CHAPTER III
RESEARCH METHODOLOGY

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Methodology adopted for the purpose of analysis of Research problem is of key importance. This chapter attempts to discuss the sample selection procedure data collection time frame of the study, objectives of the study, hypotheses of the study, as well as the tools of analysis.

3.1 CONSTITUTION OF THE SAMPLE

Table III 1 presents the current ratio of all 29 industries for the year 2006-2007, Non-Government Non-Financial Large Public Ltd. Companies as defined by the RBI

TABLE III 1

CURRENT RATIO OF SELECTED INDUSTRIES

Sr. No.	INDUSTRY	YEAR 2006-07
1	Tea Plantation	1.00
2	Mining & Quarrying	1.30
3	Food Products & Beverages	1.20
4	Sugar	1.20
5	Edible Oils & Oil Cakes	1.10
6	Cotton Textile	1.00
7	Man-made Textile	1.00
8	Appearel	1.60
9	Paper and Paper Products	1.00
10	Chemicals & Chemical Products	1.30
11	Basic Chemicals	1.10
12	Chemical Fertilizers & Pesticides	1.00
13	Paints & Varnishes	1.30
14	Pharmaceuticals & Medicines	1.80
15	Rubber & Plastic Products	1.20
16	Plastic Products	1.10
17	Ceramics	1.10
18	Cement & Cement Products	1.30

Sr. No.	INDUSTRY	YEAR 2006-07
19	Iron & Steel	1.60
20	Fabricated Metal Products	1.20
21	Machinery & Machine Tools	1.30
22	Electrical Machinery & Appareles	1.50
23	Radio, Television, Communication equipments & Appareles	1.70
24	Motor Vehicles & Other Transport Equip.	1.40
25	Construction	1.20
26	Wholesale & Retail Trade	1.40
27	Hotels & Restaurants	1.20
28	Transport, Storage & Communication	0.50
29	Computer and Related Activities	2.50
	All Industries	**1.20**
Source: The RBI Bulletin (Finance of companies) March 2008 Vol LXII. Number 3 pp 466-480.		

It is observed from above Table that the ratio ranges between 2.50 (Computer & Related Activities) and 0.50 (Transport, Storage & Communication) Out of 29 industries 6 industries have average exactly same as the, all industries, 10 have ratio below average and 13 have ratio above.

For the detail analysis of the present study, four industries are selected.

(i) Steel Industry

(ii) Cement Industry

(iii) Organic Chemicals; and

(iv) Inorganic Chemicals.

The first two industries are having high capital intensity the latter two industries are having low capital intensity. Considering the special nature of the Steel and Cement Industry in terms of its importance to the nation and Chemical Industry for the nation these industires are selected for the study.

3.2 DATA COLLECTION

The data for the research is obtained from the PROWESS Database, maintained by the Center for Monitoring Indian Economy (CMIE) updated upto 28th April 2009. The database gets updated on a regular basis. Hence, the total number of companies keeps on changing. Similarly, the numbers of Listed Companies also keep on changing

as and when the database is updated. The data collected for the study is given in the Tabular form in Table III 2.

TABLE III 2

DATA SELECTION

Sr. No.	INDUSTRY	Listed & Large Companies	Data Availability From 1998-99 to 2007-08	Companies having Data from 1998-99 to 2007-08
1	2	3	4	5
1	STEEL	488	59	52
2	CEMENT	159	28	24
3	ORGANIC CHEMICALS	178	46	29
4	INOGANIC CHEMICALS	114	25	21
	TOTAL	939	158	126

In all, there were 6724 Companies in the PROWESS database as on 28th April, 2009. In the next step, screening was applied to identify the Large Size Companies for the selected industries viz Steel, Cement, Organic Chemicals and Inorganic Chemicals Industry. Here, only Large Listed Companies are taken, as defined by RBI [The RBI Bulletin (Finance of companies) March 2008 Vol. KXII, number 3, pp 466-480]. These are the companies having paid-up capital of Rs. 1 Crore and above. The Companies for which data were found as on 28th April, 2009 are displayed in Table III 2 as Large and Listed Companies in Column 3. Thereafter, further screening was applied to find whether data were available for a period of 10 years starting form year 1998-99 (as on 31-03-1999) to year 2007-08 (as on 31-03-2008), such companies are shown in the column 4 of Table III 2 for each industry. Thereafter, it was observed that the data were missing for these 10 years period, in spite of the over all command given. Hence, through manual intervention, screening was carried out to ensure the availability of 10 years data. These are displayed in column 5 of Table III 2.

On primary scrutiny of the data as mentioned in column 5 of Table III 2, for the companied in each industry, it was observed that under the Steel Industry for one company JSW Steel Ltd., and under the Cement Industry for Birla Corporation Ltd., the working capital ratios were observed in heavy minus. Hence, both the companies are dropped. The list of companies for each industry is given in Appendix 1.

3.3 OBJECTIVES OF THE STUDY

The present study of components of current assets proposes to study and evaluate the procedure, practices and policies followed in the different industries for the different components of current assets. The study intends to analyze the management of components of current assets.

Precisely the objectives of the study are:

i. To analysis the average ratios related with management of components of current assets over a period of time for selected industries and variations amongst the same.

ii. To examine, the variances for a selected ratio between companies, between industries and between various years.

iii. To analyze, the impact of indicators of Management of Components of Current Assets on profitability of the selected sample.

iv. To analyze, the impact of Turnover Ratios on Profitability of the selected samples.

v. To suggest the measures for ensuring the effective and efficient utilization of different components of the working capital for the purpose of the maximization of shareholder's wealth.

3.4 HYPOTHESES

To achieve above objectives, for the purpose of the present study following hypotheses are framed:

H_{01} The proportion of CA/TA, INV/CA,REC/CA and CB/CA remain same over a period of time for all selected industries.

H_{02} The length of operating cycle and cash conversion cycle remains same over a period of time for all selected industries.

H_{03} The proportion of various structural ratios *viz* WC/TA, WC/CA, INV/WC, REC/WC, CB/WC, INV/GFA, TL/NW and NFA/TA, the Liquidity Ratios *viz* CR, QR and CB/CL, and the Turnover Ratios *viz* TATR, NFATR, CATR, WTR, ITR, DTR, CBTR, ACP, CTR & APP remains same over a period of time for all selected industries.

H_{04} The selected Profitability Ratios remains same over a period of time.

H_{05} There is no variations for the selected ratios between the companies.

H_{06} There is no variations for the selected ratios between the years for selected companies.

H_{07} There are no variations between the industries.

H_{08} The level of sales do not affect the level of working capital

H_{09} The selected ratios indicating Management of Components of Current Assets do not affect Return On Assets.

H_{010} The selected Turnover Ratios do not affect to Return On Assets.

H_{011} The selected ratios indicating Management of Components of Current Assets do not affect Net Profit Margin.

H_{012} The selected Turnover Ratios do not affect to Net Profit Margin

3.5 METHODOLOGY ADOPTED:

In this part, mainly the selection of the ratios for the purpose of the analysis and the statistical tools used for the purpose of analysis are discussed. On the basis of available literature and keeping in view the results of related research studies, a list of various indicators of Management of Components of Current Assets as well as relevant turnover ratios are prepared. Moreover, based on the findings of literature review, the study aims to analyze the impact of Management of Components of Current Assets as well as relevant Turnover Ratios, on profitability of the selected groups of sample companies. The details of the selected ratios is presented in Table III 3.

3.5.1 Financial Tools Ratio Analysis

The ratios are discussed in detail whenever the calculations are made. Total 29 ratios are selected. The ratios are further grouped as basic ratios for the components of current assets and working capital and listed into the further categories.

TABLE III 3

Sr.No.	Ratios	Abbreviation
BASIC RATIOS OF THE COMPONENTS OF THE CURRENT ASSETS		
1	CURRENT ASSETS TO TOTAL ASSETS	(CA/TA)
2	INVENTORY TO CURRENT ASSETS RATIO	(INV/CA)
3	RECEIVABLE TO CURRENT ASSETS RATIO	(REC/WC)
4	CASH & BANK BALANCE TO CURRENT ASSETS	(CB/CA)
RATIOS USED FOR THE COMPONENTS OF CURRENT ASSETS STRUCTURAL RATIOS		
5	WORKING CAPITAL TO TOTAL ASSETS	(WC/TA)
6	WORKING CAPITAL TO CURRENT ASSETS	(WC/CA)
7	INVENTORY TO WORKING CAPITAL	(INV/WC)
8	RECEIVABLE TO WORKING CAPITAL	(REC/WC)
9	CASH & BANK BALANCE TO WORKING CAPITAL	(CB/WC)
10	INVENTORY TO GROSS FIXED ASSETS	(INV/GFA)
11	TOTAL LIABILITIES TO NET WORTH	(TL/NW)
12	NET FIXED ASSETS TO TOTAL ASSETS	(NFA/TA)

Sr.No.	Ratios	Abbreviation
LIQUIDITRY RATIOS		
13	CURRENT RATIO	(CR)
14	QUICK RATIO	(QR)
15	CASH & BANK BALANCE TO CURRENT LIABILITIES	(CB/CL)
TURNOVER RATIOS		
16	SALES TO TOTAL ASSETS	(TATR)
17	SALES TO NET FIXED ASSETS	(NFATR)
18	SALES TO CURRENT ASSETS	(CATR)
19	SALES TO WORKING CAPITAL	(WTR)
20	SALES TO INVENTORY RATIO	(ITR)
21	SALES TO DEBTORS RATIO	(DTR)
22	SALES TO CASH & BANK BALANCE	(CBTR)
23	AVERAGE COLLECTION PERIOD	(ACP)
24	CREDITORS TURNOVER RATIO	(CTR)
25	AVERAGE PAYMENT PERIOD	(APP)
PROFITABILITY RATIOS		
26	PROFIT BEFORE TAX TO TOTAL ASSETS	(PBT/TA)
27	PROFIT AFTER TAX TO TOTAL ASSETS	(PAT/TA)
28	GROSS PROFIT MARGIN	(GPM)
29	NET PROFIT MARGIN	(NPM)

3.5.2 Statistical tools for the purpose of Analysis

In this part various statistical tools like trend projection, ANOVA, Regression Analysis are discussed, which are applied for the analysis.

3.5.2.1 To analyze the trends and direction of change in the MCCA of selected companies various ratios (as mentioned in Table III 3) along with mean, standard deviation and co-efficient of variation are calculated over the period of study. The year wise mean ratio for all companies in the selected industry for the entire study period (1998 to 2008) have been calculated.

3.5.2.2 Time Trends in ratios indicating MCCA: To study the time trends in ratios indicating MCCA, the 'Method of Least Squares' is applied. This is used to fit a 'Linear Trend Model'.

To examine whether these ratios for selected companies exhibit a significant linear trend, the linear trend model is used. Here, in linear regression analysis, regression of selected ratios indicating MCCA as dependent variables and time in years as independent variables are conducted. The time period is 10 years (1998-99 to 2007-08). Time dummies are used to denote this independent variable. This results into equation

$Y = a+B_1X + e$

Where

Y = the value of Dependent Variable (Y), what is being predicted.

a = constant term of the model

B_1 = Beta, the co-efficient of X, the slope of the regression line

X = is the value of independent variable, what is predicting or explaining the value of y

e = error term, the error in predicting the value of y given the value of x.

Here, in time series analysis, 'y' represents the trend value of the ratio indicating MCCA, 'X' variable represents time in years, B_1 represents the slope of the trend line, a is the computed trend figure of Y variable when X = 0.

For the purpose of analyzing the behaviour of ratios and to examine the time trends, total selected ratios are divided in two parts (A) Basic Ratios indicating MCCA and (B) other ratios grouped in structural ratios, liquidity ratios and turnover ratios. Amongst the basic ratios, ratios Sr. No. 1 to 4 as mentioned in Table III 3 are selected and then mean, standard deviation and co-efficient of variation are presented. Moreover, Time trend is also examined with the help of regression. Thereafter, other ratios Sr. No. 5 to 25 are selected as indicators of MCCA and their average, standard deviation and co-efficient of variation are derived. Here, also through linear trend model, time trend is estimated. To examine the time trend in profitability ratios also trend projection is applied, Sr. No. 26 to 29 in Table presents the profitability ratios.

3.5.2.3 Analysis of Variance (ANOVA)

To examine whether variations exists between companies regarding various ratios indicating MCCA, the statistical tool of one way Analysis of Variance referred as ANOVA is applied.

Professor R.A. Fishcher in 1920 has developed the technique of variance and the technique is useful in application of diversified practical problems. The technique consists of classifying and cross classifying 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.[1] (Gupta S.P., 1997)

The basic principle of ANOVA is to test for difference among the means of populations by examining the amount of variation within each of these samples relative to the amount of variation between the samples.

ANOVA assumes Normality, Homogeneity and Independence of error

ANOVA – Single Factor

If there were only two samples, the worksheet function, T-test, called equally be used. With more than two samples, this is no convenient generalization of test and the single factor ANOVA model can be called upon instead.

The one way or single factor ANOVA the following steps are involved

Step 1 Calculate variance between samples.

i) Obtain the mean of each sample by $\overline{X}_1$, $\overline{X}_2$ *etc.*

ii) Calculate the Grand average of X, Workout the mean of the sample by

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

iii) Take the deviation of sample means from the mean of samples and grand average.

iv) Square these deviations and obtain the total which will give sum of squares between the samples.

v) Divide the total obtained in step (iv) by the degrees of freedom. The degrees of freedom will be one less than the number of samples, i.e. if there are 4 samples then the degrees of freedom will be 4-1 =3 or v = k-1 where k = number of samples.

Step 2 Calculate variance within the samples.

i) Calculate mean of each sample by $\overline{X}_1$, $\overline{X}_2$ *etc.*

ii) Take the deviations of the various items in a sample from the mean values of the respective samples.

iii) Obtain these deviations and obtain the total which give the Sum of Squares within the samples.

(iv) Divide the result of (iii) steps by the degrees of freedom between the samples to obtain variance or mean square (MS) between the samples.

Step 3 F ratio is worked out as under:

$$F = \frac{\text{Between-column variance}}{\text{Within-column variance}}$$

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 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 of F, the difference is taken as insignificant i.e. due to chance and the null-hypothesis of no difference between sample means stands. In case the calculated value of F happens to be either equal or more than its table value, the difference is considered as significant (which means the samples could not have come from the same universe) and according the conclusion may be drawn. The higher the calculated value of F is a more the table value, the more definite and sure one can be about the conclusions.

F crit value is the table value.

In addition to examine 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. Moreover, it was also considered of importance to examine the variance between industries. Hence, this is also examined for all ratios indicating MCCA between industries.

3.5.2.4 Specification of Model for Company Level Study

1. First stage of Analysis is Simple Linear Regressions:-

   To examine the impact of

   a) level of sales on level of working capital

   b) various ratios indicating MCCA on ROA

   c) various Turnover Ratios on ROA

   d) various ratios indicating MCCA on NPM

   e) various Turnover Ratios on NPM.

In the first stage of analysis, simple linear regression of each dependent variable working capital for 'a' or profitability for 'b' to 'e' is run on independent values [Sales (a), and indicators of MCCA or turnover ratios for (b), (c), (d) and (e)]

This gives an indication, regarding whether the selected independent variable has significant impact on dependent variable on not?. The equation will be same as discussed in 3.5.2. 2. However, Y and X will assume different meanings now.

For (a) Y = working capital and X = Sales

For (b) Y = ROA and X = indicators of MCCA

For (c) Y = ROA and X = Turnover Ratios

For (d) Y = NPM and X = indicators of MCCA and

For (e) Y = NPM and X = Turnover Ratios

The t test: To determine the existence of a significant linear impact of independent variable (determinants) on dependent variable (working capital, ROA or NPM, as the case may be), a hypotheses test – the 't' test concerning whether B_1 (the slope of the regression line) is equal to zero is conducted. If null hypotheses (mentioned in Section 3.4) 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 (alpha =0.10), (alpha = 0.05) and (alpha =0.01) is tested and selected for the next stage of analysis. This is done so, because, there are various indicators of MCCA, as well as turnover ratios.

2 Second Stage of Analysis: Multiple Regression Techniques:

In the second stage of analysis, in this study, the impact of various indicators of MCCA on ROA or NPM is examined using multiple regression techniques. Multiple regression is a technique with which one can ascertain, the joint effects of a set of independent variables in explaining a proportion of the variations in dependent variable. It is an extension of simple regression techniques. Where instead of a single explanatory variable, several explanatory variables can be used to predict the value of dependent variable.

The Multiple Regressions model is used to estimated the impact of each of the indicators of explanatory variables on the dependent variable. This is put as:

$$Y = a + B_1X + B_2X_2 + B_3X_3 + B_4X_4 + \ldots\ldots\ldots B_nX_n + e$$

Where,

Y = The value of dependent variable what is being predicted

a = constant term of the model.

B_1 B_2 ..... B_n are the co-efficient of independent variables

X_1 X_2 ..... X_n are the value of independent variable, what is predicting or explaining the value of Y.

e = error term, the error in predicting the value of y given the value of x.

To conduct this analysis, use of microsoft excel is made. Here, output of the regression (simple or multiple) is received and then interpretation is carried out based on theoritical background.

The co-efficient of Multiple Determination (R^2) measure the proportion of the various independent 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, the Adjusted R^2 is considered a better population estimate and is useful when comparing the R^2 value, between models with different number of independent variables. Hence, in this study, for multiple regressions analysis, both R^2 and Adjusted R^2 are observed, particularly, when comparison are being made between two regression models, that predict the same dependent variable but have different number of independent variables.

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2. Kothari C. R. ed. 2001 *Research methodology methods techniques* Wishwa Prakashan 4835/24 Ansari Road, Dariyagunj, New Delhi – 110002 P. 301.

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