and Compiled from published Annual Report of BHEL and from Public Enterprise Survey Report (Vol-3).

Analysis of Financing of Working Capital

An enterprise has various sources of working capital to finance its current assets like short term financing and long term financing for meeting the financial requirements. The detailed analysis of the financing of working capital is shown in Table-4 wherefrom it is observed that the percentage of long term fund used for working capital ranged between 44.04 to 85.91. It indicates that the selected company has been generating about 50% or more from long-term sources of fund in order to finance the working capital during the study period. Between the years 2001 to 2004 its share was below 10 percent but in year 2006- 07 it reached to the highest point i.e., contributing almost 45 percent. The trend of the last five year shows that this source of financing is gaining importance.

Table-4
Analysis of the Financing of Working Capital of BHEL during 1999-2000 to 2009-10

Year	Gross Working Capital (1)	Sources of Working Capital		Long-term Sources of Fund (4)	% of Long-term Fund used for Working Capital (5) = {(2) ÷ (4)}×100
		Long-term (2)	Short-term (3)		
1999-2000	700238	616468	83770	1383938	44.54
2000-01	757620	654256	103364	1485596	44.04
2001-02	805453	705577	99876	1513539	46.62
2002-03	834840	739875	94965	1533476	48.25
2003-04	1042470	938551	103919	1583597	59.27
2004-05	1334298	1211329	122969	1656388	73.13
2005-06	1633078	1513091	119987	1785962	84.72
2006-07	2106297	1992210	114087	2887759	68.99
2007-08	2770472	2651838	118634	3086939	85.91
2008-09	3671918	3447740	224178	4308818	80.02
2009-10	4271727	4012114	259613	5604511	71.59

Source: Computed and Compiled from published Annual Report of BHEL and from Public Enterprise Survey Report (Vol-3).

Analysis of Simple Correlation Between Liquidity & Profitability

An attempt has been undertaken to measure the degree of relationship between the selected measures relating to liquidity management and the profitability ratio (shown in Table-5) of the selected company, for which correlation analysis has been applied taking into account their magnitudes by Pearson's simple correlation coefficient. In order to examine whether the computed values of correlation coefficients between the selected liquidity ratios and profitability are statistically significant or not, t-test has been used. All the correlation coefficients have been highlighted in Table-6. It is observed from Table-6 that the correlation coefficients between ROCE & CR and ROCE & QR are (-) 0.94 and (-) 0.867 which indicate that there is a very high degree of negative association between the profitability and both CR & QR and the correlation coefficients are found to be statistically significant at 1% level. It is evident from these two ratios that the higher the company's margin of safety to the short-term creditors, the lower is the profitability of the company (Nandi, 2011).

Table-6 exhibits that the correlation between ITR and profitability (ROCE) is positive (0.39) which is found to be insignificant both at 1% and 5% levels. The computed value of correlation coefficient between ROCE and ITR under study conforms to the accepted principle that the higher the ITR, the greater is the efficiency of inventory management and the larger is the scope of profitability. While the correlation between DTR and ROCE is positive (0.374)

and is found to be statistically significant at 5% level. The study of the relationship between the profitability (ROCE) and the receivable management (DTR) conforms to the generally accepted rule that the faster the DTR, the lower is the relative investment in receivable and the higher is the scope for improving profitability. There is a very low positive (0.112) degree of relationship between CTR and ROCE and is found to be statistically insignificant at 1% and 5% levels. The more acceptable principle is that higher the CTR, the more will be the efficiency of cash management and the larger will be the scope of improving profitability. The study of correlation coefficients between ROCE and CTR reveals that the computed value of correlation coefficient does not conform to this acceptable principle. It is seen from Table-6 that the correlation coefficient between ROCE and WCTR is 0.86 which implies that there is a positive relationship between these two variables. The calculated value of correlation coefficient is found to be statistically insignificant at 1% level of significance. It is an accepted principle that the faster the working capital turnover ratio (WCTR), the slower is the relative investment and greater is the profitability of the company. The computed value of correlation coefficient between ROCE and WCTR under study conforms to this accepted principle. There is a very high degree of negative correlation between ROCE & WCTR (-0.853) and ROCE & DER (-0.845) which are found to be statistically significant at 1% level.

Table-5

Ratios relating to Liquidity Management and Profitability Ratio of BHEL

Year	CR	QR	ITR (times)	DTR (times)	CTR (times)	WCTR (times)	WCTA	DER	ROCE (%)
1999-00	1.53	1.14	3.76	1.64	1.84	2.73	0.28	0.27	25.90
2000-01	1.82	1.33	3.12	1.52	1.91	1.86	0.42	0.28	8.20
2001-02	1.71	1.28	3.65	1.59	1.53	2.20	0.36	0.16	16.70
2002-03	1.76	1.33	3.74	1.84	5.66	2.08	0.37	0.16	18.40
2003-04	1.65	1.31	4.12	1.88	3.26	2.12	0.35	0.11	21.50
2004-05	1.58	1.23	3.54	1.73	3.25	2.11	0.34	0.10	29.80
2005-06	1.58	1.22	3.88	2.03	3.51	2.42	0.34	0.09	40.50
2006-07	1.46	1.17	4.44	1.93	3.23	2.82	0.30	0.08	51.60
2007-08	1.38	1.11	3.73	1.79	2.55	2.71	0.27	0.01	54.10
2008-09	1.30	1.02	3.58	1.75	2.72	3.34	0.21	0.01	51.47
2009-10	1.32	1.03	3.70	1.65	3.49	3.32	0.22	0.01	57.45
Average	1.55	1.20	3.75	1.76	3.00	2.52	0.31	0.12	31.82

Source: Computed and Compiled from published Annual Report of BHEL and from Public Enterprise Survey Report (Vol-3).

Table-6
Analysis of Correlation between the measures of Liquidity Management and the Profitability Ratio of BHEL

Simple Correlation Coefficient between	
Ratios relating to Liquidity Management	Profitability Ratio (ROCE)
CR	-0.940**
QR	-0.867**
ITR	0.390
DTR	0.374*
CTR	0.112
WCTR	0.86**
WCTAR	-0.853**
DER	-0.845**

Note: ** indicates correlation coefficients are statistically significant at 1% level and * indicates correlation coefficient is statistically significant at 5% level by using SPSS -10.2 version.

Source: Table-5

ANALYSIS OF MULTIPLE CORRELATION & REGRESSION

While fitting the regression equation, ROCE has been taken as the dependent variable and CR, QR, ITR, DTR, CTR, WCTR, WCTAR & DER have been considered as the independent variables. The multiple regression equation which has been fitted in this study is: $ROCE = b_0 + b_1.CR + b_2.QR + b_3.ITR + b_4.DTR + b_5.CTR + b_6.WCTR + b_7.WCTAR + b_8.DER$ where b_0 is the constant, $b_1, b_2, b_3, b_4, b_5, b_6, b_7$ and b_8 are the respective partial regression coefficients. The joint influence of the selected measures relating to liquidity management on the profitability of the selected company under study has been studied in Table-7. Putting the respective values of partial regression coefficients from Table-7, the multiple regression equation so fitted is $ROCE = 220.813 - 37.73.CR - 246.66.QR + 15.64.ITR - 3.29.DTR + 2.59.CTR + 0.202.WCTR + 358.38.WCTAR - 56.89.DER$. The equation states that when CR and QR is increased by one unit (keeping all other independent variables remain constant), the ROCE is decreased by 37.73 units and 246.66 units and this adverse impact of CR & QR on the profitability is found to be statistically insignificant at 1%, 5% and 10% levels. While for one unit increase in ITR, CTR, WCTR & WCTAR (other independent variables held constant) the ROCE is increased by 15.64 units, 2.59 units, 0.202 unit & 358.38 units respectively and the positive influence of these independent variables on the profitability of the company under study is statistically insignificant at 1%, 5% and 10% levels excepting in case of WCTAR which is statistically significant at 10% level. Lastly, for one unit increase in DER (keeping all other independent variables remain constant), the company's profitability (ROCE) is decreased by 56.89 units. The adverse impact of liquidity ratio on profitability (ROCE) is found to be statistically insignificant at 1%, 5% and 10% levels during the study period.

It is observed from Table-7 that the multiple correlation coefficient of ROCE on CR, QR, ITR, DTR, CTR, WCTR, WCTAR and DER for the study period from 1999-2000 to 2009-10 is 0.996. It reveals that the profitability of the company is highly influenced by the selected indicators of liquidity management. This multiple correlation coefficient is found to be statistically significant at 5% level. It indicates that the joint influence of the selected measures relating to liquidity management on the profitability has been satisfactory during the study period. It is also evident from Table-7 that the multiple coefficient of determination (R^2) is 0.993 which interprets that the 99.3% of the total variation in ROCE is explained jointly by the

variation in the independent variables. Therefore, it may be concluded that the contribution made by these eight indicators of liquidity management for improving the profitability of the BHEL is 99.3% during the study period.

Table-7
Analysis of Multiple Correlations and Multiple Regression of BHEL

Variable	Regression Coefficients	Standard Error	Calculated value of 't'	Significant 't'
Constant (b ₀)	220.813	93.118	2.371	0.141
CR (b ₁)	-37.73	87.952	-0.429	0.710
QR(b ₂)	-246.66	160.350	-1.538	0.264
ITR(b ₃)	15.64	10.411	1.502	0.272
DTR(b ₄)	-3.29	14.671	-0.224	0.844
CTR(b ₅)	2.59	1.473	1.760	0.221
WCTR(b ₆)	0.202	15.355	0.013	0.991
WCTAR(b ₇)	358.38	101.924	3.516***	0.072
DER(b ₈)	-56.89	35.786	-1.590	0.253
Multiple Correlation Coefficient (R) = 0.996	Coefficient of Multiple Determination (R²) = 0.993	Adjusted (R²) = 0.964	Standard Error of (R) = 3.311	F ratio = 34.635*
Durbin-Watson (d) = 2.510				
<p><i>Note: (i) Tabulated values of 'F' at 1% and 5% levels with {k, (n-k-1)} d. f. are $F_{0.01, (8, 2)} = 99.37$ and $F_{0.05, (8, 2)} = 19.37$, (ii) Tabulated values of 't' at 1%, 5% and 10% levels with (n-k-1) d. f. for both tailed test are: $t_{(0.01,2)} = 9.93$, $t_{(0.05,2)} = 4.30$ & $t_{(0.10,2)} = 2.92$ and (iii) * Statistically significant at 5% level, ** Statistically significant at 1% level and ***Statistically significant at 10% level.</i></p>				

Source: Table-5

CONCLUSION & SUGGESTIONS

- i) On the basis of overall analysis, it is therefore important to state that the selected company always tries to maintain adequate amount of net working capital in relation to current liabilities as to keep a good amount of liquidity throughout the study period.
- ii) The company must maintain a considerable amount of cash & bank balance in order to meet its short-term commitments and for emergency requirements. This will help the company to increase its margin of working capital and also to make adequate arrangement of credit facilities with banks so as to maintain good amount of liquidity.
- iii) Since the quick ratios of the selected company under study are above the standard norm of 1:1 during the whole of the study period, it may be concluded that the liquidity position of the company was satisfactory and therefore, the company should try to maintain adequate amount of liquid assets to meet its short-term maturing obligations.
- iv) The contribution of long term fund used for working capital varied from 44.04% to 85.91%. It clearly indicates that the selected company has been generating about 50% or more from long-term sources of fund in order to finance for working capital during the study period.
- v) The study of correlation analysis reveals both positive and negative coefficients. Out of eight ratios relating to liquidity management selected during the period under study, four ratios namely, ITR, DTR, CTR and WCTR registered positive association with the selected profitability ratio (ROI) and the remaining ratios like CR, QR, WCTAR and DER witnessed negative association with the selected profitability ratio. Of the eight coefficients, five coefficients are found to be statistically significant and the remaining three are insignificant.
- vi) The study of multiple regression analysis reveals that the slope of regression line reveals both positive and negative impact of the independent variables on the profitability of the company under study. Out of eight partial regression coefficients of the ROCE line, the partial regression coefficients of ITR, CTR, WCTR and WCTAR are found to be positive indicating a positive influence on the profitability and the remaining regression coefficients witnessed a negative impact on the company's profitability. Of the four positive regression coefficients only in case of WCTAR it is significant at 10% level which indicates that there is a significant influence of this measure of liquidity management on the profitability of the company and the remaining coefficients are found to be statistically insignificant during the study period. The study of multiple coefficient of determination (R²) reveals that 99.3% of the total variation in the profitability of the company is jointly explained by the eight independent measures relating to working capital management.
- vii) Lastly the management of BHEL should also try to maintain a definite proportion among different components of working capital in regard to overall current assets to keep and adequate quantum of liquidity all the times. Such proportion can be worked out on the basis of past experience by the management of BHEL.

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FORMULA USED FOR CALCULATING RATIOS	
CR = (Current Assets ÷ Current Liabilities)	CTR = (Sales ÷ Yearend Cash & Bank)
QR = (Quick Assets ÷ Quick Liabilities)	WCTR = (Sales ÷ Working Capital)
ITR = (Sales ÷ Inventories)	WCTAR = (Working Capital ÷ Total Assets)
DTR = (Sales ÷ Debtors)	DER = (Total Debt ÷ Total Equity)