CHAPTER - 4

Research Methodology

Chapter Contents

CHAPTER 4: RESEARCH METHODOLOGY

This chapter presents the research methodology adopted for analyzing some important aspects of working capital management in selected Indian Non Financial Service Sector Industries. The meaning of Non Financial Service Sector is also discussed. This chapter apprises on the procedure followed for sample selection along with the period of study as well as data collection. The hypotheses of the study that are to be tested are also stated. Moreover, the measures of working capital management, profitability and leverage employed to satisfy the objectives of the study are detailed. Further, the statistical tools and techniques adopted for the analysis of data as well as to substantiate the findings have been discussed in detail.

4.1 Introduction

Surveys indicate that largest portion of a financial manager's time is devoted to day to day internal operations of a firm, *i.e.* working capital management[1] which facilitates smooth functioning and efficient asset utilization. In practice, working capital management has become one of the most important issues in the organizations where many financial executives are struggling to identify the basic working capital drivers and the appropriate level of working capital[2]. In the said context, considering the growing importance of service sector globally as well as in India, an attempt has been made through the current study to examine some important aspects of WCM of Service Sector companies which will provide an insight into the short term financial management in the selected industries.

The service sector is defined as per the National Industrial Classification (NIC) and is explained in detail in Section 4.2.1. Throughout the study, the terms 'sector' and 'industry' has been used interchangeably. The same is the case with terms 'company' and 'firm'. This study aims to examine the significant aspects of working capital management and analyze its impact on the profitability of the selected sample of service sector companies.

On the basis of available literature and existing theories of working capital management and keeping in view the results of various related empirical studies, a list of relevant ratios is prepared which is presented in para 4.4.

4.2 Research Gap

Since its inception in late 1860's the theory on working capital management has developed with contributions of various economists, researchers, academicians and practitioners. The literature on WCM is replete with various empirical studies being either a case study or comparative or of a fact finding nature or for developing a theory based on empirical analysis. In the course of literature review it was observed that all the research studies focused on industries belonging to manufacturing sector and it was difficult to find a specific study with full fledged focus on nature of WCM in the Service Sector. Further, it was difficult to find a comprehensive study covering all the seven dimensions of WCM, *i.e.*, Working Capital Policy, Current Asset Structure, Current Liabilities Structure, Liquidity Management, WCM Efficiency, Working Capital Leverage and impact of Sales on Working Capital; WCL on ROTA and WCM on profitability even in the manufacturing sector with large samples. In context of the above, the current study bridges this gap in literature by examining all the seven dimensions of WCM over a period of 16 years in the Indian Service Sector due to the growing importance of the sector in the Indian and World economy as discussed in the preceding para.

4.3 Data Source and Sample Selection

In this section, the meaning of the phrase "Non Financial Service Industry" is discussed. Also the source of data as well as selection of sample and time frame for carrying out this study is discussed.

4.3.1 Meaning of the Non Financial Service Industry

The present study is entitled, "*A Study on Some Important Aspects of Working Capital Management in Selected Indian Industries*". The Service Industry has been selected based on its growing importance in the Indian as well as the World Economy (already discussed in Chapters 1 & 2, pp. 1 – 36). The CSO under the aegis of Ministry of Statistics and Programme Implementation (MOSPI) prepares and revises NIC for the purpose of developing and maintaining comparable data base according to economic activities. The NIC of the Services is given in Table 4.1. Thus, Service Sector encompasses all the activities grouped as per NIC.

Taking this classification as base, Centre for Monitoring Indian Economy (CMIE) has further classified the Service Sector into Financial Services Sector and Non Financial Services Sector. The Financial Service Sector includes Banking, Financial Services like Leasing, Asset & Portfolio Management, Broking *etc* and Insurance Services. The Non

Financial Services Sector incorporates all those services which do not fall under the purview of Financial Services Sector. Thus, for the purpose of current study, the Service Sector would specifically mean and include the Non Financial Service Industry. Thus, throughout the study the phrases, "Service Industry", "Service Sector", "Non Financial Service Industry" and "Indian Non Financial Service Industry" are used interchangeably and in the same context.

TABLE – 4.1: Activities Comprising the Services Sector	
a	Trade
b	Hotels and restaurants
c	Transport including tourist assistance activities as well as activities of travel agencies and tour operators
d	Storage and communication
e	Banking and insurance
f	Real estate and ownership of dwellings
g	Business services including accounting; software development; data processing services; business and management consultancy; architectural, engineering and other technical consultancy; advertisement and other business services
h	Public administration and defence
i	Other services including education, medical and health, religious and other community services, legal services, recreation and entertainment services
j	Personal services and activities of extra-territorial organizations and bodies
(Source: http://mospi.nic.in/nscr/sss.htm)	

4.3.2 Data Collection and Sample Selection

The data for the purpose of research is obtained from PROWESS Database maintained by CMIE (updated up to 28th September, 2011). The database gets updated on regular basis and hence the total number of companies keeps changing. Similarly, the number of listed companies also keeps changing as and when the database is updated. Table 4.2 shows the sample and time frame selection procedure which is detailed as follows:

First Step: Of the 6305 companies (the numbers keeps being updated) representing the service industry existing as on 28th September, 2011, the number of listed companies, listed on Bombay Stock Exchange (BSE), as on the same date was found to be 1072. Prowess gives information about listing as on the current date. There is no provision whereby, one can find out how many companies have been listed as on any particular date. So, first a list of listed companies existing on 28th September, 2011 is obtained for each industry group.

Second Step: Of these, the availability of companies having audited financial information for a period of 11 years, 12 years, 13 years, 14 years, 15 years and 16 years are found.

TABLE 4.2									
Table Detailing Sample and Time Frame Selection									
Sr. No.	Name of Sector	1	2	Data Availability Check for Different Time Frames					
				1999-00 To 2009-10 (11 Yrs)	1998-99 To 2009-10 (12 Yrs)	1997-98 To 2009-10 (13 Yrs)	1996-97 To 2009-10 (14 Yrs)	1995-96 To 2009-10 (15 Yrs)	1994-95 to 2009-10 (16 Yrs)
1	Communication Services	201	22	17	14	10	8	7	4
2	Health Services	136	23	19	17	16	14	13	11
3	Hotel and Restaurants	388	67	57	52	48	43	40	31
4	Information Technology and enabled Services	975	287	174	133	102	72	58	41
5	Miscellaneous Services	1532	103	82	71	56	45	37	24
6	Recreational Services	326	88	30	22	16	11	7	6
7	Transport Services	414	47	55	47	40	33	29	23
8	Wholesale and Trading Services	2333	435	251	228	186	160	141	85
	Total	6305	1072	685	584	474	386	332	225
1 represents Total number of Listed & Non Listed Companies				2 represents Total number of BSE Listed Companies					
(Source: Compiled from CMIE Prowess Database)									

- Some companies have accounting period of more or less than 12 months. Comparison between such companies with different accounting period is not possible. Hence to serve the purpose of accounting comparison, the data for the companies which do not have a normal 12 months accounting period have been annualized to bring these companies on even platform with other companies.
- For detecting outliers – For the purpose of analysis purpose, average ratios for the entire period from 1995 to 2010 have been computed in this study. Firms reporting zero sales value for any of the year/s for the period 1995 – 2010 were excluded, as it would affect the Efficiency & Profitability Ratios as well as the OC variables.
- In addition, firms with Abnormal CR, Abnormal Profitability Ratios and or Abnormal OC variables and Efficiency Ratios were excluded from the sample. The inclusion of such companies with abnormal observations vitiated the entire industry results and thus their elimination from sample was considered appropriate.

❖ The Industry wise details of the companies eliminated from analysis along with the reasons for elimination is detailed in Table 4.3. Moreover, the Industry wise summary of eliminated companies along with reasons is presented in Table 4.4.

TABLE – 4.3		
Industry wise Details of Companies Eliminated with Reasons		
Sr. No.	**Industry-wise Name of Company**	**Reason**
Hotels and Restaurant Industry		
1	Hotel Rugby	Zero Sales: Mar 09 –10
2	Howard Hotels	Zero Sales: Mar 96
3	Khyati Multimedia Limited	Zero Sales: Mar 96
4	Lord Ishwar Hotels Ltd	Zero Sales: Mar 96; Mar 05 –08
5	Polo Hotels Limited	Zero Sales: Mar 03 –10
6	Vedant Hotel	Zero Sales: Mar 04 –07
ITeS Industry		
1	Ace Software Exports Ltd.	Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
2	B N R Udyog Ltd.	Zero Sales: Mar-95 –98
3	Clio Infotech Ltd	Zero Sales: Mar-95–98; Mar-06–10 & Abnormal CR
4	Computech International Ltd.	Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
5	Cranes Software Intnl. Ltd.	Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
6	I E C Education Ltd.	Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
7	Lee & Nee Softwares (Exports) Ltd.	Zero Sales: Mar-02
8	Magnum Ltd.	Zero Sales: Mar-07 – 10
9	Mangalya Softech Ltd.	Abnormal Current Ratio + Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
10	Mega Corporation Ltd	Zero Sales: Mar-95 – 99 + Abnormal Current Ratio
11	Nettlinx Ltd.	Zero Sales: Mar-95 – 97
12	Odyssey Technologies	Abnormal Observations for Profitability Ratios
13	Omega Interactive Technologies Ltd.	Zero Sales: Mar-95 – 98
14	P V P Ventures Ltd.	Zero Sales: Mar-06 & 07; Mar-09 & 10
15	Pagaria Energy Ltd.	Zero Sales: Mar-95, 97 & 99 + Abnormal Current Ratio
16	Ram Informatics Ltd.	Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
17	Shreejal Infohubs Ltd.	Abnormal Current Ratio + Abnormal Observations for Operating Cycle Variables & Efficiency Ratios
18	Silicon Valley Infotech Ltd	Zero Sales: Mar-95 & Mar-02 –10
19	Trigyn Technologies	Abnormal Observations for Profitability Ratios
20	Unisys Softwares & Holding Inds. Ltd.	Zero Sales: March 95–98 & March 03–05 Abnormal Current Ratio
21	Virtualsoft Systems Ltd.	Zero Sales: Mar-95 – 00

TABLE – 4.3 (Continued...)		
Industry wise Details of Companies Eliminated with Reasons		
Sr. No.	**Industry-wise Name of Company**	**Reason**
Transport Services Industry		
1	Central Provinces Railways Co. Ltd	Zero Sales: Mar-04 –10
2	Scindia Steam Navigation Co. Ltd.	Negative Net Worth Zero Sales: Mar-03 –10
3	Tolani Bulk Carriers Ltd.	Zero Sales: Mar-08 –10 + Abnormal Current Ratio
4	Arshiya International Ltd.	Abnormal Observation for Operating Cycle Variables
5	Global Offshore Services Ltd.	Abnormal Observation for Operating Cycle Variables
6	Coastal Roadways Ltd	Very erratic WCTR
7	Shipping Corporation of India Ltd	Very erratic WCTR
Miscellaneous Services Industry		
1	International Data Management Ltd.	Negative Net Worth Zero Sales: Mar 99 & Mar 2001 – 10
2	M C S Ltd.	Zero Sales: 95 & 96, Mar – 00, 03 to 10
3	A B G Infralogistics Ltd	Abnormally high ACP, OPM & NPM: 2002 – 10 Abnormally high APP: 97 – 98 & 2002 – 2010.
4	Alphageo India Ltd.	Abnormally high negative NPM, OPM & Operating Cycle variables for Mar-97
5	In House Productions Ltd	Abnormally High ACP & OC: Mar: 96 – 98, 02 – 04 Abnormally High negative NPM, OPM: 98 – 04
6	Reliance Indl. Infra.	Abnormally high OC variables: 96– 00; 04 – 10.
7	Lynx Machinery and Commercials	Involved in the business of Trading in Machinery and Investments in Shares
8	Shri Matre Power and Infrastructure Limited	Involved in Manufacturing Activities.
9	Simplex Realty Limited	Involved in Construction Business
10	Vallabh Poly Plast Limited	Invovled in Manufacturing Activities.
11	Paraan Ltd.	Involved in Manufacturing Activities.
12	Ganesh Benzoplast Limited	Involved in Manufacturing and Export Activities.
13	GAIL (India) Ltd.	Involved in processing – Manufacturing Activities.
14	Gagan Gas Ltd.	Involved in processing – Manufacturing Activities.
15	Gujarat Gas Ltd.	Involved in processing – Manufacturing Activities.
Health Services Industry		
1	Dolphin Medical Services Ltd	Abnormally high CR & ACP in last years.
2	K M C Speciality Hospitals (India) Ltd.	Negative Net Worth
3	Medinova Diagnostic Services Ltd.	Negative Net Worth
4	N G Industries Ltd.	High CR in 1st 3 years & very high ACP in 1996.
Communication Services Industry		
1	Ez – Communication Ltd	Abnormal Observation for Operating Cycle Variables
2	Quadrant Televentures Ltd	Zero Sales: Mar – 96 & Mar – 99

- ❖ While screening the companies, in the respective industries, it was found that all the companies belonging to Wholesale & Trading Services Industry, either were involved in providing financial services or were engaged in manufacturing and or process activities which was found out by reviewing the websites of all the 85 companies. Thus, the decision was taken to drop the entire industry, as the firms in the said industry were not involved in providing services.
- ❖ In the Recreational Services Industry, of the 6 companies, 1 had zero sales and for the remaining 5 companies, abnormal observations were observed for CR as well as Operating Cycle Variables for all the companies of the industry which affected the Recreational Services Industry average abnormally. In addition, inclusion of such industry with abnormal observations would have vitiated the entire industry results and so for proper analysis it was considered appropriate to drop this industry.

TABLE – 4.4

Industry wise Summary of Companies eliminated from analysis with reasons

Sr. No.	Name of Industry	Reason
1	Hotels & Restaurant Industry (Total 31 Companies)	6 Companies were eliminated on account of Zero Sales
2	ITes Industry (Total 20 Companies)	21 Companies were eliminated: 12 on account of Zero Sales of which 4 companies also had abnormal CR. 7 on account of Abnormal Operating Cycle Variables & Efficiency Ratios of which 3 companies also had abnormal CR. 2 companies on account of abnormal profitability.
3	Transport Services Industry (Total 23 Companies)	7 Companies were eliminated: 1 due to Negative Net Worth. 2 due to Zero Sales. 2 due to abnormal operating cycle variables. 2 due to erratic WCTR.
4	Miscellaneous Services Industry (Total 24 Companies)	15 Companies were eliminated, as, 9 companies were found to be involved in manufacturing and or construction activities and hence dropped. 1 had Negative Net Worth. 1 on account of Zero Sales. 4 either due to abnormal profitability or operating cycle variable or both.
5	Health Services Industry (Total 11 Companies)	4 companies were dropped: 2 due to Negative Net Worth. 2 due to abnormal CR & ACP.
6	Communication Services Industry (Total 4 Companies)	2 Companies were eliminated: 1 due to zero sales. 1 due to abnormal Operating Cycle Variables.

TABLE – 4.5		
Industry Wise Classification of Sample		
Sr. No.	**Name of Industry**	**No. of Companies**
1	Hotels & Restaurant Industry	25
2	IT&A Industry	20
3	Transport Services Industry	16
4	Miscellaneous Services Industry	09
5	Health Services Industry	07
6	Communication Services Industry	02
	TOTAL	**79**

Thus, after removing the outliers, the final sample was a set of 79 companies representing 6 service industries having audited financial information available throughout the study period of sixteen years starting from 1994-95 to 2009-2010. Table 4.5 presents the industry wise classification of the selected sample of 79 Service sector companies. These industries are also referred to as "service industry groups" as well as "constituent industries" of Non Financial Service Industry throughout the study.

4.4 Hypotheses of the Study

In this study, an attempt is made to analyze the time trends of the WCM, Leverage (LEV) and Profitability (PROF) variables to know the direction and change in the working capital policies as well as profitability and leverage position of the selected industries in the ***first stage of analysis***. In the ***second stage of analysis***, an attempt is made to examine the difference if any in the WCM, LEV and PROF between the sample service industries. Finally, ***in the third stage***, impact of sales on working capital as well the impact of selected independent variables on the Profitability of the selected sample is examined. The objectives of the present study have been stated in Chapter 1, Para 1.5. Considering these objectives, the hypotheses have been framed for each stage of analysis.

Hypotheses for the 1st Stage of Analysis

To study the time trends in WCM, LEV and PROF of Indian Non Financial Service Industry

H_{01} The working capital policy ratios, *i.e.,* CATAR, CLTAR, CLCAR and NWCCAR remain same in the Non Financial Service Industry over the study period.

H_{02} The leverage ratios, *i.e.,* LTDTAR and TDTAR remain same in the Non Financial Service Industry over the study period.

H_{03} There is no significant linear trend in the current asset structure ratios, *i.e.,* ITCAR, RTCAR, CBBTCAR, PETCAR, LATCAR and MSTCAR of the Non Financial Service Industry over the study period.

H_{04} There is no significant linear trend in the current liabilities structure ratios, *i.e.,* TCCLR, DACECLR, PCLR, STBBCLR, CFCCLR and OCLCLR of the Non Financial Service Industry over the study period.

H_{05} There is no change in the liquidity position of Non Financial Service Industry measured in terms of CR, QR and ALR over the study period.

H_{06} There is no significant linear trend in efficiency of current asset management measured in terms of TATR, CATR, WCTR, CBBTR, ITR, RTR and CTR for Non Financial Service Industry over the study period.

H_{07} The length of ACP, IHP and APP remains same in the Non Financial Service Industry over the study period.

H_{08} The length of Operating cycle and Net Trade Cycle does not change over the study period for the Non Financial Service Industry.

H_{09} The profitability position of Non Financial Service Industry measured in terms of OPM, NPM, ROTA, EAT/TA and RONW remains same over the study period.

H_{010} There is no significant linear trend in Working Capital Leverage of Non Financial Service Industry over the study period.

Similarly, the industry wise trends in WCM, LEV and PROF is also observed for the 6 constituent service industry groups of the Non Financial Service Industry, *i.e.,* Hotels and Restaurant Industry, IT-ITeS Industry, Transport Services Industry, Health Services Industry, Communication Services Industry and Miscellaneous Services Industry. Therefore, all the above mentioned hypotheses, *i.e.,* from H_{01} to H_{010} were also tested individually for all the 6 service industry groups to examine the industry wise trends in WCM, LEV and PROF. For *e.g.* In case of Hotels and Restaurant Industry, the null hypothesis, H_{01} will be written as,

H_{01} The working capital policy ratios, *i.e.,* CATAR, CLTAR, CLCAR and NWCCAR remain same in the Hotels and Restaurant Industry over the study period.

Similarly, all the hypotheses from H_{02} to H_{10} would be applicable to Hotels and Restaurant Industry wherein Non Financial Service Industry will be replaced with Hotels and Restaurant Industry. The same would apply for the remaining 5 industries as well for all the hypotheses, H_{01} to H_{10}.

Hypotheses for the 2nd Stage of Analysis

To examine if there exists differences between companies of Non Financial Service Industry with respect to management of working capital, LEV and PROF:

H_{011} There are no significant differences between the companies of Non Financial Service Industry with respect to the working capital policy pursued measured in terms of ratios, *i.e.,* CATAR, CLTAR, CLCAR and NWCCAR.

H_{012} No significant differences exist between companies of Non Financial Service Industry in the leverage ratios, *i.e.,* LTDTAR and TDTAR over the study period.

H_{013} No significant differences exist between the companies of Non Financial Service Industry with respect to the current asset structure ratios, *i.e.,* ITCAR, RTCAR, CBBTCAR, PETCAR, LATCAR and MSTCAR.

H_{014} No significant differences exist between the companies of Non Financial Service Industry with respect to the current liabilities structure ratios, *i.e.,* TCCLR, DACECLR, PCLR, STBBCLR, CFCCLR and OCLCLR

H_{015} There are no significant differences between the companies of Non Financial Service Industry with respect to the liquidity position measured in terms of CR, QR and ALR.

H_{016} There are no significant differences between the companies of Non Financial Service Industry in the current asset management efficiency measured in terms of TATR, CATR, WCTR, CBBTR, ITR, RTR and CTR.

H_{017} No significant differences exist between companies of Non Financial Service Industry in the length of ACP, IHP and APP.

H_{018} No significant differences exist between the companies of Non Financial Service Industry with respect to the length of Operating cycle and Net Trade Cycle.

H_{019} There are no significant differences between companies of Non Financial Service Industry in the profitability position measured in terms of OPM, NPM, ROTA, EAT/TA and RONW.

H_{020} No significant differences exist between the companies of Non Financial Service Industry with respect to the degree of Working Capital Leverage.

To examine if there exist differences between years in the selected WCM, LEV and PROF Ratios:

H_{021} There are no significant differences in the selected WCM, LEV and PROF ratios between the years for the companies of Non Financial Service Industry.

To examine if there exists significant differences in WCM, LEV and PROF ratios between industries:

H_{022} There are no significant differences in management of WCM, LEV and PROF parameters between the selected Indian Non Financial Service industries over the study period.

H_{023} There are no significant differences in selected parameters of WCM, LEV and PROF between the years of the selected industries of the Non Financial Service Industry.

Differences are also to be examined between companies of each of the individual 6 service industries. Moreover, the differences between years for the selected ratios of WCM, LEV and PROF are also to be examined for the 6 service industry groups. Hence, all the above mentioned hypotheses, from H_{011} to H_{023} are also tested individually for each of the 6 constituent service industry groups of the Non Financial Service Industry.

Hypotheses for the 3rd Stage of Analysis

To study the impact of Sales on Working capital

H_{024} There is no significant impact of Sales on the working capital of company.

To study the impact of Working Capital Leverage on Return on Total Assets

H_{025} There is no significant impact of Working Capital Leverage on a company's Profitability.

To study the impact of various measures of Size, LEV, Working Capital Policy, Liquidity and WCM Efficiency on the Profitability of the companies in Indian Non Financial Service Industry:

H_{026} There is no significant impact of Size of a company on its Profitability.

H_{027} There is no significant impact of Leverage of a Company on its Profitability.

H_{028} There is no significant impact of Working Capital Policy and risk of a company on its Profitability.

H_{029} There is no significant impact of Liquidity of a company on its Profitability.

H_{030} There is no significant impact of WCM Efficiency on a Company's Profitability.

The impact of: *i)* Sales on Working Capital; *ii)* Working Capital Leverage on Return on Total Assets as well as *iii)* WCM, LEV and Size on PROF is also to be examined for the selected industries of the Non Financial Service Industry. Hence, all the above mentioned hypotheses, from H_{024} to H_{030} are also tested for the selected individual service industry groups.

4.5 Explanation of Terms Used in Study

1. ***Working Capital investment*** is used synonymously for Current Asset Investment and similarly working capital financing is synonymously used for current asset financing.
2. ***Working Capital Management Efficiency*** is used synonymously for Current Asset Management Efficiency,
3. ***Risk free rate of Return*** is taken as the 91 day T bill rate as given on RBI Website updated on 24th September 2012.

In the following *para* all the WCM, LEV and PROF parameters used to conduct the study are explained in detail with their equations and interpretations.

4.6 Financial Tools used for the Analysis

Ratio analysis is one of the widely used financial tools for analyzing the financial aspects of a business entity. "Ratio analysis owes its origin to Euclid. He, for the first time, made a rigorous analysis of the properties of ratios in Book V of his 'Elements' published in about 300 BC. Since then ratios have been used extensively as analytical tools in the fields of science and technology. Its use in financial management is, however, of recent origin"[3]. With development of financial management theory research has also been carried out on various aspects of ratio analysis *viz,* Properties of ratios and analysis[4,5,6,7], Usefulness of Financial Ratios[8,9,10,11,12], Adjustment of ratios of industry/ firms over a period of time[13], Ratios to understand industry characteristics[14], Assessment of industry risk through ratios[15], Predictive powers of ratios[16,17,18,19,20,21,22,23,24,25,26,27] etc.

Hence, financial ratios are applied in the present study to analyze important aspects of WCM of the selected Non Financial Service Industries of India. The list of ratios selected for the purpose of analysis is arrived at on the basis of literature reviewed. Throughout the study, the terms, "ratio", "measure" and "parameter" are used interchangeably and in the same context. The meaning, formulae and interpretation of selected ratios are discussed in the following section.

4.6.1 Working Capital Policy Ratios

1. Current Asset to Total Asset Ratio (CATAR)

$$\text{CATAR} = \frac{Current\ Assets}{Total\ Assets}$$

This ratio indicates the extent of funds invested in the current assets of any firm and thus represents the level of investment in current assets. Higher the ratio, higher is the

investment in current assets leading to higher liquidity. However, higher liquidity results into lower profitability but at the same time low level of risk associated with the asset structure and indicating that company can pay off its short term obligations. Such high ratio signifies conservative working capital investment policy followed by a firm. Low ratio indicates lower investment in the current assets thereby reducing the liquidity of asset structure and increasing risk and at the same time profitability and indicating an aggressive policy pursued by the firm. Thus, it is essentially portraying the working capital investment policy pursued by a firm and is used as a measure of working capital investment policy by Afza & Nazir[28], Afza & Nazir[29], Afza & Nazir[30], Afza & Nazir[31], Singh & Chekol[32], Raheman *et al*[33], Haq *et al*[34], Al Shubiri[35], Al Shubiri[36], Hussain *et al*[37], Vahid, *et al*[38], Al-Mwalla[39].

2. Current Liabilities to Total Asset Ratio (CLTAR)

$$\text{CLTAR} = \frac{Current\ Liabilities}{Total\ Assets}$$

This ratio establishes the relationship between current liabilities and total assets. A high ratio indicates greater use of short term funds to finance the total assets thereby reflecting aggressive financing approach with lower cost and liquidity along with higher profitability and risk and vice-versa is the case when ratio is low. Thus, it is essentially portraying the working capital financing policy pursued by a firm and is used as a measure of working capital financing policy by Padachi[40], Chowdhury & Amin[41], Afza & Nazir[28], Afza & Nazir[29], Afza & Nazir[30], Afza & Nazir[31], Singh & Chekol[32], Raheman *et al*[33], Al Shubiri[35], Al Shubiri[36], Hussain *et al*[37], Vahid *et al*[38], Al-Mwalla[39].

3. Current Assets to Net Fixed Assets Ratio (CANFAR)

$$\text{CANFAR} = \frac{Current\ Assets}{Net\ Fixed\ Assets}$$

Assuming a constant level of fixed assets a higher CA/FA ratio indicates a conservative current assets policy and a lower CA/FA means an aggressive current assets policy assuming other factors to be constant.[42] Thus, this ratio is a measure of the level of liquidity of the firm. Risk, profitability trade-off is considered by varying the current assets, holding constant the fixed assets. The firm is said to follow a conservative policy when this ratio is highest at all levels of output. In such a case, the firm's liquidity is high while the risk and profitability are low. When the firm follows an aggressive policy, the ratio of current assets to fixed assets is lowest while risk and profitability are high, liquidity is low. Thus, it also indicates the current asset investment policy pursued by a firm.

4. Current Liabilities to Current Assets Ratio (CLCAR)

$$\text{CLCAR} = \frac{Current\ Liabilities}{Current\ Assets}$$

This ratio is reciprocal of CR and it indicates the extent of current assets financed by current liabilities and reflects the current asset financing policy of a firm. A high ratio represents less use of short term funds to finance current assets which indicates conservative current asset financing policy with lower risk. However a lower ratio indicates aggressive financing policy with higher use of short term funds to finance current assets and is a risky proposition. This ratio was employed by Verma[43].

5. Net Working Capital to Current Assets Ratio (NWCCAR)

$$\text{NWCCAR} = \frac{Net\ Working\ Capital}{Current\ Assets}$$

This ratio indicates the extent of CA financed by the long term funds of the company and reflects the current asset financing policy of a firm. The higher the ratio, the greater is the liquidity and conservative approach to finance CA. The lower the ratio lesser of long term funds are used to finance the CA and simultaneously less cushion is available to the short term creditors and aggressive is the approach. Thus, "how far the company is from liquidity crisis can be judged by making a comparison of this ratio.[44]"

6. Working Capital Leverage (WCL)

$$\text{WCL} = \frac{\text{CA}}{\text{TA} \pm \triangle \text{CA}}$$

The derivation of formulae has already been discussed in Chapter 3, Para 3.5.5.1. It measures the sensitivity of ROTA to change in current asset investment policy. Since, this equation is related to the working capital investment policy of the business and how it affects the ROTA, it is considered under the working capital policy classification. Further, as a measure of sensitivity it is an indicator of working capital risk arising out of current asset investment policy.

4.6.2 Leverage Ratios

1. Long Term Debt to Total Assets Ratio (LTDTAR)

$$\text{LTDTAR} = \frac{Long\ Term\ Debt}{Total\ Assets}$$

This ratio indicates the proportion of long term funds used to support the total assets of the firm. This is one of the debt measure. Also, by simultaneously referring to CLTAR and LTDTAR over a period of time, the policy of the firm with respect to use of long term and short term debt in financing the total assets can be gauged and the Pecking Order Hypothesis can be confirmed.

2. Total Debt to Total Assets Ratio (TDTAR)

$$\text{TDTAR} = \frac{Total\ Debt}{Total\ Assets}$$

Total debt here means the aggregate of short term debt and the long term debt. This ratio measures the proportion of total assets financed by the total debt funds and reflects the level of leverage of a firm.

4.6.3 Current Asset Structure Ratios

The current asset structure ratios indicate the investment in different constituents of current assets by a firm and thus, reveal the composition or structure of current assets (CA). As per, Chandra[45] and Banerjee[46] current assets include Inventories, Receivables (Bills Receivables & Debtors), Cash & Bank Balances, Marketable Securities, Prepaid Expenses and Loans and Advances. However, Berstein and Wild[47] have not considered Prepaid Expenses as a constituent of current asset whereas, Gibson[48] and Wild, Subramanyam and Halsey[49] have not considered Loans and Advances as a constituent of Current Asset. However, as per Weston and Brigham[50], Pandey[51], Gitman[52], Brigham and Ehrhardt[53], Brearley, Myers, Allen and Mohanty[54] and Van Horne[55] current assets include, Cash, Marketable Securities, Inventories and Receivables only. Moreover, Park and Gladson[56] observed, "The term current assets includes 'prepaid expenses such as insurance, interest, taxes, unused royalties, current paid advertising service not received, and operating supplies. Prepaid expenses are not current assets in the sense that, they will be converted into cash but in the sense that, if not paid in advances they would require the use of current assets during the operating cycle." Considering all these, for the purpose of carrying out the present study, the analysis of current structure is carried out as per the definition of Chandra[45] and Banerjee[46].

1. Inventory to Current Assets Ratio (ITCAR)

$$\text{ITCAR} = \frac{Inventory}{Current\ Assets}$$

This ratio is computed by dividing the total inventories (*i.e.,* raw material, work – in – process, finished goods & stores & spares) by the Total Current Assets. This ratio indicates the proportionate investment of inventories in current assets of a firm. Inventory is considered to be the most illiquid as compared to the other components of current assets. In the said context, this ratio gives an idea about the liquidity of the current assets. It also indicates the policy followed by a firm with respect to the investment in inventory.

2. Receivables to Current Assets Ratio (RTCAR)

$$\text{RTCAR} = \frac{Receivables}{Current\ Assets}$$

This ratio is computed by dividing the total receivables (*i.e.*, Debtors and Bills Receivables) by the Total Current Assets. This ratio indicates the proportionate investment of receivables in current assets of a firm. It also indicates the credit policy followed by a firm.

3. Loans and Advances to Current Assets Ratio (LATCAR)

$$\text{LATCAR} = \frac{Loans\ and\ Advances}{Current\ Assets}$$

This ratio indicates that portion of current assets which is held as loans and advances given and also signifies about the receivables management of the companies.

4. Prepaid Expenses to Current Assets Ratio (PETCAR)

$$\text{PETCAR} = \frac{Prepaid\ Expenses}{Current\ Assets}$$

This ratio indicates the share of prepaid expenses in the total current assets of a firm.

5. Marketable Securities to Current Assets Ratio (MSTCAR)

$$\text{MSTCAR} = \frac{Marketable\ Securities}{Current\ Assets}$$

This ratio is computed by dividing Marketable Securities by the Total Current Assets. This ratio indicates the portion of current assets invested in marketable securities and helps in analysis of cash management.

6. Cash and Bank Balance to Current Assets Ratio (CBBTCAR)

$$\text{CBBTCAR} = \frac{Cash\ and\ Bank\ Balances}{Current\ Assets}$$

This ratio is computed by dividing the total amount of cash and Bank balances held by the Total Current Assets. This ratio indicates the portion of current assets held as cash balances. The larger the ratio, the more liquid the current asset structure is.

4.6.4 Current Liabilities Structure Ratios

The current liabilities (CL) structure ratios indicate the composition of current liabilities as well as the different sources of short term funds utilized to finance the current assets of business. Berstein and Wild[47] and Wild, Subramanyam and Halsey[49] have given the most comprehensive constituents of Current liabilities which includes Accounts payables, Bills payables, Unearned Income, Accrued Expenses, Short Term Bank Borrowings (STBB), Interest Payable, Taxes Payable & Current Portion of Long term Debt (CPLTD). However, they do not include provisions for dividend and other current Liabilities. Weston and Brigham[50], Brigham and Ehrhardt[53], Brearley *et al*[54] and

Gibson[48] have not included STBB in the constituent of Current Liabilities, whereas Banerjee[46] have not considered CPLTD. Chandra[45] has defined current liabilities to include all the short term loans and advances and maturing obligations due for payment in twelve months as well as current liabilities and provision. Though, he has not given item wise description of components of CL but has conceptually made the meaning very clear. Thus, for the present study, all the constituents as given by Berstein and Wild[47] and Wild, Subramanyam and Halsey[49] along with the conceptual definition given by Chandra[45] have been considered. Hence, Provisions for Dividend and Other Current Liabilities is also taken as a part of Current Liabilities.

While carrying out computations, it was observed that accrued interest was appeared in the balance sheets of selected sample, however, it was observed for very few companies which was again for few years only. Similar observation was made for CPLTD. Considering both of them as financing charge which is a current obligation, both of them were added together and termed as Current Financing Charge. Similarly, the amount of Acceptances (*i.e.*, Bills Payables) were found only for few companies and that too for few years and so Creditors (*i.e.*, Accounts Payables) and Acceptances were added to give the amount of total Trade Credit and thus, Trade Credit as a proportion of Current Liabilities was computed. Also, it was found that, Provision for Tax and for dividend is aggregated and shown as Provisions in Prowess database. Hence, the Provisions include both for tax and dividends. Accrued expenses and Unearned Income as a part of current liabilities were not found in the balance sheets of selected sample. However, a new component *viz*, Deposits & Advances from Customers and Employees (DACE) was found and its proportion was considered in the Current Liabilities Structure Ratios.

1. Trade Credit to Current Liabilities Ratio (TCCLR)

$$\text{TCCLR} = \frac{Trade\ Credit}{Current\ Liabilities}$$

This ratio is computed by dividing the Trade Credit, *i.e.*, aggregate of Creditors and Acceptances by the total Current Liabilities. This ratio indicates the proportion of Trade Credit to total current liabilities utilized as a source for financing of the current assets. This ratio was employed by Hossain and Akon[56] as well as Padachi[57].

2. Deposits and Advances from Customers and Employees to Current Liabilities Ratio (DACECLR)

$$\text{DACECLR} = \frac{DACE}{Current\ Liabilities}$$

This ratio indicates the proportion of DACE in the total current liabilities structure.

3. Provisions to Current Liabilities Ratio (PCLR)

$$PCLR = \frac{Provisions}{Current\ Liabilities}$$

This ratio indicates the proportion of Provisions in the total current liabilities structure utilized to create liquidity to finance the current assets.

4. Short Term Bank Borrowings to Current Liabilities Ratio (STBBCLR)

$$STBBCLR = \frac{Short\ Term\ Bank\ Borrowings}{Current\ Liabilities}$$

This ratio is computed by dividing the STBB by the total Current Liabilities. This ratio indicates the proportion of STBB utilized in the total CL structure to finance the current assets. This ratio was employed by Hossain and Akon[56] as well as Padachi[57].

5. Current Financing Charge to Current Liabilities Ratio (CFCCLR)

$$CFCCLR = \frac{Current\ Financing\ Charge}{Current\ Liabilities}$$

This ratio indicates the proportion of CFC in the total CL structure.

6. Other Current Liabilities to Current Liabilities Ratio (OCLCLR)

$$OCLCLR = \frac{Other\ Current\ Liabilities}{Current\ Liabilities}$$

This ratio indicates the proportion of OCL in the total CL structure.

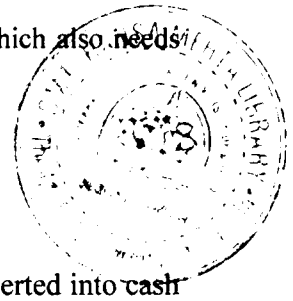
4.6.5 Liquidity Ratios

1. Current Ratio (CR)

$$CR = \frac{Current\ Assets}{Current\ Liabilities}$$

Sometime during the last few years of the 1890s there arose the practice of comparing current assets of an enterprise with its current liabilities[58]. This ratio popularly came to be known as current ratio. Truly, the use of ratios of financial analysis can be said to have begun with the advent of current ratios[4]. This ratio is computed by dividing current assets with current liabilities and it measures the ability of a firm to meet its current obligations and is a measure of a firm's short term solvency. It indicates the availability of current assets per rupee of current liabilities. As a conventional rule, a ratio of 2:1 is considered to be indicative of good liquidity position. However, this is bound to differ depending on the industry. Lower CR will indicate lower liquidity, meaning thereby the lesser use of long term capital to finance the current operations of the business, which would add to the profitability as well as the risk of the firm and will reduce the liquidity. Similarly, a higher CR will indicate liberal use of long term funds to finance current assets which would increase liquidity but reduce profitability as well as risk. Thus, CR also measures the working capital risk. However, it is only a crude measure of a firm's

liquidity as it ignores the liquidity of the composition of current assets, which also needs due consideration before opining on a firm's liquidity position.



2. Quick Ratio (QR)

$$QR = \frac{Current\ Assets - Inventories}{Current\ Liabilities}$$

This ratio is based on the premise that, an asset is liquid if it can be converted into cash immediately or reasonably soon without loss in the value of asset and therefore inventories are eliminated from current assets while computing this ratio. It is a more rigorous and piercing test of liquidity and is considered to be a better guide to liquidity position of a firm as compared to current ratio. Generally a ratio of 1:1 is considered to be satisfactory and representing sound liquidity position. However, the standard norm is even bound to differ depending on the industry.

3. Absolute Liquidity Ratio (ALR)

$$ALR = \frac{Cash\ Assets}{Current\ Liabilities}$$

In this ratio, cash assets include cash and bank balances and marketable securities. This ratio, also known as super quick ratio and cash position ratio is a more rigorous test of liquidity position of a business concern. This ratio measures the cash available to pay current obligations. Also, termed as cash ratio, it measures liquidity in absolute terms and is a severe test of liquidity. Generally a ratio of 0.5:1 is considered to indicate a sound liquidity position. However, this is also bound to differ depending on the industry. It is determined by dividing cash including bank balances and marketable securities by the amount of current liabilities. A high ratio may be considered well by the short term creditors of any company, however, from the management point of view, it indicates slack cash management and improper utilization of cash.

4.6.6 Current Asset Management Efficiency (CAME) Ratios

1. Total Asset Turnover Ratio (TATR)

$$TATR = \frac{Sales}{Total\ Assets}$$

This ratio measures the overall efficiency in utilization of a firm's assets and is analogous to the output – capital ratio in economic analysis. It shows the ability of a firm in generating sales utilizing all the financial sources in the form of total assets and indicates sales generated per rupee of investment in total assets.

2. Current Asset Turnover Ratio (CATR)

$$CATR = \frac{Sales}{Current\ Assets}$$

This ratio indicates how effectively current assets are being utilized by a firm. This ratio is applied to measure the profitability and efficiency of total current assets employed in operating activities.

3. Working Capital Turnover Ratio (WCTR)

$$\text{WCTR} = \frac{Sales}{Net\ Working\ Capital}$$

This ratio is calculated by dividing Sales by Average Net Working Capital (NWC). This ratio indicates number of times NWC of a firm is turned over within specified period and helps to assess the degree of efficiency in the use of long term funds for operating sales. A high WCTR is desirable but it may also imply an overtrading situation which may be a sign of financial weakness. Similarly a low WCTR indicates inefficient utilization of funds and may also indicate excess liquidity.

4. Inventory Turnover Ratio (ITR)

$$\text{ITR} = \frac{Sales}{Inventories}$$

This ratio indicates the rapidity with which the inventory is converted into sales (cash and credit) and measures the liquidity of a firm's inventory. It signifies the efficiency or otherwise of the investment in inventories as well as the inventory control policy adopted by the firm. A high ITR indicates efficient inventory management. However, it may also indicate under investment in inventories which may adversely affect the ability of a firm to meet demands of its customers as well as create a problem of stock-out with high stock-out costs. A low ITR signifies excessive investment in slow moving inventories resulting into high inventory costs and lowering the profitability reflecting poor inventory management.

5. Receivables Turnover Ratio (RTR)

$$\text{RTR} = \frac{Sales}{Receivables}$$

This ratio is determined by dividing Sales by Average Receivables. This ratio indicates, number of times the debtors' of a firm are turned over and collected in cash and is a measure of the efficiency of receivables management of a firm. This ratio reflects the efficiency of credit and collection policy pursued by a firm. It measures the speed of collections from receivables and thereby measuring liquidity of receivables of a firm in terms of their rapidity or slowness in collectability and its quality. Low ratio indicates liberal credit policy and relaxed collection efforts on the part of the firm. A higher ratio indicates strict credit policy and good collection efforts.

6. Cash and Bank Turnover Ratio (CBTR)

$$CBTR = \frac{Sales}{Cash\ Assets}$$

Also known as Cash Velocity ratio, this ratio is determined by dividing Sales by Average Cash Assets. Cash assets include cash and bank balances and marketable securities. Ghosh[59] in his study has employed this formula for computing CBTR. This ratio explains the speed with which cash is turned over. It indicates the efficiency with which cash assets are utilized in the business. The higher the ratio, the less the cash balance required for any given level of sales and taking other things constant, it indicates greater efficiency and vice versa.

7. Creditors Turnover Ratio (CTR)

$$CTR = \frac{Sales}{Creditors}$$

This ratio is determined by dividing Sales by Average Payables. This ratio indicates the speed with which creditors of the company are paid off. The higher is the ratio, the more number of times payables are settled during the years implying less credit period as well as disciplined payment approach followed by a firm. Lower the ratio, lesser number of times payables are settled indicating more credit enjoyed by a business. This ratio is also an indicator of the credit policy pursued by a firm.

8. Average Collection Period (ACP)

$$ACP = \frac{365}{RTR}$$

ACP is expressed in number of days. This is one of the Operating Cycle Measure. It represents the number of day's worth of credit sales that is locked in receivables and is yet another indicator of efficiency of credit management. If compared with the credit terms of the firm, one can gauge about the efficiency or otherwise of its receivables management. Over the period, if the ACP increases, it indicates a slack control of receivables and deteriorating quality of receivables and very liberal, ineffective and inefficient credit and collection policy whereas if it reduces, it indicates improved receivables management and prompt payment by customers. Thus, this ratio indicates the time required for receivables to get converted into cash and is an indicator of the receivables policy pursued by a firm.

9. Inventory Holding Period (IHP)

$$IHP = \frac{365}{ITR}$$

IHP is expressed in number of days. This is also one of the measures for computing the operating cycle. It represents number of days worth investment tied up in

inventories and thus time taken for inventories to get converted into cash and is an indicator of the inventory investment & control policy pursued by a firm.

10. Average Payment Period (APP)

$$APP = \frac{365}{CTR}$$

APP is also expressed in number of days. This is computed by dividing 365 by the Creditors Turnover Ratio. Also known as credit payment period or disbursement period, it reveals the time lag between the date of credit purchase and the date on which payment is made and reflects the payment policy of the company in terms of its promptness in settling its accounts. A high value would represent greater time taken by the firm in paying its obligations which may provide cushion to the liquidity but have an adverse impact on the reputation of the firm and its borrowing power in the short run in future. A low value would indicate prompt payments which have an impact of reducing liquidity but at the same time enhancing the repute of firm.

11. Operating Cycle (OC)

$$OC = ACP + IHP$$

Operating cycle is also expressed in number of days. It measures the length of time that elapses between acquisition of raw materials and final cash realization. If over a period of time the OC increases, it indicates mismanagement of Inventory and Receivables whereas if it decreases, it signifies improvement in the inventory and Receivables management and thereby overall improvement in WCM efficiency.

12. Net Trade Cycle (NTC)

$$NTC = OC - APP$$

Net trade cycle is also expressed in number of days. NTC represents the time within which the working capital investments in the form of inventories and receivables gets realized in cash. Thus it reflects the company's ability to finance its core operations with vendor credit. NTC captures liquidity risk. If creditors exceed the sum of receivables and inventory, NTC is negative. The negative NTC implies that company may be following the strategy of turning over inventory as quickly as possible, collecting its receivables as quickly as possible, and paying payables as late as possible without involving intangible costs of stretching payables. If it is negative, the probability a firm defaulting in its current obligations is high. NTC is an outcome of working capital financing decision of a firm - whether the inventory and receivables are financed through suppliers' credit or through some other source. Over a period if NTC increases, it is an indicator of poor WCM whereas if it decreases, it indicates efficient WCM.

4.6.7 Profitability Ratios

1. Operating Profit Margin (OPM)

$$\text{OPM} = \frac{\textit{Earnings Before Interest and Tax}}{\textit{Net Sales}} \times 100$$

This ratio measures the efficiency with which the firm sells its goods and services. It is a useful measure of efficiency of operations based on sales when comparison is to be made between companies or industries having different degrees of leverage and falling under different tax brackets.

2. Net Profit Margin (NPM)

$$\text{NPM} = \frac{\textit{Earnings after Tax}}{\textit{Net Sales}} \times 100$$

Expressed in percentage terms, this ratio establishes the relationship between net profit after tax with sales and signifies management's efficiency in manufacturing, administering and selling the products. This ratio shows the net contributions made by every ₹ 1 of sales to owner's funds. It is an indication of management's ability to operate business with sufficient success not only to recover from the revenues of the period, but also the cost of merchandise or services, the expense of operating the business (including depreciation) and the cost of borrowed funds but also to leave a margin of reasonable compensation to owners for providing their capital. It is the overall measure of a firm's ability to turn each rupee sales into net profit and indicates a firm's capacity to withstand adverse economic conditions.

3. Return on Total Assets (ROTA)

$$\text{ROTM} = \frac{\textit{Earnings Before Interest and Tax}}{\textit{Total Assets}} \times 100$$

This ratio indicates the basic earning power of the firm's total assets before interest and tax and financial leverage (interest). It is a useful measure of business performance and profitability when analysis is done to compare firms and industries with different tax rates and different degrees of financial leverage.

4. Earnings after Tax to Total Assets

$$\text{EAT/TA} = \frac{\textit{Earnings after Tax}}{\textit{Total Assets}} \times 100$$

This ratio measures the overall efficiency of the management in generating profits on the investments in total asset. This measure relates the profit to the size of the firm (which is measured in terms of total assets). This ratio measures the efficiency of utilization of total assets in generating revenues.

5. Return on Net Worth

$$\text{RONW} = \frac{Earnings\ after\ Tax}{Net\ Worth} \times 100$$

This ratio examines the profitability from the perspective of the equity investors by relating the profits available to equity shareholders with the book value of the equity investment. Preference dividends, if any, are deducted from the net profit to determine equity earnings. Net Worth includes paid up equity share capital including reserves and surplus net of losses and miscellaneous expenditures, if any. Thus, the total equity is synonymous to 'net worth' and 'shareholders' funds'. This ratio measures the returns that a company earns on its net worth. Generally, the investors expect returns more than the risk free rate of return as risk is associated with equity capital and is an important yardstick of performance for equity shareholders since it indicates the return on funds employed by them.

The list of Ratios *along with their appropriate categorization and abbreviation* is presented in Table 4.6. The formulae used for calculating the ratio and the rationale for their categorization is already discussed in Para 4.6.1 to 4.6.7.

TABLE 4.6

Category wise List of Ratios Used for Analysis

Sr. No.	Name of Ratio	Abbreviation
Working Capital Policy Ratios		
1	Current Assets to Total Asset Ratio	CATAR
2	Current Liabilities to Total Asset Ratio	CLTAR
3	Current Liabilities to Current Asset Ratio	CLCAR
4	Net Working Capital to Current Asset Ratio	NWCCAR
5	Current Assets to Net Fixed Assets Ratio	CANFAR
6	Working Capital Leverage	WCL
Leverage Ratios		
7	Long Term Debt to Total Assets Ratio	LTDTAR
8	Total Debt to Total Assets Ratio	TDTAR
Current Asset Structure Ratios		
9	Inventory to Current Asset Ratio	ITCAR
10	Receivables to Current Asset Ratio	RTCAR
11	Cash and Bank Balances to Current Asset Ratio	CBBTCAR
12	Prepaid Expenses to Current Asset Ratio	PETCAR
13	Loans and Advances to Current Asset Ratio	LATCAR
14	Marketable Securities to Current Asset Ratio	MSTCAR
Current Liabilities Structure Ratios		
15	Trade Credit to Current Liabilities Ratio	TCCLR
16	Deposits & Advances from Customers and Employees to Current Liabilities Ratio	DACECLR

TABLE – 4.6 (Continued...)		
Category wise List of Ratios Used for Analysis		
Sr. No.	Name of Ratio	Abbreviation
Current Liabilities Structure Ratios		
17	Provisions to Current Liabilities Ratio	PCLR
18	Short Term Bank Borrowings to Current Liabilities Ratio	STBBCLR
19	Current Financing Charge to Current Liabilities Ratio	CFCCLR
20	Other Current Liabilities to Current Liabilities Ratio	OCLCLR
Liquidity Ratios		
21	Current Ratio	CR
22	Quick Ratio	QR
23	Absolute Liquidity Ratio (Cash Ratio)	ALR
Current Asset Management Efficiency Ratios & Operating Cycle Variables		
24	Total Asset Turnover Ratio	TATR
25	Current Asset Turnover Ratio	CATR
26	Working Capital Turnover Ratio	WCTR
27	Inventory Turnover Ratio	ITR
28	Inventory Holding Period	IHP
29	Receivables Turnover Ratio	RTR
30	Average Collection Period	ACP
31	Cash and Bank Turnover Ratio	CBTR
32	Creditors Turnover Ratio	CTR
33	Operating Cycle	OC
34	Average Payment Period	APP
35	Net Trade Cycle	NTC
Profitability Ratios		
36	Operating Profit Margin	OPM
37	Net Profit Margin	NPM
38	Earnings before Interest and Tax to Total Assets	ROTA
39	Earnings after Tax to Total Assets	EAT/TA
40	Return on Net Worth (Return on Equity)	RONW

Having discussed the financial tools, the following *para* details the methodology adopted in terms of application of descriptive and inferential statistical tools for the first stage of empirical analysis.

4.7 Methodology Adopted for the First Stage of Empirical Analysis

The first stage of empirical analysis involves analyzing the Trends as well as examining the Time Trends in the selected ratios for Non Financial Service Industry as well as its constituent industry groups. Hence, the methodology adopted for analyzing trend is detailed first followed by that of Time Trends in WCM, LEV and PROF.

4.7.1 Analysis of Trend in WCM, LEV and PROF of Non Financial Service Industry

Besides looking at the ratios for one year, one would like to look at the ratios for several years. This will help in detecting secular changes and avoiding bias introduced by transitory forces[60]. Thus, to analyze the trends and direction of changes in the working capital management of 79 service sector companies of India, various WCM, LEV and PROF ratios (as mentioned in Table 4.6) were computed for all the companies. Moreover, the year wise mean ratios for all the companies in the selected industry for each industry for the entire study period (1995 to 2010) had been calculated.

The most popular and widely used measure of representing the entire data by one value is what is connoted as Arithmetic Mean[61]. It is also termed as central value and is a representative of a data set.

Levine *et al*[62] observed, "The standard deviation helps one to know how a set of data clusters or distributes around its mean." Gupta[63] noted, "The standard deviation measures the absolute dispersion, the greater the standard deviation, the greater will be the magnitude of the deviations of the values from their mean". Coefficient of variation (CV) is a relative measure of variance and is expressed in percentage. It measures the scatter in the data in relation to mean and is calculated as:

$\mathbf{CV = \frac{\sigma}{\bar{x}} \times 100}$, where σ is standard deviation and $\bar{x}$ is arithmetic mean of a sample.

Along with tabular presentation of various WCM, LEV & PROF ratios, diagrams and graphs have been used for obtaining visual impression of trends in the selected ratios of sample over the study period. Doughnut Graph is used to depict the current asset financing mix; Pie Charts are used to show the mean share of various components of current assets to total current assets as well as the mean share of components of current liabilities to total liabilities whereas Line Charts are used to portray trends in mean Working Capital Leverage.

4.7.2 Analysis of Time Trends in WCM, LEV and PROF of Non Financial Service Industry

To examine the time trends in WCM, LEV and PROF of Non Financial Service Industry as well as its constituent industry groups, Method of Least Squares was applied. The Method of Least Squares may be used for fitting a Linear Trend Model or a Quadratic Trend Model.

◈ Linear Trend Model

In order to examine whether the selected ratios of selected companies exhibit a significant linear trend, the linear trend model is used. In the regression analysis,

regression of selected ratios of WCM, LEV & PROF as dependent variables and time in years as independent variables is conducted. The time period is 16 years (1994-95 to 2009-10). Time dummies are used to denote this independent variable. The straight line trend, if any in the selected ratios is represented by the equation:-

$Y = \alpha + \beta_1 X + u_t$ 1

Where,

Y = the value of Dependent variable (Y), which is being predicted.

α = constant term of the model – intercept

β_1 = Beta, the co-efficient of X, the slope of the regression line.

X = the value of independent variable, which predicts or estimates the value of Y.

u_t = the unexplained variation also termed as the error term which indicates the error in predicting the value of Y, given the value of X.

In time series analysis, Y represents the trend value of the ratios of WCM, "X" variable represents time in number of years, β_1 represents the slope of the trend line, α is the computed trend figure of Y variable, when X = 0

For the purpose of analyzing the behaviour of the ratios and to examine the time trends, total selected ratios are divided into 8 groups

◈ **Quadratic Trend Model**

The results of 'Linear Trend Model' along with 'D statistics' for each selected parameter is observed. There may be a possibility that a ratio does not follow a linear trend but a quadratic trend and therefore the 'Quadratic Trend Model' is also fitted to examine if the ratio follows the quadratic trend for all the selected ratios.

$Y = \alpha + \beta_1 X + \beta_2 X^2 + u_t$ 2

Where,

Y = the value of Dependent variable (Y), which is being predicted.

α = constant term of the model – intercept

β_1 = the estimated linear effect on Y (the slope of the curve at origin)

β_2 = the estimated quadratic effect on Y (the rate of change in slope)

X = the value of independent variable, which predicts or estimates the value of Y.

u_t = the unexplained variation also termed as the error term which indicates the error in predicting the value of Y, given the value of X.

Both 'Linear Trend Model' and the 'Quadratic Trend Model' are applied to find whether there is a linear trend or curvilinear trend in the WCM, LEV and PROF Ratios, over the period of study. The results of both 'Linear Trend Model' and the 'Quadratic Trend Model' are interpreted jointly. The trends in WCM, LEV & PROF ratios of

overall sample of 79 Service sector companies are examined first followed by Industry wise trends for the 6 service sector industries.

Now the following para discusses the methodology for the second stage of empirical analysis.

4.8 Methodology Adopted for the Second Stage of Analysis

The second stage of empirical analysis involves examining differences, if any, amongst the companies of the Non Financial Service Industry with respect to the management of WCM which is also examined individually for its constituent industry groups and hence this para briefs on the statistical tool applied for conducting this analysis.

Analysis of Variance (ANOVA)

Professor Ronald A. Fischer developed the technique of Analysis of Variance in 1920's and is commonly abbreviated as ANOVA.

The simplest form of the *F-test* or *Analysis of Variance* is an extension of the *t test* to the comparison of more than two groups. The technique is useful in application of diversified practical problems. The technique consists of classifying and cross classifying the statistical results and testing whether the means of a specified classification differ significantly. It helps in determining whether the classification is important in deciding results.

The basic principle of ANOVA is to test for difference among the means of populations by examining the amount of variation within which each of these samples relative to the amount of variation between the samples. ANOVA assumes Normality, Homogeneity and Independence of Error.

"However, none of these assumptions are fully satisfied by real data. The underlying populations from which samples are drawn are never exactly normally distributed with precisely equal variances. If the violation of these assumptions were likely to result in a large F, then the F test would be a poor test of null hypothesis. A statistical test is considered to be *robust* if it is not greatly affected by such extraneous assumptions. F test is found to be robust with respect to non normality if N is large and is likely to be robust if N is only moderately large. When sample sizes are equal, the F test is robust with respect to the non normality and unequal variances. Although very little has been done to assess the effect of non normality with unequal sample sizes, the results appear to indicate that the effect of non zero skewness is negligible and the effect of non zero kurtosis, although slightly greater than with equal sample sizes, is still too small to be of concern in most applications.[64]" Analysis of Variances (ANOVA) thus, helps to

examine differences, if any, which may exist among the companies and among the industries over the period of time as well as differences between the years which further helps to interpret the changes if any in the policies adopted by a particular industry or company. To examine whether variations exist between companies regarding various ratios indicating WCM, LEV & PROF, the Single Factor Analysis of Variance referred abbreviated as Single Factor ANOVA and also termed as One Way ANOVA or simply, ANOVA is applied which is detailed in the following para.

◈ ***Single Factor ANOVA***

If there were only two samples, t-test can be easily used but with more than two samples, the family wise experiment error increases. And so, in order to have robust results without reducing the power of test, ANOVA is considered to be a better alternative. Single factor ANOVA is conducted when variances are to be analyzed based on 1 factor. The following steps are involved in one way or single factor ANOVA:

Step-1: Calculate variance between the samples

1. Obtain the mean of each sample, $\bar{X}_1$, $\bar{X}_2$, $\bar{X}_3$, $\bar{X}_4$, $\bar{X}_5$ etc.
2. Calculate the grand average of and workout the mean of sample by

$$\bar{\bar{X}} = \frac{\bar{X}1 + \bar{X}2 + \bar{X}3 + \ldots.}{N1 + N2 + N3 + \ldots.}$$

3. Take the deviation of sample means from the mean of samples and grand average.
4. Square these deviations and obtain the total which will give sum of squares between the samples.
5. Divide the total obtained in *Step 4* by the degrees of freedom. The degrees of freedom will be one less than the number of samples, *i.e.*, if there are 10 samples, then the degrees of freedom will be 10-1 = 9 or v = k-1, where, k is the number of samples.

Step 2: Calculate the variance within the samples

1. Obtain the mean of each sample by $\bar{X}_1$, $\bar{X}_2$, $\bar{X}_3$, $\bar{X}_4$, $\bar{X}_5$ etc.
2. Take the deviations of the various items in a sample from the mean values of respective samples.
3. Obtain these deviations for all samples and then the aggregate which gives the Sum of Squares within the samples.
4. Divide the result obtained in *Step 4* by the degrees of freedom between the samples to obtain the variance or mean squares (MS) between the samples.

Step 3: F ratio is worked out as under

$$F = \frac{\text{Between Column Variance}}{\text{Within Coloumn Variance}}$$

Symbolically, $F = \frac{S_1^2}{S_2^2}$

The F distribution measures the ratio of the variance between the groups to the variance within the groups. It is used to judge whether the difference among several sample means is significant or is just a matter of sampling fluctuations. If the value of F is less than table value (also known as the critical value) of F, the difference is taken as insignificant, *i.e.*, due to chance and the null hypothesis of no difference between sample means is considered to be true and valid. However, where the value of F is more than table value of F, the difference is considered as significant, which means that samples could not have come from the same universe and accordingly the null hypothesis of no difference between sample means stands invalid and appropriate conclusions may be drawn. The higher the calculated value of F than the table value, the more definite and sure one can be about the conclusions.

In addition to examining the variations, if any, between companies within given industry, an attempt is also made to examine the variance over a period of time, *i.e.* between years. Also, it was considered to be important to examine the variance between industries. Hence, this is also examined for all ratios measures of WCM, LEV and PROF between industries.

The next para discusses the technique for the third stage *i.e.*, final stage of empirical analysis.

4.9 Methodology Adopted for Third Stage of Analysis

This para details *Specification of Model for Industry Level Study to examine the Impact of Liquidity on Profitability* which is the third stage of empirical analysis. This analysis is further segregated into two parts, *i.e., i)* Application of Simple Linear Regression and *ii)* Stepwise Regression which is detailed in the following paras.

4.9.1 First Phase Analysis: Simple Linear Regressions

Firstly the impact of sales on working capital is examined applying simple linear regression. Similarly, *secondly,* simple linear regression is also applied to examine the impact of WCL on ROTA. Further, in order to examine the impact of various measures of Liquidity, LEV, Size, CAME, and working capital policy on the profitability of a company, in the first stage of analysis, simple linear regression between each indicator of an independent variable, one at a time, with each measure of Liquidity, LEV, Size,

CAME and working capital policy (dependent variable) is conducted. The simple linear regression of each indicator of independent variable with each measures of dependent variable will give an indication with respect to whether the selected independent variable has significant impact on Profitability and are able to predict the values of dependent variables or otherwise.

The simple linear regression equation used to estimate the impact of each of the indicators of explanatory variables on the dependent variable is

$Y = \alpha + \beta_1 X + u_t$

Where,

Y = the value of Dependent variable (Y), which is being predicted.

α = constant term of the model – intercept

β_1 = Beta, the co-efficient of X, the slope of the regression line.

X = the value of independent variable, which predicts or estimates the value of Y.

u_t = the unexplained variation also termed as the error term which indicates the error in predicting the value of Y, given the value of X.

◈ **The t-test**

This test has been applied to determine the existence of significant linear impact of independent variables on the dependent variable. The test of hypotheses 't' test concerning β_1 (slope of the regression line) is equal to zero is conducted. If null hypotheses, **(Refer Para 4.4)** is rejected one can conclude that there is an evidence of linear impact. The best and only significant predictors, which have significant impact on the ratio where significance of 't' statistics at 5% and 1% level of significance is tested and selected for the next stage of analysis. This is done to understand the impact of individual indicators on profitability measures.

4.9.2 Second Phase Analysis: Stepwise Regression Analysis

In the second stage of analysis, the simultaneous impact of all the indicators of Liquidity, Leverage, Working Capital Policy, WCM Efficiency and Size on the *five* individual measures of Profitability, *i.e.,* OPM, NPM, ROTA, EAT/TA and RONW is examined using stepwise regression technique which is an extension to simple regression technique, where, instead of a single explanatory variable, several explanatory variables can be used to predict the value of a dependent variable.

In the standard regression model, all the independent variables enter the regression equation at once as we want to examine the impact of whole set of the independent variables together on the dependent variable.

As observed by Levine *et al*[65], "An important feature of stepwise regression process is that an explanatory variable that has entered into the model at an early stage may subsequently be removed after other explanatory variables are considered. In stepwise regression, variables are added or deleted from the regression model at each step of model building process. The stepwise procedure terminates with the selection of a best fitting model, when, no additional variables can be added to or deleted from the last model fitted",

This technique is considered to be better than Multiple Regression Model for two reasons: i) It retains only those independent variables in the model which are significantly related to the dependent variable and ii) It eliminates those independent variables which are highly correlated based on the VIF statistics and gives the best fit model. Hence, there is no need of separately examining the multicollinearity through Pearson's Correlation Matrix as the regression model takes this factor into consideration in the process of model building.

SPSS (Statistical Package for Social Sciences), a statistical software has been used to conduct the analysis. In this study, along with the standard model where all the specified independent variables enter the regression equation at once, stepwise multiple regression method has also been used. In the standard model, since we want to observe the relationship between the entire set of independent variables and dependent variables, all the independent variables are entered by SPSS regardless of their significance levels. The interpretations are made on the basis of theoretical construct and literature review findings after the output, result of regression is received.

In stepwise procedure, a new regression is run for each new variable that is considered to be included in the model in order to see if the variable is beneficial to the model and how beneficial it is. In this method, SPSS enters the independent variable with highest 't' statistic and continues entering these variables until there are no variable left with 't' statistic having significance value less than 0.05. The stepwise process comes to an end when the best fitting model is selected and when no more independent variables can be added or deleted or would make any significant difference to model R^2.

The standard model is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \ldots\ldots\beta_n X_n + u_t \quad \ldots\ldots\ldots\ldots\mathbf{3}$$

Where,

Y = the value of Dependent variable (Y), which is being predicted.

α = constant term of the model – intercept

$\beta_1, \beta_2, \beta_3 \beta_4 \beta_5 \beta_6 \ldots\ldots\beta_n$ are the Beta co-efficients of independent variables.

$X_1, X_2, \ldots\ldots X_n$ are the values of independent variable, which predicts or estimates the value of Y.

u_t = the unexplained variation also termed as the error term which indicates the error in predicting the value of Y, given the value of X.

◈ **Variance Inflationary Factor (VIF) test**

Variance Inflationary Factor (VIF) is a measure of multicollinearity of each explanatory variable. Gujarati noted[66], "The variance inflationary factor shows how the variance of an estimator is inflated by the presence of multicollinearity".

$$\text{Variance Inflationary Factor} = \frac{1}{1-R_j^2}$$

Where, R_j is the multiple correlation coefficient. $(1-R_j^2)$ is also called as tolerance. The tolerance is the percentage of the variance in a given predictor that cannot be explained by the other predictors. When the tolerances are close to 0, there is high multicollinearity and the standard error of the regression coefficients would be inflated. Levine *et al*[65] noted, "If a set of explanatory variables is uncorrelated, then VIF_j is equal to 1. If the set is highly intercorrelated, then VIF_j may exceed even 10." Thus if $VIF_j \geq 10$, then there is a problem with multicollinearity. Some statisticians suggest that to be on the conservative side, even if VIF_j exceeds 5, the regression model should be used with caution.

If multicollinearity exists, the variable with largest VIF value is deleted. In this way we can make certain that multicollinearity problem, if any among the predictors is solved. Variance inflationary factors for each multiple regression conducted in the third stage of analysis are reported in this study.

◈ **The Co-efficient of Multiple Determination (R^2)** measures the proportion of the dependent variable 'Y' that is explained by a set of independent variables selected. R^2 is an accurate value for the sample drawn but is considered an optimistic estimate for the population value and so it is desirable to review the value of Adjusted R^2.

◈ **The Adjusted R^2** is considered a better population estimate and is useful when comparing the R^2 value, between models with different numbers of independent variables. Hence, in this study, for stepwise regression analysis, both R^2 and Adjusted R^2 are observed, that predict the same dependent variable but have different number of independent variables.

◈ **t-tests** are used to assess the statistical significance of individual β_2 coefficients (regression coefficients), specifically testing the null hypothesis that the regression

coefficient is zero. The rule of thumb adopted is to drop all variables, not significant at the 5% level or 1% level from the equation.

◈ **F-test** is used to test the significance of R^2 or the significance of the regression model as a whole. It is used to test the null hypothesis that all the slopes are equal to zero. F is the test statistic from an F Distribution, is a function of R^2, the number of independents, and the number of cases. F is computed with k and (n – k – 1) degrees of freedom, where, k = number of independent variables in the regression model. At 5% and 1% level of significance level, if p-value is <0.05 or < 0.01 (depending on the level of significance), then the model is considered significantly better than would be expected by chance and we reject the null hypothesis of no linear relationship of Y (dependent variables) to the independent variables.

◈ **p-value** is the observed level of significance and is the smallest level at which the null hypothesis can be rejected for a given set of data. If the p-value for one or more coefficients is less than 0.05 level of significance, then these coefficients can be statistically significant, and it can be inferred that the related independent variables affect the dependent variables 'Y'.

Since this study uses a fixed sample of 79 companies belonging to 6 diverse service sectors covering a span of 16 years from 1994-95 to 2009-10, to carry out stepwise regressions, the values of all the independent variables and dependent variable have been calculated for each company of the sample of 79 companies for each year from 1995 to 2010. The ratios used as indicators for the dependent and explanatory variables have been calculated for each year and for each company and then are averaged over the time period of 16 years. *Further,* the empirical analysis is also carried out for firms based on industry wise classification.

Having discussed the model for Industry Level Analysis of Influence of Liquidity on Profitability the next para defines the Liquidity and Profitability Variables used in the present study.

4.10 Specification of Model for Liquidity and Profitability Parameters

In this section, the parameters of firm size, leverage, working capital policy, liquidity, working capital management efficiency and profitability selected for examining the impact of liquidity on profitability are presented. Since, the impact of one variable on another is to be examined; these parameters are categorized as Dependent and Explanatory Variables. Further, various ratios represent each of the parameter, *for e.g.,* Liquidity is measured by CR, QR as well as ALR and hence these three ratios are

indicators of Liquidity. Similarly, all the explanatory and dependent variables have various indicators. The meaning, computation, justification and interpretation of all the ratios have already been discussed in Para 4.4.1, so here the list of all the dependent and explanatory variables along with their broad groups and abbreviations is presented in Table 4.7. Further, from literature review, it emerged that Firm Size is also an explanatory variable to predict the profitability. Hence, Firm Size is included for examining its impact on profitability and is explained in the para following the table.

TABLE – 4.7

DETAILS OF INDEPENDENT AND DEPENDENT VARIABLES USED IN STUDY

Broad Group	Variables	Abbreviation
Independent Variables – WCM, LEV and Size		
Size	Natural Logarithm of Sales	LnS
	Natural Logarithm of Total Assets	LnTA
Leverage	Long Term Debt/Total Assets	LTDTAR
	Total Debt/ Total Assets	TDTAR
Working Capital Policy	Current Liabilities/ Total Assets	CLTAR
	Current Assets/ Total Assets	CATAR
	Current Assets/ Net Fixed Assets	CANFAR
	Current Liabilities/ Current Assets	CLCAR
	Working Capital/ Current Assets	WCCAR
Liquidity	Inventory/Current Assets	ITCAR
	Receivables /Current Assets	RTCAR
	Cash and Bank Balances/ Current Assets	CBBTCAR
	Prepaid Expenses/ Current Assets	PETCAR
	Loans and Advances/ Current Assets	LATCAR
	Marketable Securities/ Current Assets	MSTCAR
	Current Assets/ Current Liabilities	CR
	Current Assets – Inventories/ Current Liabilities	QR
	Cash and Bank Balances + Marketable Securities/ Current Liabilities	ALR
Efficiency	Sales / Total Assets	TATR
	Sales/ Current Assets	CATR
	Sales/ Working Capital	WCTR
	Sales/ Inventory	ITR
	Inventory Holding Period	IHP
	Sales/ Receivables	RTR
	Average Collection Period	ACP
	Sales/ Cash and Bank Balances	CBBTR
	Sales/ Creditors	CTR
	Average Payment Period	APP
	Operating Cycle	OC
	Net Trade Cycle	NTC
Dependent Variable – Profitability		
Based on Sales	Earnings Before Interest and Taxes/ Sales	OPM
	Earnings After Taxes/ Sales	NPM
Based on Total Assets	Earnings Before Interest and Taxes/ Total Assets	ROTA
	Earnings After Taxes/ Total Assets	EAT/TA
Based on Net Worth	Earnings After Taxes/ Net Worth	RONW

Firm Size:

Past theories of Firm size predict positive relationship between the size and profitability[67]. It is believed that large firms take cost advantage (economics of Scale), diversify their products, create entry Barriers for new firms and have a great power to bear risk arising from different changes in the market place, which results in increased rate of profits. Padachi[40] (2006), Afza and Nazir[31] (2009), Magpayo[68] (2011), Sabunwala[69] (2012) found that firm size had positive impact on profitability. However, Bieniasz and Golas[70] (2011) found a negative impact of firm size on profitability indicating that as the firms become much larger the advantages of economies of scale are offset by organizational cost. Samiloglu and Demirgunes[71] (2008) and Abbasi and Bosra[72] (2012) found no relationship between size and profitability.

It can be measured in terms of sales as well as total assets. In this study, both the measures are taken to examine the impact of Firm Size on Profitability as from the literature review, it emerged that both the measures are employed for measuring firm size. It is computed by taking Natural Logarithm of Sales and Total Assets.

Having discussed the sample and the methodology for the empirical analysis, the next chapter begins with the ***first stage of empirical analysis*** and examines the trends and time trends in the WCM, LEV and PROF of the Non Financial Service Industry as well as its constituent industry groups.

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