Chapter - 1

RESEARCH METHODOLOGY

1.1 Introduction
1.2 Review of literature.
1.3 Objectives of the study
1.4 Hypotheses of the study
1.5 Research design
1.6 Chapter Plan
1.7 Significances of the study
1.8 Limitations of study
1.9 Future scope of study
1.1 Introduction

In the last century, firms in certain industries especially public utility industries such as energy transportation and communications have been public owned or regulated to alleviate public fears that such firms would use market power to raise price artificially. Many of these industries exhibited scale economies which meant that a single firm would have the lowest cost of production and could monopolize the industry. Hence, these industries were treated as natural monopolies and regulated to control entry prices and profits.

Energy privatization has been part and parcel of a recent trend, which has placed greater reliance on market forces and less dependence on government in the allocation of resources. For many nations, their formerly state-owned energy companies that have been privatized include some of the world’s largest petroleum companies based in the industrialized nations. Global giants such as British petroleum, British gas, ENI (Italy) petrol (Canada) Repsol (Spain) and Total (France) have all undergone transitions from state-owned to a significant degree of private ownership.

Although privatization efforts differ substantially from country to country, in general nations have privatized state-owned energy industries to achieve one or more of several objectives.

These objectives have included:

- Raising revenue for the state.
- Raising investment capital for the industry or company being privatized.
- Reducing wider share ownership.
- Promoting wider share ownership.
- Increasing efficiency.
- Introducing greater competition.
- Exposing firms to market discipline.

By global standard, India is just at the beginning of the energy reform, we however have an ideal opportunity to learn from these worldwide experiences of the
restructuring of the energy industries and put in place the policy framework that draws from the best international practices. This will then enable us to leapfrog in the new scale of development process.

Seeing to oil sector development process, the crude oil production shows uneven growth from 1972 to 2001. During 2000-01 230 crores of rupees import was recorded whereas 203 crores rupees were exported by India. It shows the gap of 27 crores rupees. Beside this, the demand of petroleum product in India was increased every year. 1950s and the 1960s were the years of rapid rates of increase of global oil demand, when oil demand grew by an average of 7.7% per year. 1950s and the 1960s were the years of rapid rates when oil demand grew by an average of 7.7% per year. The world’s total primary energy consumption in 2000 was 9096 million tons of oil equivalent, and with a world population of 6,056 million. The total investment envisaged over the next 25 years in the downstream petroleum sector is a whopping Rs.3,70,000 crores or US $ 80 billion.

Energy intensity of an economy refers to the energy consumption per unit of GDP. The economic growth and energy demand are linked, however energy intensity is influenced by the stage of the economy development of particular economy and the standard of living of individuals.

There is an unequivocal agreement that the quality of economic infrastructure particular, in India is a serious impediment to accelerating growth energy industry is obviously one of the most critical areas. Improving India’s energy infrastructure requires a massive increase in the entire sub sector. It also requires much greater levels of efficiency to ensure low cost and quality of service.

Thus the researcher would like to conduct the research in petroleum industry, the study will be important in views of researcher by considering important of financial analysis in profitability, liquidity, assets of leading and non-financial analysis in behavioral cost and overhead cost schedule of petroleum sector industry. The researcher will try to shows the whole pictures of refineries and their various financial factors which affect the industry in various financial aspects.
1.2 Review of literature.

(A) Conceptual literature

A book “A comparative approach to financial management” given by Alokagraval and mriduagraval published by ashok kumar lodha for law point, kolkata-700001. From where, Researcher reviewed the certain concept diluted with the study. The concept like the ratio analysis, working capital management, management of debtor, management of cash and management of inventory.


A book “Financial management and policy”, introduced by james c. van horne, published by prentice hall of India private limited, new Delhi,- 3rd edition-1975, from where researcher reviewed the certain concept like liquidity structure of assets and liabilities, management of cash, management of accounts receivable, inventory management, financial ratio analysis, fund flow analysis and working capital management.

A book “Cost accounting”, given by Ravi M. Kishor, Published by Taxmann Allied services (P.) Ltd., New delhi-2008. From where, researcher reviewed the certain concepts like overhead structure analysis in which production overhead structure, administrative overhead structure, selling and distribution and research and development overhead structure.

A book “Cost and management accounting”, given by Dr. S. N. Maheshwari, Published by Taxmann Allied services (P.) Ltd., New Delhi-1978. From where researcher reviewed certain concepts like DuPont Three steps and Five step model for measuring the return on equity of sampled units.
(B) Empirical literature

IUP publication has published a journal, the Journal of public finance Feb. 2012 in which inflation of oil product impact on overall Indian economy. Economy intelligence service has published by central for monitoring Indian economy Pvt. Ltd. In which described the monthly Review of Indian economyjuly-2012 with special reference to cut in domestic petrol prices by oil marketing companies.

In Indian journal accounting issue Dr. shantakumar bose writes the importance of oil sector. He has told oil sector plays an important role in refineries. They are thus catalyst for social and economic development in any nation. This study is an addition to these literatures for the evaluation of the units undertaken for the study.

The economic intelligence service issued periodical Industry financial aggregates and ratios, June–2012 in which described financial and non-financial performance of oil sector industries. The fortune India April-2005 has focused in its cover story about oil industry. This report includes the world crude prices relation with a production growth rate or oil production growth and field wise crude production in India. Business India Dec.-2010 has overview the recovery growth of various refineries. In business India Aug.-2011 covered dictons with minister regarding oil sector.

The journal of applied economies published by E.N.murthy in feb-2012 in which described the a direct impact of falling crude oil prices was on domestic petrol prices on 28 June 2012, OMC’s cut petrol price in the range of Rs.2.46 to 3.22 per liter. This was the second reduction in June. On 2 June 2012 OMC had cut petrol prices by Rs. 2 per liter. With have been lowered by more than Rs.5 per liter wiping out half of the Rs.7.5 per liter hike announced on headline inflation as petrol accounts for one% of WPI.

“Dollar vs Oil prices”– the changing equations” By N Janardhan Rao and very in ‘The Analyst’ in Sep.2006 writes about the changing equations of impact of dollar on oil trade. According to EMF, OPEC revenues estimated to have gone up from $ 262 ton in 2002 to $ 61.4 bn. in 2005. Such incentives would further encourage the oil exporting nations to increase the price of oil in an attempt to preserve the demand of
oil is increasing and will to do so whereas an increase of in the level of global oil production appears to be close to its maximum the OPEC oil situation countries that largely trade with the dollar will be imported by increased energy cost.

“A study of financial appraisal of refinery units” – Varsha Virani, M.Phil, Saurastra University has analyzed the two units namely BPCL & IOC. In her research there are various testing of hypothesis and multiple correlation, which shows the affecting financial factors of these two units.”

Indian journal of accounting volume XLII (1) December 2011, pp. 48-54 “cash management performance evaluation” by Sudipta Ghosh. This study comparison between TSL and SAIL. The empirical findings of the study revealed that TSL on the average has utilized its cash more efficiently in comparison to SAIL. TSL has better capacity to correct its sales in to cash than that of SAIL.

Jill Andresky Fraser’s classic articles on the topic “THE ART OF CASH MANAGEMENT”. Included finance business – cash management and learning how to handle a cash crisis. Assembled here are practical pieces of advice, tips and tricks from CEOs, and tools that you can use to get handle on business cash.

Indian journal of commerce volume 65 NO.1 January – March 2012. A comparative study of public and private LIC companies in India, an attempt is made to analysis the performance of public and private LIC in India.

Doshi S.H., senthil R., and Patidar P, (2005) attempted to identify the reasons behind different cash practices adopted by the top three Indian information technology companies.


Review of the prediction power of Altman and Ohlson models in predicting bankruptcy of Listed Companies in Tehran Stock Exchange – Iran published by Abolfazl ghaidiri Moghghdam, farzane Nasir Zadesh, Mohammad Mosoud
Gholampour Fard. The objective of this study is to test the prediction power of original Altman and ohlson model discriminate analysis.

Pompe & Bilderbeek (2005) tested a hypothesis on the predictive power of different ratio categories during the successive periods prior to bankruptcy, and also the relationship between the age of a firm and the predictability of bankruptcy by using the data for small and medium size companies and concluded that every ratio investigated had some predictive power, and there is no fixed order in prediction power of the different categories of financial ratios. And the ratios indicate similar predictive efficacies 5 years before failure. They also found out that the bankruptcy of young firm is more difficult to predict than the bankruptcy of well-established firm, so they achieved better result by having a separate model for each age category.

Partha Ghosh (2013) Testing of Altman’s Z-Score model, a case study of Dunlop India Ltd. Research paper published in Indian Journal of Research. This paper attempts to study how much Z-score is viable in bankruptcy of the said company. The Altman’s Z score has been employed to investigate the risk of financial distress of Dunlop India Ltd. from 2007-08 to 2011-12.

Shilo Lifschutz, Arie Jacobi(2010) In this study, we conducted an empirical investigation of whether it is possible to rely on two versions of the Altman Model (1968) to predict financial failure of publicly traded companies in Israel between 2000 and 2007. The findings of the study indicated that given the sample and the study term, the preferable model for predicting financial failure of Israeli companies is the Ingbar version of the Altman Model with a critical value of 1 and with the addition of the gray area. In particular, a survival index above 1 predicts a high likelihood of survival, while a lower index predicts low likelihood of survival. According to our study, the model is able to predict bankruptcy of companies with a 95% accuracy rate one year prior to bankruptcy and with an 85% accuracy rate two years prior to bankruptcy.

Nirmal Chakraborty (2013) Working Capital Performance: A Case Study On Dabur India Ltd. Among all the problems of management, the problems of working capital management have probably been recognizes as the most crucial one. It is because of the fact that working capital always helps a business concern to gain and
strength. This study focuses working capital performance of Dabur Ltd. And also make correlation Co-efficient between liquidity and profitability.

Refuse M.E.(1996) refocused on urgent need on working capital management. He found that the idea of delaying payment to the creditors as a strategy of improving capital. Instead he proposed that the companies should strategize more on stock management based on lean supply chain techniques. Grabowsky B.J. (1976) examined the mismanagement of account receivable by small business and found that there is significant relationship between various success measures and the employment of formal working capital policies and procedures.

Sakariya S.V.(2012) Working Capital Management And Profitability Performance: Case Study Of Wipro Company Ltd. Working capital may be regarded as the lifeblood of a business firm. Working capital management is an integral part of financial management. This research paper measure working capital performance of Wipro Company. The researcher chooses the 18 ratios for measuring working capital management and impact on earnings. The chi-square test used for testing the hypothesis and last sessions of research paper give some findings and suggestions to company for better performance.

Anusha Agarwal has written research paper Vol 25, No. 2, April-September 2011, Journal of Accounting and Finance on How to manage Working Capital: An empirical study of Maruti Suzuki India Limited. The paper examines the working capital approach to liquidity management has long been the prominent technique used to plan and control liquidity.

Journal of Accounting and Finance, Vol 25, No. 2, April-September 2011, “Working Capital Management of Reliance Industries Limited-A Case Study” by P.K Jain, Shveta Singh and sunny Kapoor. The paper examines the Emerging concept in the realm of Working capital management, is that of zero working capital, where a company is able to manage receivables and inventories in a manner that almost exactly offsets the creditors.

Shilo Lifschutz, Arie Jacobi(2010) In this study, we conducted an empirical investigation of whether it is possible to rely on two versions of the Altman Model.
(1968) to predict financial failure of publicly traded companies in Israel between 2000 and 2007. The findings of the study indicated that given the sample and the study term, the preferable model for predicting financial failure of Israeli companies is the Ingbar version of the Altman Model with a critical value of 1 and with the addition of the gray area. In particular, a survival index above 1 predicts a high likelihood of survival, while a lower index predicts low likelihood of survival. According to our study, the model is able to predict bankruptcy of companies with a 95% accuracy rate one year prior to bankruptcy and with an 85% accuracy rate two years prior to bankruptcy.

Nihar Kiran Nanavati published an article, “DuPont analysis to measure return on equity of satyam computer service limited (now known as Mahindra satyam limited)” in Indian journal of research in March 2013. He attempts to calculate the ROE satyam computer service limited. Here in after refer to as satyam using 3 step and 5 step DuPont model for the financial year 2010 – 11 and 2011 – 12 to measure efficiency of the company in respect of profit earning capacity as well as managerial effectiveness. An article” DuPont analysis used to dissect ROE spreadsheet” by Jae Jun. this research paper an attempt has been made to study the DuPont analysis using 3 and 5 step DuPont analysis with example.

“SUPPLY CHAIN MANAGEMENT IN INDIAN PETROLEUM REFINERIES” Thesis submitted to the COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY in partial fulfillment of the requirements for the award of the Degree of Doctor of Philosophy in Management under the Faculty of Social Sciences by kemthose P. Paul. Petroleum oil is the lifeblood of a modern nation. The importance of its supply chain is therefore evident. Petroleum oil supply chains are large flow type supply chains. Sources of crude oil are fixed by natural availability to certain regions. Oil requirement is however more global with developed cold regions requiring more of it. Economics dictate that refining is to be done nearer to demand locations. The first problem that is tackled in this thesis is that of developing a model for refinery location selection. A multistage multi-factor model using weighted ranking has been developed for this. Facility design and its creation lay the playground for operations. The importance of proper facilities planning is therefore worth noting. The importance of building flexibility of
different types in to facility design is addressed in this thesis. The importance of flexibility is more because of uncertainty in terms of availability and price of crude oil on one side and products demand on the other side, over the long life time of a refinery.

Once facilities are ready, proper planning is necessary for their operations. For planning of refinery, supply chain hierarchical planning model to suit the post Administered Price Mechanism scenario in India is developed. The hierarchical planning models have annual planning, quarterly planning, monthly planning, and daily planning modules interconnected with appropriate data flows.

In order to implement supply chain planning and control models, an integrated information flow system is essential. A model for such a system is also presented in the thesis. Lastly no study on operations is complete without looking at the current operations and problems involved therein. The inbound, internal, and outbound logistic system of a refinery (Kochi Refinery Limited) has been studied in detail. Bottlenecks, excess capacity, and other related problems are discussed in detail. Recommendations for solutions to some of the identified problems are also given in this thesis. The attempt in this thesis is therefore to look at refinery supply chain problem in totality from locations planning to operations and to solve the relative problems.

The history shows that oil market have highly unstable at the beginning of 20th century. After the world war II the US and Britain signed a treaty to set up an international body which would control production and set prices whereas the rest of world price was allowed to fail this resulted in the formalist of OBEC. The book also shows that oil prices with an upward trend for almost 30 years till the late 1950s after which cracks to appear.

The refinery in India is doing well but the government has created some blocks for the growth of the sector. Indian oil industry has estimated turnover 75 million dollar oil related market includes 30% of India’s total import bill. They contribute nearly 20% of the country has an in significant share. In the world oil and gas production, but consumption wise it accounts for global 3%.
1.3 Objectives of the study

The study has been carried out for achieving following objectives:

1. To measure the return on equity of oil refineries using five step DuPont model.
2. To know profitability of the oil refineries.
3. To analyse the relationship of return on investment with other financial parameters.
4. To predict the bankruptcy and financial strength of sampled units through Edward Altman model.
5. To know liquidity condition of the oil refineries.
6. To reviewed the liquidity position of sampled units by mottals rank comprehensive test.
7. To evaluate the inventory structure of oil refineries.
8. To know receivable condition of oil refineries.
9. To measure the performance through cash management of oil refineries.
10. To identify the most prominent financial parameters are affected to financial position of oil refineries.
11. To evaluate indirect overhead cost structure oil refineries.

1.4 Hypotheses of the study

For the present study the researcher has been formulated two hypotheses, null hypothesis and alternate hypothesis. Both hypotheses have been tested with the help of statistical tools. The different hypotheses as under:

1. \( H_0 \):- There is no significant difference on gross profit margin ratio between all selected units under study period.

\[ H_1 \]:- There is a significant difference on gross profit margin ratio between all selected units under study period.

2. \( H_0 \):- There is no significant difference on operating profit margin ratio between all selected units under study period.
$H_1$: There is a significant difference on operating profit margin ratio between all selected units under study period.

3. $H_0$: There is no significant difference on net profit margin ratio between all selected units under study period.

$H_1$: There is a significant difference on net profit margin ratio between all selected units under study period.

4. $H_0$: There is no significant difference on cash flow margin ratio between all selected units under study period.

$H_1$: There is a significant difference on cash flow margin ratio between all selected units under study period.

5. $H_0$: There is no significant difference on operating expense ratio between all selected units under study period.

$H_1$: There is a significant difference on operating expense ratio between all selected units under study period.

6. $H_0$: There is no significant difference on return on fixed assets of sample units between all selected units under study period.

$H_1$: There is a significant difference on return on fixed assets of sample units between all selected units under study period.

7. $H_0$: There is no significant difference on return on net worth between all selected units under study period.

$H_1$: There is a significant difference on return on net worth between all selected units under study period.
8. $H_0$: There is no significant difference on return on debt between all selected units under study period.

$H_1$: There is a significant difference on return on debt between all selected units under study period.

9. $H_0$: There is no significant difference on return on capital employed between all selected units under study period.

$H_1$: There is a significant difference on return on capital employed between all selected units under study period.

10. $H_0$: There is no significant difference on cash return on assets between all selected units under study period.

$H_1$: There is a significant difference on cash return on assets between all selected units under study period.

11. $H_0$: There is no significant difference on current ratio between all selected units under study period.

$H_1$: There is a significant difference on current ratio between all selected units under study period.

12. $H_0$: There is no significant difference on liquid ratio between all selected units under study period.

$H_1$: There is a significant difference on liquid ratio between all selected units under study period.

13. $H_0$: There is no significant difference on gross working capital cycle between all selected units under study period.
H₁:- There is a significant difference on gross working capital cycle between all selected units under study period.

14. H₀:- There is no significant difference on age of debtor between all selected units under study period.

H₁:- There is a significant difference on age of debtor between all selected units under study period.

15. H₀:- There is no significant difference on age of creditor between all selected units under study period.

H₁:- There is a significant difference on age of creditor between all selected units under study period.

1.5 Research design

1.5.1 Data collection

This study has been based on secondary data. The data has been collected from published annual report of oil refinery; other information related to refinery has been collected from official website and net sources, annual report, books and journals newspaper etc. Various researches have been referred conducted by the M.Phil. students and Ph.D. students of various universities. The reference books have been referred from the library of various universities. Thus, various sources have used to collect the relevant data. No primary data has been collected.

1.5.2 Universe and sample of the study

The numbers of oil refineries work in India are the universe of the study. Researcher has decided to take six unit of universe for the study using convenience sampling technique. The following refineries of oil sectors of India have been taken for the study.

1. Bharat Petroleum Corporation Ltd.
2. Hindustan Petroleum Corp. Ltd.
3. Indian Oil Corporation Ltd.
4. Mangalore Refinery & Petroleum
5. Numaligarh Refinery Ltd
6. Chennai Petroleum Corporation Ltd.

1.5.3 Tools and techniques

➢ Tools:-

1. Ratio analysis

For the analysis of financial statement many tools are used like common size statement analysis, comparative analysis, trend analysis, and ratio analysis. The ratio analysis is most acceptable tools for the analysis of financial statements. Present study also used various ratios for financial analysis like profitability ratios, liquidity ratios and assets management ratios.

2. Mean

The mean used for comparison of two and more than two units. Average value of variables is mean. The mean are calculated by total value of variable are divided by number of variables.

3. DuPont Model

The DuPont analyses also help to company is achieving its ROE. The analysis of ROE using DuPont model are done in following two ways:

i. \[ \text{ROE}= \text{Net profit margin} \times \text{Assets Turnover} \times \text{Equity multiplier}. \]

- Net profit margin shows operating efficiency.
- Asset turnover shows assets utilization efficiency.
- Equity multiplier shows financial leverage.

Where,

\[ \text{Net profit margin} = \frac{\text{Net income}}{\text{Total sales}} \]
\[ \text{Assets turnover} = \frac{\text{Total sales}}{\text{Total Assets}} \]
\[ \text{Equity Multiplier} = \frac{\text{Total Assets}}{\text{Shareholder equity}} \]

Multiplying these three values resulting in ROE according to their step DuPont model analysis with the three step DuPont model. Concluded whether a company is increasing ROE through improved profitability, Assets turnover and
financial leverage, In Addition to this some experts are saying that interest payments on debt effects net profit margin. According to that one advanced versions was introduced that called advanced five step DuPont analysis model.

ii. The five steps DuPont formula in an easy to understand form is given as below:

\[
\text{ROE} = (\text{Tax Burden}) \times (\text{Interest Burden}) \times (\text{operating margin}) \times (\text{Assets turnover}) \times (\text{Equity multiplier})
\]

- Tax Burden is the proportion of profit retained after paying Taxes.
- Interest Burden shows how interest is affecting profit. If company has no debt the ratio will be 1.
- Operating income margin is the operating income per rupee of sales.
- Assets turnover shows assets utilization efficiency.
- Equity multiplier shows financial leverage

Where

\[
\begin{align*}
\text{Tax Burden} &= \frac{\text{Net Income}}{\text{EBT}} \\
\text{Interest Burden} &= \frac{\text{EBT}}{\text{EBIT}} \\
\text{Operating income margin} &= \frac{\text{EBIT}}{\text{Sales}} \\
\text{Turnover} &= \frac{\text{Sales}}{\text{Total Assets}} \\
\text{Equity multiplier} &= \frac{\text{Total Assets}}{\text{Shareholder Equity}}
\end{align*}
\]

When tax Burden, interest Burden and operating margin are multiplied to gather, it gives us net income margin, and now it has been broken down further to show how tax and interest effect on ROE.

4. Edward Altman Model

Rather than searching for single best ratio professor Edward Altman has introduced new model in 1968 called Altman Z-score model. The Z-score formula is used for predicting liquidity position and financial economist. The Z-score is multivariate formulas that measures the financial health of the company and predict the bankruptcy within two years. The model covers both the problems, financial problems and operating problems. The model uses five ratios symbolically X1, X2,
X3, X4 and X5. The ratio X1, X2 and X4 for financial problems and X3 and X5 for operating problems. The ratios are follows:

1. \( X_1 = \frac{\text{Working Capital}}{\text{Total Assets}} \) (Stand for liquidity measure)
2. \( X_2 = \frac{\text{Retained Earning}}{\text{Total Assets}} \) (Stand for measure of reinvested earning)
3. \( X_3 = \frac{\text{Earnings Before Interest and taxes}}{\text{Total Assets}} \) (Stand for profitability measure)
4. \( X_4 = \frac{\text{Capital Fund}}{\text{Total Liability}} \) (Stand for leverage measure)
5. \( X_5 = \frac{\text{Sales}}{\text{Total Assets}} \) (Stand for sales generating ability)

The Z-score is composite credit score for manufactures involving measures of firm’s performance including measures of corporate liquidity, cumulative and current profitability, leverage and sales productivity. Each measure is assigned a compute determined weighting such, that when an analyst multiplies the weights lines the financial performance and sums up of this five factors, the result is the overall Z-score.

The Z-score have gained acceptance by auditor’s management accountants, courts and data base system for evaluation. It has been used in variety of context and countries but was designed originally for publicly held manufacturing companies with assets of more than $01 million. The latter published Altman modification model called Z1-score which can be applied to privately hold manufacturing companies and Z2-score for non-manufacturing companies. The various Altman model with applicable firm are as follow.

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Applicable Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-score</td>
<td>1.2X1+1.4X2+3.3X3+0.6X4+0.999X5</td>
<td>Publicly Manufacturing Companies</td>
</tr>
<tr>
<td>Z1-score</td>
<td>0.171X1+0.847X2+3.107X3+0.42X4+0.998X5</td>
<td>Privately Manufacturing Companies</td>
</tr>
<tr>
<td>Z2-score</td>
<td>6.56X1+3.26X2+6.72X3+1.05X4</td>
<td>None-Manufacturing Companies</td>
</tr>
</tbody>
</table>

The latter two equations are often referred to as Altman model for privately Manufacturing Companies and non-manufacturing company’s zones of discrimination are as follows:
5. Mottals liquidity position rank test

In the study liquidity position is tested by a comprehensive test known as “Mottals test”. The detail about components use in mottals test which is shown below:

<table>
<thead>
<tr>
<th>Zones</th>
<th>Z</th>
<th>Z1</th>
<th>Z2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe Zones</td>
<td>Z &gt; 2.99</td>
<td>Z &gt; 2.9</td>
<td>Z &gt; 2.6</td>
</tr>
<tr>
<td>Grey Zones</td>
<td>1.81 &lt; Z &lt; 2.99</td>
<td>1.23 &lt; Z &lt; 2.9</td>
<td>1.1 &lt; Z &lt; 2.6</td>
</tr>
<tr>
<td>Distress Zones</td>
<td>Z &lt; 1.81</td>
<td>Z &lt; 1.23</td>
<td>Z &lt; 1.1</td>
</tr>
</tbody>
</table>

In this test the following ratios are taken into consideration. Each of the ratios is expressed as percentage.

i. Inventory/Current Assets
ii. Debtors/Current Assets
iii. Cash and Bank/Current Assets
iv. Loan and Advances and other Current Assets/Current Assets

For (i) the lower the ratio more favorable is the position and ranking has been done in that order. For (ii), (iii) and (iv) the higher the ratio, the more favorable is the position and thus ranking has been done in that order. Ultimate ranking has been done on the principle that lower the points scored the more favorable is the position and vice-versa.

➢ Techniques:-

1. Analysis of variance (ANOVA)

Professor R. A. fisher man to use that term variance and in fact it was he who developed a very elaborate theory concerning ANOVA explaining its usefulness in practical field. Later on Professor snedecor and many other contributed to the development of this technique. ANOVA is essentially a procedure for testing the difference among different groups of data for homogeneity. “The essence of ANOVA is that total amount of variation in a set of data is broken down into two types, that amount which can be attributed to chance and that amount which can be attributed to specified causes.” There may be variation between samples and also within sample items. ANOVA consists in splitting the variance for analytical
purposes. Hence, it is a method of analyzing the variance to which a response is subject into its various components corresponding to various source of variation.

Thus in general through ANOVA technique one can, investigate any number of factors which are hypothesized or said to influence the dependent variable. One may as well investigate the differences amongst various categories within each of these factors which may have a large number of possible values. If we take only one factor and investigate the differences amongst its various categories having numerous possible values, we are said to use one-way ANOVA and in case we investigate two factors at the same time, then we use two-way ANOVA. In two ways ANOVA, the interaction of inter-relationship of two factors affecting the value of a variable can as well be studied for better decision.

2. **Correlations and matrix Correlations:**

   The mode of relation and degree of relationship are measure through Correlations. The matrix Correlation is used for measuring interrelationship between more than two variables. The present study also used correlation for deciding Correlation between Return of equity and other selected variable. Matrix Correlation used for measuring interrelationship between twenty five financial variables.

3. **Standard Deviation and Coefficient of Variance:**

   In the present study Standard deviation has used as a one statistical techniques for deciding how the variable are far from the mean and Coefficient of Variance are used for measuring policy consistency or uniformity of variables.

4. **Factor Analysis:**

   Centroid method of factor analysis, developed by L.L. Thurstone, was quite frequently used until about 1950 before the advent of large capacity high speed computers. The centroid method tends to maximize the sum of loadings, disregarding signs; it is the method which extracts the largest sum of absolute loadings for each factor in turn. It is defined by linear combinations in which all weights are either + 1.0 or – 1.0. The main merit of this method is that it is relatively simple, can be easily understood and involves simpler computations. If one understands this method, it
becomes easy to understand the mechanics involved in other methods of factor analysis. The study used centroid method of factors analysis for determination of prominent factors which is highly affected to financial health of the units.

1.6 Chapter plan

The present study generalized eight chapters. The first chapter of the study has described methodology of research study has been used for testing the hypotheses. The first chapter also displays significances of the study to various stakeholder and future scope for further research.

Second chapter of the study include overview of oil and gas sectors with the global trend and sample profile of selected oil refineries in India. Price chronology of oil product of last five years and milestone of the oil and natural gas sector is a main theme of the second chapters.

Last chapter of the study include main finding from the analysis of financial data and overhead cost structure. The suggestion for better efficiency and financial performance has generalized in last section of the last chapter.

The remaining chapters of the study included analytical part of study namely profitability, liquidity, assets management, comparatives and overhead cost structure analysis. The objective wise chronological step has followed for this analysis section of the study The name of each chapter given below:

Chapter -1 Research Methodology
Chapter- 2 Overview of Oil Industry and Sample Profile
Chapter - 3 Profitability Analysis of Oil Refineries
Chapter - 4 Liquidity Analysis of Oil Refineries
Chapter - 5 Assets Management of Oil Refineries
Chapter -6 Comparative Analysis of Oil Refineries
Chapter -7 Overhead Cost Structure Analysis of Oil Refineries
Chapter - 8 Findings And Suggestions
1.6 Significances of the study

This industry is core industry and it has a very large investment of the country. So it can be said that the large investment are blocked in the refineries undertaken for the study the for the research purpose, it has been many reason for the significance of the study. The significance of the study will be as follows.

1. The study has been deal with certain financial parameters and financial tools. From that financial position, positive side and negative side can be review by researcher. The study has helpful for predicting overall performance of selected oil refinery and oil industry.

2. The study has been described efficiency of utilization of shareholder fund through various ratios like return on investment, return on shareholder fund and return from capital employed etc..... The investors can take decision about their investment activities. In additions domestic institutional investors and foreign institution investors also know about performance of oil industry in economy. The study helpful for taking investment decision great extent. The existing shareholder also can forecast for forth coming dividend receivable in future.

3. The suppliers and lenders are more interested to know liquidity condition and liquidity policy of company because supplier give time lag of payment for supplying goods and lenders interested to receive back their investment on due time. The study has given a clear picture about liquidity condition and liquidity policy. So decision can reviewed according by the supplier and lenders either individuals or institutions.

4. The manager much conscious to utilization of fund which was collected from society. The manager required to take internal decision for management of cash, management of receivable, management of inventory and cost control decision. The study measure possible areas in which cost control might be possible. So decision can be reviewed.

5. The accounting tools are used for measuring the financial performance of manufacturing units or analysis of financial statement. The statistical techniques used for testing the hypothesis and also measure degree of relationship and mode of relationship between two or more variables. The combination of accounting tools and statistical techniques give clear picture about financial health. The
6. The oil industry large extent regulated by the gout because major players are dominated as public sectors. The crude prices are mostly affected to economy. So study has been importance to measuring the economics of employment and social development.

7. Energy industry is obviously one of the most critical areas improving India’s energy infrastructure increase in investment in all the sector it also requires much greater level of efficiency to ensure low cost and good quality of service. So to improve the level of efficiency analyzed data of this research will be necessary.

1.7 Limitations of study

The study is limited up to following:

1. The study will base on secondary data taken from published annual report and website.
2. The individual effort will be limited so it also limitation of the study.
3. This study on public sector, so data depend on policy of government.
4. It may be personal view differ from others.
5. The financials statements are analyzed in past data and not reflect on current cost scenario. Over a period of time not affected of changing price level.
6. The certain aspect cannot be expressed in terms of money, mainly reputation of company, worker efficiency, relationship with stakeholders, customer satisfaction and behavioral responses etc. The financial statement analysis is outside of these approaches.

1.8 Future scope of study

The future scope of the study will be wide in this area of study.

This study include public sectors refineries however, private sectors units can be consider reviewing the performance of industry. The financial and none financial performance of the companies has been analyzed from various areas, but remaining
aspect of these units such as social responsibility, human resources management, costing methods, market policies, dividend policies and leverage etc…can be studies in future. There are great scopes for further research.

The study has limited for five year period i.e.2007-08 to 2011-12. Further will be expand study period for measuring better financial health and trend. The study total related with financial aspect only. The certain aspect cannot be expressed in terms of money, mainly reputation of company, worker efficiency, relationship with stakeholders, customer satisfaction and behavioral responses etc. So this field open for further research.

In this study, comparative analysis has been made with certain tool and hypothesis. It can be change for analysis to derive meaningful conclusion. So there is great scope in various aspects in different area with variation in aspect of data. The study will useful for future research as an empirical literature review.