WORKING CAPITAL MANAGEMENT-A CASE STUDY APPROACH WITH SPECIAL REFERENCE TO NRL

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Abstract: The sustainability and growth skill of an enterprise is determined by an efficient financial management. Current asset financing is one of the most complex decisions for a financial manager. Excess of funds locked up in current assets adversely affects the firm's scope for profitability whereas inadequacy in working capital may land the firm into serious trouble by landing it towards the risk of meeting its current obligation schedules. So a sound strategy and systematic approach to management of working capital is required to support a trade off between profitability and liquidity in an enterprise. The present study is a case study on working capital management of Numaligarh Refinery Limited (NRL), an emerging and flourishing enterprise in North East region. Data collected from Annual Reports of NRL for 16 years from 2004-2019 are used for the purpose. Descriptive statistics and OLS regression is used for the analysis. Johansen's cointegration test and ARDL models are further used to study the relationship between profitability and liquidity. The study aims at capturing the present scenario of NRL and the need for reengineering its liquidity management to promote its mission of long term sustainability and growth in the global arena. Results indicate improvent in the overall working capital management scenario but at the same time a declining trend in both liquidity and profitability of the firm in the recent years in comparison to the previous half.
Keywords: Short term finance, reengineering, profitability, liquidity, credit policy

Introduction

In the phase of globalisation, India being one of the largest economies of the world is passing through a challenging face. Increasing concern for energy requirements, environmental regulations, ever hiking prices and demand for of petroleum and natural gas prices has thrown up both challenges and opportunities to India's oil and gas industry. According to US Energy Information Administration, India is the 3rd largest consumer of oil and the 4th largest importer of Liquified Natural Gas. Despite of domestic production, as high as 70 percent of its demand for oil is still fulfilled by imports which calls for a considerably good investment and efficiency in the refinery sector.

The government is continuously making arrangements to promote the country as a competitive refining destination to establish an export market of petroleum products in collaboration with petrochemical industries to produce and export revenue generating value added products. The Numaligarh Refinary Limited (NRL) and Brahmaputra Cracker and Polymer Limited(BCPL) are some efforts by the government in Northeast to give a boost to this vision.

The present study is an attempt to study the working capital management and performance in the Numaligarh Refinary Limited (NRL) with liquidity and profitability as the broad parameters. The NRL was set up in the Golaghat district of Assam in accordance with the provision made in the historic Assam Accord signed on 15th August 1985. Since then it has proved itself as a vehicle for speedy industrial development and growth in the region The NRL was incorporated on 22nd April, 1993 and started its commercial operations from October 2000. Within the first two years of commercial production, NRL received Management System Certification for quality, environment and occupational work and safety (ISO). It has also earned the prestigious certification for its information Security Management System (DNV, Netherlands), being the first among all PSUs of the country. With its track records of consistent profitability and steady growth, it has earned the status of the "Fastest Growing Miniratna" in the year 2018 (Dalal street Investment Journal) and is a recipient of Refinery Performance Improvement Award from the Ministry Of Petroleum And Natural Gas. During 2018-19, NRL recorded its highest ever sales in history with high speed diesel and paraffin wax capturing a wider market in recent year (www.nrl.co.in)

Literature Review

Monday et al(2013) in their attempt to study the impact of working capital management on the profitability use variables like cash conversion cycle, inventory turnover ratio(ITR), and liquidity ratio(LR) as a measure of working capital and Return on Assets (ROA) as a measure of profitability. Using panel data analysis the study found that the positive relationship between ROA and ITR. The LR indicates the firm to be in conservative position must kept current assets in relation to the total assets by the oil and gas firms. The study also revealed a negative relationship with the Cash Conversion Cycle and Profitability[1]

Ondago, (2014) studied the relationship between working capital management and its impact on the profitability of the oil marketing companies in Kenya. Receivables collection period, inventory conversion period, average payment period, current ratio and current asset to total assets ratio are used as a measure of working capital management and Return on Total Assets is used as a measure of profitability to explain the relationship. It is found that current assets to total assets ratio, inventory conversion period and size of the firm have the highest impact on profitability of the oil marketing firms.[2]

Raza et al (2015) They study the impact of working capital management on the profitability of the firm in oil sector of Pakistan and found that average payable as a part of working capital management has a very close positive relationship with the operating profit which is a dependent variable. But other variables like cash conversion cycle average receivables etc. has negative relationship with the profitability.[3]

Rao(2016)made a case study on ONGC Ltd to know the impact of working capital management on the profitability where working capital ratios are used as independent variables and Profit After Tax to Owner`s fund is used as dependent variable as a measure of profitability. The study concluded that working capital ratios have a negative relationship with the PAT to Owner`s fund which indicates that any increase in these ratios will decrease profitability of the firms. Moreover a positive relationship can be found in case of inventory and debtors turnovers.[4]

Ironkwe et al (2017), in their study of working capital management and financial performance of oil companies in Nigeria made an attempt to see the impact of financing and investing policies on the ROA and EPS. The result revealed that investing policy and ROA are perfectly related but the same is negatively related with the financing policies of the firm. Moreover the study examine that WCM as well as financing policy has no close relationship with the EPS of oil companies in Nigeria. Finally the study suggests that the oil segment of the companies should give special focus on the appraisal of their financial performance trend and the WCM framework for smooth functioning of the firm.[5]

Jibumon (2018) in his study of working capital management and liquidity and profitability relationship of ONGC Ltd found that the company invests excess funds in inventory which affects the current ratio position. The study suggests not introducing additional working capital but improving the debt collection period and inventory position of the firm can improve the liquidity position. The study concluded that working capital positively influence the profitability of the firm.[6]

Research Gap

It has been observed that a lot of studies have been undertaken on analysing the liquidity and profitability aspects of working capital management of oil and natural gas companies but despite of its giant contribution to petroleum sector in India, no significant study for analysing working capital management of a "minratna" PSU has been undertaken to understand its long term sustainability.

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[1]Monday et al(2013)., "Working Capital Management and Firm Profitability: Evidence from A Panel Data Analysis of Selected Oil and Gas Firms in Nigeria."

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[4]Rao(2016), P. H, "Impact of Working Capital Management in the Profitability – A Case Study of Oil and Natural Gas Corporation"

[5] Ironkwe U.I & et al., (2017), "Working Capital Management and Firms Financial Performance of Oil Companies in Nigeria",IOSR Journal of Business and Management (IOSR-JBM), V.19, No.1, pp. 01-17.

[6]Jibumon K.G, (2018), "An Analysis Of Working Capital And Liquidity of ONGC Ltd with Special Reference To 2012April To March 2017", International Journal of Application or Innovation in Engineering & Management (IJAIEM), V.7, No.2

Limitations of the Study
1. The study focuses on only quantitative data and qualitative aspects which play a crucial role in management decision making have been ignored.
2. Not all the aspects of working capital management are considered for the purpose of the study.

Objectives
1. To study the working capital management of NRL and analyse its operational efficiency
2. To study the overall liquidity position of NRL and assess the degree of auniformity among the elements of liquidity
3. To study trend and association between liquidity and profitability of NRL

Hypothesis
1. Ho1: There is no association between actual working capital and estimated working capital of the company
2. Ho2: There is no uniformity in movement among the elements of liquidity of the company
3. .Ho3: Liquidity of the firm has no impact on the profitability of the company

Methodology
Data used in the study is secondary in nature and has been collected from annual reports of NRL available since the period from 2004 to 2019
For analysing, descriptive ratios are calculated from the various elements of income statements and financial position statement. Simple mathematical tools such as ratio analysis, percentage analysis, averages etc and statistical techniques like Kendall's coefficient of concordance(Kendall's W), chi square tests, Pearson's correlation analysis, OLS regression tests and F tests have been used wherever applicable. Further to analyse the association between liquidity and profitability of the company econometric tools such as ADF(Augmented Dickey Fuller) unit roots test for stationarity of time series data, Johansen's co integration test and ARDL(Autoregressive Distributed Lags) methods along with diagnostic test like CUSUM and CUSUM square tests are also applied. Granger Causality Test was applied to test the existence of cause effect relationship between Liquidity of NRL and its Profitability For sensitivity analysis of profitability to changes in working capital, working capital leverage has been calculated.
Calculations have been done using MS Excel 2007, SPSS version 26.0 and E views 10 students version.

Analysis and Interpretations
Table-1: Working Capital And Selected Working Capital Management Ratios

Year	Gross Working Capital(GWC)	Current Ratio(CR)	Acid test ratio(QR)	Current Assets to Total Assets Ratio(CTR)	Current Assets to Sales ratio(CSR)	Inventory Turnover ratio(ITR)
2004	800.754	1.94	0.439375	0.341451	0.308019	2.79543
2005	948.525	1.33	0.287498	0.438887	0.273556	2.976668
2006	1096.723	1.49	0.380157	0.436983	0.222558	3.476033
2007	1421.733	1.39	0.540965	0.591964	0.213664	4.454512
2008	1912.975	1.24265	0.608673	0.775327	0.253422	4.585133
2009	1412.44	1.42281	0.410212	0.568811	0.182353	4.345906
2010	1790.14	1.47015	0.183321	0.66437	0.267309	2.847463
2011	3413.79	1.402216	0.916999	0.890466	0.327	2.617946
2012	3680.32	1.453517	0.811282	0.574608	0.222137	3.681214
2013	2648.64	1.797752	1.148691	0.508136	0.275518	2.539793
2014	2924.75	1.963961	1.085358	0.537099	0.308068	3.618973
2015	5362.81	1.653704	1.437754	0.627449	0.43919	3.345076
2016	4577.51	3.466599	3.151295	0.597213	0.32488	4.493265
2017	5025.32	3.163888	2.51676	0.597334	0.309975	5.196106
2018	5114.67	2.485743	1.950822	0.572979	0.264644	4.634129
2019	4784.92	2.288178	2.037555	0.489397	0.19829	5.568804

Source: (Computed from Annual reports)

The amount of working capital utilized in the operation of NRL during the study period and some related efficiency and liquidity ratio have been shown in Table 8. 1. Volume of Gross working capital indicates the amount of investment in current assets by the company and the relevant ratios imply the management of these current investments. There has been 497.55 % rise in the volume of working capital from Rs. 800.75 crores in 2004 to Rs. 4784.92 crores in 2019.

Analysis of Liquidity and Operational Efficiency of NRL

Current Ratio

It can be observed from table 1 that the current ratio of NRL has been increased with some fluctuations during the study period. The ratio increases gradually from 1.24 in 2008 to 3.46 in 2016 while on an average the current ratio for the study period stood at 2.11 which is quite satisfactory. It is also found that during the last four years the current ratio improves considerably and attains its conventional norms of 2:1.

Quick Ratio

The Quick Ratio of NRL varies within the range of 0.28 in 2005 to 3.15 in 2016 and on an average it is 1.24. It is observed from table 1 that in the initial year i.e. from the year 2004 to 2010 the QR is very less and it was far below the norms but thereafter the ratio improved to the considerable extent. The recent data on Quick ratio is not satisfactory as it indicates much higher liquid cash than required.

Current Assets to Total Assets Ratio (CTR)

On an average 61% of the total investment of the firm are being utilized for working capital purpose. It can be noted that in the initial year the percentage of total investment as working capital were less but thereafter it follows a uniform pattern with less fluctuations.

Current Assets to Sales Ratio (CSR)

The CSR ranges from 18.2% in 2009 to 43.9% in 2015 with fluctuation in the values year after year. In majority of the years the ratio is lower i.e. less than 30% and on an average NRL maintained CSR of 25.3% throughout the year. Thus this ratio implies that the company efficiently utilizes their short term funds in making sales and therefore operating efficiently through effective employment of WC funds (Table-1)

Inventory Turnover Ratio (ITR)

An increasing trend of ITR during the study period with the presence of some considerable fluctuation is observed. The average value of ITR of NRL stood at 4.18 times. It shows that over the study period the ratio increases to the considerable extent which implies that the inventory management of the company is improved over the time (Table-1).

Table -2. : Financing Pattern of working capital

| Year | Sources of Working Capital | | Short Term% | Long Term% |
	Short Term funds	Long Term funds		
2004	460.25	2149.38	17.6366	82.3634
2005	806.39	1635.201	33.02724	66.97276
2006	786.73	1896.316	29.32227	70.67773
2007	1111.81	1491.461	42.70819	57.29181
2008	1629.3	982.05	62.39302	37.60698
2009	1058.23	1588.8	39.97801	60.02199
2010	1309.2	1587.86	45.19064	54.80936
2011	1942.86	1116.56	63.50419	36.49581
2012	2052.16	3138.94	39.53228	60.46772
2013	1254.55	3183.97	28.26505	71.73495
2014	1451.76	3856.76	27.34774	72.65226
2015	2619.26	4284.06	37.94203	62.05797
2016	1117.62	5369.75	17.22763	82.77237
2017	1366.42	5871.07	18.87975	81.12025

| 2018 | 1695.26 | 5659.25 | 23.05062 | 76.94938 |
| 2019 | 1604.15 | 5896.06 | 21.38807 | 78.61193 |

Source: (Self Computed from Annual Reports)

Table -2 shows that NRL has always followed a conservative policy as it has always highly relied upon long term funds over short term funds for financing its working capital requirement. This policy proves to be less risky but at the same time it is comparatively less profitable over aggressive policy of working capital management.

Table -3: Model Estimates of Estimated Working capital from Sales as the Independent Variable

	Unstandardised Coefficients					
Model estimates	Coefficients	Standard Errors	P- value	Degrees of Freedom	R square(coefficient of determination)	Adjusted R square
Intercept(a)	-194.144	560.861				
Sales(b)	.329	.054	..000	15	.725	.706

Source: (Computed in SPSS)

Ho1: There is no association between actual working capital an estimated working capital of the company

The estimated working capital of NRL is obtained by assuming its linear dependency on sales by using the regression equation as stated:

GWC= a + bS where,   S =sales, a=intercept and b= regression coefficient of sales.

EGWC= a + bS

Table-3 shows the model estimates of EGWC which are significant at .001% level with a coefficient of determination 72.5%. This indicates working capital is well explained by sales leaving 27.5% unexplained due to some other factors.

The correlation coefficient between Gross Working Capital and Estimated Gross Working capital is .852 which is significant at .001 levels. This indicates high level of association between them which makes it clear that working capital management of NRL is nearly efficient. This means company does not face much risk relating to shortage of working capital or underutilisation of funds

Table -4: Statement showing shortage/ excess of Working Capital over estimated working capital

Year	Gross Working Capital(y)	Estimated Working Capital(ȳ)	Excess/Shortage(y-ȳ)
2004	800.754	757.316204	43.44
2005	948.525	1094.329328	-145.80
2006	1096.723	1538.745818	-442.02
2007	1421.733	2178.458353	-756.73
2008	1912.975	2434.018644	-521.044
2009	1412.44	2522.05707	-1109.61
2010	1790.14	2174.47515	-384.33
2011	3413.79	2546.53138	867.26
2012	3680.32	4223.372	-543.05
2013	2648.64	2498.73097	149.91
2014	2924.75	2850.48461	74.26
2015	5362.81	3050.29618	2312.51
2016	4577.51	3729.02976	848.48
2017	5025.32	4394.09668	631.22
2018	5114.67	5044.28951	70.38
2019	4784.92	5895.72835	-1110.81

Source: (Computed from Annual reports and OLS method)

Accordingly we obtain the deviations of GWC from EGWC. It was observed (table-4) that working capital is in excess in second half before 2013 since when it has always followed an excess trend. But in the most recent year 2019 an acute shortage in working capital is noticed.

Table -5. : Yearwise Ranking in Order of Liquidity Management

Year	ITCR	DTCR	CTCR	MTCR	Lioquidity ranks				Total rank	Ultimate rank
					ITCR	DTCR	CTCR	MCTR		
2004	67.17142	19.72758	2.968031	10.13296	13	11	11	6	41	5
2005	66.95142	21.43978	0.368707	11.2401	12	9	14	4	39	6.5
2006	68.07077	22.83517	2.736672	6.357393	15	8	13	12	48	3
2007	53.27837	13.65206	25.41858	7.650992	8	13	5	9	35	8
2008	45.50811	23.68656	25.29894	5.506384	6	7	4	15	32	9.5
2009	64.9901	9.423774	19.42537	6.160753	11	15	8	13	47	4
2010	80.53951	6.094913	6.380149	6.985432	16	16	10	10	52	1
2011	59.91205	27.91533	7.402608	4.770015	10	4	9	16	39	6.5
2012	67.57028	26.83407	0.007375	5.58828	14	5	16	14	49	2
2013	53.5411	31.3341	0.116611	15.00818	9	2	14	2	27	11
2014	47.34252	9.762907	33.87521	9.01936	7	14	3	8	32	9.5
2015	36.90448	28.5556	24.35242	10.18751	2	3	6	5	16	16
2016	27.2449	21.14709	44.83189	6.776122	1	10	1	11	23	13
2017	37.67001	18.586	34.55912	9.184863	3	12	2	7	24	12
2018	42.89342	24.11283	19.47874	13.51501	5	6	7	3	21	14
2019	41.31663	33.25169	2.838244	22.59343	4	1	12	1	18	15
Mean Ranks					2.53	2.56	2.47	2,44		

Source: Computed in SPSS

Table-6. Kendall's W and Chi Square Test on Working Capital Ratios

N	Kendall's W[a]	Chi-Square	Df	Asymp. Sig.
16	.652	31.275	3	.000

2. Ho2: There is no association among the elements of liquidity of the company

In table-5, an attempt has been made to study the overall liquidity structure of NRL for the study period by using a comprehensive ranking based on the aggregate of rankings under four individual criteria viz. Inventory to Current Assets Ratio (ITCR), Debtors to Current assets Ratio (DTCR), Cash and Bank to Current assets Ratio (CTCR) and Miscellaneous Current Assets to Current Assets Ratio (MTCR). Ultimate Ranking has been done based on the aggregate score of the individual rankings A high value of DTCR, CTCR and MTCR indicates greater liquidity and hence the ranking has been done in decreasing order of liquidity for these ratios whereas for ITCR whose low value indicate a favourable position has been ranked in an increasing order from low to high.

Kendall's coefficient of concordance has been calculated to test the null hypothesis that there is no association between the various components of liquidity in working capital and chi square value for the test has been calculated to test the significance of the association. The computed value of Kendall's W comes out to be .652 (Table-6) which is statistically significant at 0.01% level of significance (calculated Chi square value 31.275 > critical value).Thus we reject the null hypothesis and state that there is a close association and uniformity among the four elements of liquidity in working capital structure.

Table -5 shows the liquidity position of NRL in order of its best to worst for the time period under study. It can be observed that liquidity position of NRL was much better in its first half as compared to later recent years. The same can be attributed to a heavy decline in ITCR and simultaneously rise in DTCR, CTCR and MTCR in the later half. Also mean ranks indicate ITCR has the most dominant role to play in the declining trend of liquidity of NRL.

Table -7: Analysis of Correlation between liquidity and Profitability

Year	Liquidity	Liquidity Rank	Profitability	Profitability Rank
2004	0.3415	5	1.345911844	16
2005	0.4389	6.5	2.39556605	15
2006	0.437	3	2.778040158	9
2007	0.592	8	4.835833455	4

2008	0.7753	9.5	8.135263989	1
2009	0.5688	4	5.196897029	3
2010	0.6644	1	4.534625219	5
2011	0.8905	6.5	7.461506771	2
2012	0.5746	2	4.277877245	6
2013	0.5081	11	2.570982139	10
2014	0.5371	9.5	2.399705971	11
2015	0.6274	16	2.302119952	13
2016	0.5972	13	2.22085572	14
2017	0.5973	12	2.37553291	12
2018	0.573	14	2.813657287	8
2019	0.4894	15	3.139579651	7

Source: (Self Compiled from Annual Report Data)

### 3. .Ho3: Liquidity of the firm has no impact on the profitability of the company

Return on capital Employed (ROCE)[7] has been taken as a measure of profitability. The correlation coefficient between liquidity and profitability is .802 which is significant at .001 levels (Table-7.). But since it is known correlation sometimes give spurious results, we further go for econometric analysis of the data. The time series data obtained on profitability and liquidity of the company was found to be stationary in the same order of lag 1. So we are facilitated to carry out the Johansen's Cointegration test to understand the long term relationship between profitability and liquidity of NRL.

The null hypothesis for the test was there is no cointegration between profitability and liquidity of NRL. it can be observed that p value for the test is significant at 5% level of significance and hence it enables us to reject the null hypothesis(table 8). Thus we observe there is a close cointegration between profitability and liquidity of NRL. To confirm the nature of this association, we further use the ARDL model.

Results of the ARDL model at lag 1 are also significant at 1% level which indicate that profitability of NRL is associated with its liquidity management in the long run.(table 9)

Figure. 1. Cointegration graph between Liquidity and Profitability
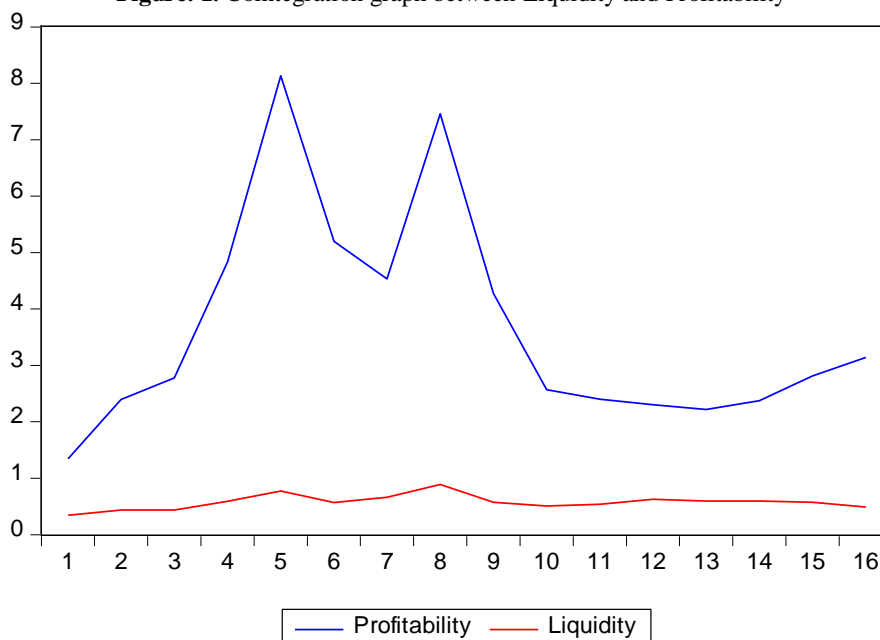
This is further depicted in diagram which shows that profitability of NRL is uniformly moving with its liquidity during the period under study. Stability diagnostic and reliability tests using CUSUM and CUSUM Square were also carried out which establishes the dependency on the ARDL model establishing a long term relationship between profitability and liquidity of NRL in the long run. But however the results of granger causality test fails

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[7]ROCE=EBIT/(Shareholder's fund+long term debts)

to confirm a cause effect relationship between liquidity management and profitability of NRL i.e., neither liquidity granger causes profitability nor vice versa.

Following the identification of the association stated above, we further carried out OLS regression to study the strength of relationship between liquidity management of NRL and its profitability in the long run. Accordingly the following model is established to study the association between liquidity(exogenous variable) of NRL on its profitability(endogenous variable).

$$P = -3.166 + 11.878L + \dot{\varepsilon}$$

The above regression equation is significant at 1% level with a coefficient of determination 64.3% which indicates a strong association among the two

An effort has been made to study the impact of working capital management of NRL on its profitability by obtaining the working capital leverage(table 11). The formula used for computing WCL is as follows:

WCL = GWC/TA+ (-) CGWC

Where, GWC= Gross Working Capital, TA=Total Assets and CGWC= Change in Gross Working Capital.

Table -11. : Statement of Working Capital Leverage

Year	Gross WC	Total Assets	WC levaerage= GWC/TA+(-)GWC
2004	800.754	2,609.63	0.292026
2005	948.525	2,441.59	0.366316
2006	1096.723	2,683.05	0.387364
2007	1421.733	2,603.27	0.485518
2008	1912.975	2,611.35	0.616573
2009	1412.44	2,647.03	0.658022
2010	1790.14	2,897.06	0.546648
2011	3413.79	3,059.42	0.728964
2012	3680.32	5,191.10	0.674344
2013	2648.64	4,438.52	0.777448
2014	2924.75	5,308.52	0.523714
2015	5362.81	6,903.32	0.574092
2016	4577.51	6,487.37	0.80278
2017	5025.32	7,237.49	0.653887
2018	5114.67	7,354.51	0.687099
2019	4784.92	7,500.21	0.66731

Source: (Self Computed from Annual Reports)

A higher value of WCL indicates greater sensitivity of Returns on Investment (ROI) or profitability to changes in working capital investment. It implies greater risk and at the same time opens up the scope of the possibility for a greater profitability.WCL was found to be highest in 2016 and lowest in 2004.Thus the WCL of 2016 was most helpful in increasing profitability in 2016. However it can be observed that change in ROI is less proportionate to change in investment. GWC as indicated by the less than unity values of WCL in all the years under study. Thus there is no full capacity utilisation under the existing working capital management endeavours of NRL. The findings are consistent to the fact that NRL has not achieved overall full capacity utilisation as observed from the Annual Reports. Nevertheless WCL in recent years is encouraging

Findings and Conclusion

1. NRL has always followed a conservative policy of working capital management. It has always highly relied upon long term funds over short term funds for financing its working capital requirement which proves to be less risky but at the same time it is comparatively less profitable over aggressive policy of working capital management.

2. There has been continuous improvement in current ratio over the recent years but however acid test ratio indicates more of liquid cash than required for operations. Excess of this ratio in recent years indicate underutilisation of resources by working capital management.Inventory management of the company has continuously improved over the years

3. Estimated working capital (obtained as dependent on sales) is strongly correlated to actual working capital and there is a strong association between two. Thus working capital management of NRL is nearly efficient. This means company does not face much risk due to capacity underutilisation

4. It was observed that working capital is in slight excess in second half as against prior to 2013 since when it has always followed an excess trend. But in the most recent year 2019 an acute shortage in working capital is noticed indicating inefficiency in working capital management which requires immediate attention to ensure sustainability of its operations.

5. Uniformity is observed among the movement of the components of working capital of NRL.. Liquidity position of NRL was much better in its first half as compared to later recent years. The same can be attributed to a heavy decline in ITCR and simultaneously rise in DTCR, CTCR and MTCR in the later half. Inventory management has the most dominant role to play in the declining trend of liquidity of NRL.

6. Profitability and liquidity of NRL are closely cointegrated in the long run but no evidence of cause effect relationship between the two is noticed.

7. Working capital management of NRL has not been able to achieve full capacity utilisation.

The findings are consistent to the fact that NRL has not achieved overall full capacity utilisation (Annual reports, 2019). Nevertheless WCL in recent years is encouraging for the firm offers a scope to make upgradation in the working capital management mechanism to improve its profitability in near future

The conservative policy of NRL calls for an improvement in the working capital management of NRL to strike out an appropriate feasible combination of both the sources to finance and wipe out excess dependency on long term funds to meet its working capital needs. Though a lot of factors such as cost of capital, risk preference, flexibility etc plays their role in deciding the working capital management, still It is generally accepted that an aggressive policy witnesses better performance over a conservative policy of working capital management. Since profitability of NRL is cointegrated with liquidity, a focus on improving its liquidity would facilitate space towards enhanced performance. For improving liquidity position, inventory turnover ratio needs close attention has it has a dominant role to play in this respect. Debt Equity ratio and Cash maintenance system too has its role to play here as they move in uniformity with ITR. This findings is in par with ONGC Ltd. (Jibumon, 2018)

Though working capital management of NRL as a Minratna is satisfactory, but it always has a scope of improving its working capital leverage and enhances its capacity utilisation for scope of better profitability. So, in this front NRL needs a reengineering of its working capital structure to achieve a long term sustainability in its performance.

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Glossary

NRL- Numaligarh Refinary Limited
PSU- Public Sector Undertaking
WC- Working Capital
GWC- Gross Working Capital
EGWC- Estimated Gross Working Capital
WCL- Working Capital Leverage
ROCE- Return on Capital Employed
EBIT- Earnings before Interest and Tax
CA-Current Assets
QA- Quick Assets
CTR- Current to Total Assets Ratio
CSR-Current Assets to Sales Ratio
ITR-Inventory Turnover Ratio
ARDL- Autoregressive Distributed Lag

ITCR-Inventory toCurrent Assets Ratio
DTCR- Debtors to Current assets Ratio
CTCR- Cash and Bank to Current assets Ratio
MTCR- Miscellaneous Current Assets to Cuirrent Assets Ratio

Annexure
Table -8. Results of Johansen's Cointegration Test

Dependent Variable: PROFITABILITY
Method: ARDL
Date: 11/23/19   Time: 14:41
Sample (adjusted): 5 16
Included observations: 12 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic):
Fixed regressors: LIQUIDITY C
Number of models evaluliated: 4
Selected Model: ARDL(4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
PROFITABILITY(-1)	0.558847	0.145899	3.830382	0.0087
PROFITABILITY(-2)	-0.160332	0.171024	-0.937483	0.3847
PROFITABILITY(-3)	0.121068	0.194372	0.622866	0.5563
PROFITABILITY(-4)	-0.306877	0.147036	-2.087090	0.0819
LIQUIDITY	11.98760	2.554109	4.693457	0.0033
C	-4.336922	1.607763	-2.697487	0.0357

R-squared	0.915873	Mean dependent var	3.952384
Adjusted R-squared	0.845767	S.D. dependent var	2.051355
S.E. of regression	0.805618	Akaike info criterion	2.712439
Sum squared resid	3.894125	Schwarz criterion	2.954893
Log likelihood	-10.27464	Hannan-Quinn criter.	2.622675
F-statistic	13.06415	Durbin-Watson stat	1.448651
Prob(F-statistic)	0.003544		

*Note: p-values and any subsequent tests do not account for model
     selection.
Source: (Test Results in E views 10 SV)

Table -9. Results of ARDL Model

Date: 11/23/19   Time: 14:13
Sample (adjusted): 3 16
Included observations: 14 after adjustments
Trend assumption: Linear deterministic trend
Series: LIQUIDITY PROFITABILITY
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.527775	15.90498	15.49471	0.0434
At most 1 *	0.320073	5.400777	3.841466	0.0201

 Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
  **MacKinnon-Haug-Michelis (1999) p-values
Source: (Test Results in E views 10 SV)

Table -10. Model coefficient of Regression of profitability regressed on liquidity

Model estimates	Unstandardised Coefficients		P- value	Degrees of Freedom	R square(coefficient of determination)
	Coefficients	Standard Errors			
Intercept(a)	-3.165	1.395			
Liquidity(b)	11.878	2.367	..000	15	..643

Source: (Test results in SPSS 26.0)