Chapter - 3
Research Design

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3.1 Introduction

Financial accountancy (or financial accounting) is the field of accountancy concerned with the preparation of financial statements for decision makers, such as stockholders, suppliers, banks, employees, government agencies, owners, and other stakeholders. The fundamental need for financial accounting is to reduce principal-agent problem by measuring and monitoring agents' performance and reporting the results to interested users.

Financial accountancy is used to prepare accounting information for people outside the organization or not involved in the day to day running of the company. Managerial accounting provides accounting information to help managers make decisions to manage the business.

In short, Financial Accounting is the process of summarizing financial data taken from an organization's accounting records and publishing in the form of annual (or more frequent) reports for the benefit of people outside the organization.

Financial accountancy is governed by both local and international accounting standards.

Financial accountants produce financial statements based on Generally Accepted Accounting Principles (GAAP) of a respective country.

Financial accounting serves following purposes:

- producing general purpose financial statements
- Provision of information used by management of a business entity for decision making, planning and performance evaluation.
- For meeting regulatory requirements\(^1\).

This research tries to identify by the financial accounting systems in State of Maharashtra (India) based on three components:

(a) Justification for investment in advance manufacturing technologies.

(b) Performance measurement and

(c) Model of financial accounting systems in alignment with the current manufacturing technology.

Accrual-basis accounting records financial events based on events that change your net worth (the amount owed to you minus the amount you owe others). Standard practice is to record and recognize revenues in the period in which they incur and to match them with related expenses in a process known as matching or expense matching. Even though cash is not received or paid in a credit transaction, they are recorded because they are consequential in the future income and cash flow of the company. Accrual-basis is GAAP compliant.

Cash-basis accounting is a method of bookkeeping that records financial events based on cash flows and cash position. Revenue is recognized when cash is received and expense is recognized when cash is paid. In cash-basis accounting, revenues and expenses are also called cash receipts and cash payments.
Cash-basis accounting does not recognize promises to pay or expectations to receive money or service in the future, such as payables, receivables, and prepaid expenses. This is simpler for individuals and organizations that do not have significant amounts of these transactions, or when the time lag between the initiation of the transaction and the cash flow is very short.

Two types of cash-basis accounting exist: strict and modified. Strict cash-basis follows the cash flow exactly. Modified cash-basis includes some elements from accrual-basis accounting such as inventory and property capitalization.

An accounting method measures the performance and position of a company by recognizing economic events regardless of when cash transactions occur. The general idea is that economic events are recognized by matching revenues to expenses (the matching principle) at the time in which the transaction occurs rather than when payment is made (or received). This method allows the current cash inflows/outflows to be combined with future expected cash inflows/outflows to give a more accurate picture of a company's current financial condition.

3.2 Meaning of Research Design

For a long time, research design has been considered a highly specialized tool for the success of a research program. It is a plan of a proposed research work. To design is to plan; that is, designing is the process of making decisions before the situation arises in which the decision has to be
carried out. It, thus, provides a picture for the whole before starting of the work. It is the general blue print that guides the investigator in the process of collecting, analyzing and interpreting observations. It includes an outline of what the investigator will do from writing the hypothesis and their operational implications to the final analysis of data. The research design defines that domain of generalizability. It is, thus, a process of deliberate anticipation directed towards bringing an expected situation under control.

Research design tells the investigators what to observe, whom to observe, how to observe, why to observe, how to record the observation, how to analyze the observations and what inferences can be drawn. In fact, the investigator sees the whole study structure and also realizes the place and important of the successive steps that researcher will be required to take in the total scheme. Accordingly, the structure of this study is described as follows:

3.3 Importance of the Study

By way of explanation it may be pointed out that perspectives of production factories are changing, if not of all, at least of those that are willing to be competitive. These factories are profit oriented and focused on manufacturing qualitative products instead of delivering shoddy products. They are reinventing ways and means of improving the quality of the goods the produce, reducing merchandise inventory, increasing their markets share and offering better services to their customers. These goal-oriented manufacturing units are naturally trying to reorganizing their factories, so they can change them to fast, efficient and flexible systems. Some of them have
incurred heavy expenditure on the automation of their machineries. As a result, there has been a sea-change both in the manufacturing possess and in the marketing techniques. However, corresponding changes in financial analysis has not been withstand. Financial accounting system is somewhat out of sync with the modern financial accounting systems that are in alignment and in consonance with the production technology processes. The few who are trying to reorient themselves to the new accounting needs face an uphill task. Some authors ascribe the reason for this to the defects existing in the financial accounting system itself which is the cause for the slowness or reluctance. Therefore, there is an urgent need for financial accounting system to adjust itself to be in consistent with the current production environment.

On the basis of the above explanation, for the urgent need of revamping the system of financial accounting, three questions on the three components – (a) investment justification in manufacturing technologies, (b) financial accounting methods, and (c) performance measurement – are posed as leads for research emphasis.

1. How should we justify the investment in technology?

2. What are the characteristics of financial accounting methods for Pharmaceutical industry?

3. Which are the factors that should be considered for the performance evaluation of Pharmaceutical Companies?
3.4 Problems under the study

This Research intends to study the methods of financial accounting used in Pharmaceutical manufacturing Industry in Maharashtra by using information of balance sheet and profit & loss statements. The following Research problems are proposed:

As a subset of management information systems, accounting information system provides the necessary fiscal information for the management’s decision making. In such a system timely and accurate, presentation of the information has a particular significance.

The accounting system records the financials transaction on an accrual basis in pharmaceutical industry. Financial statement and reports indicate the fiscal status and the performance of the economic firm or unit.

On one hand, taking into consideration performance and choosing the appropriate index to evaluate the performance of the economic unit, and on the other hand, allocating expenses with economical profits are said to be the concerns of the managers in economic unit.

Now a days, in development age of technology and the competition for survival and continuance of the activities have caused that manufacturing units obtain new technology like computerized systems while attaining new information by using Research and Development expenses. The current concern of the managers is appropriate and timely use of available facilities so that they can induce greater satisfaction on the part of the customers along with increasing the quality of the products and services. To
fulfill this issue needs allocating development and research expenditure and evaluating the extent it’s influences on performance of the manufacturing unit by studying performance indexes. With this view point in this study, the researcher is after studying the appropriate performance index and the influence of research and development expenditure in computerized system based environments.

**Research questions:**

The researcher has tried to find the answer to following questions:

1. Which financial accounting method is used in Pharmaceutical manufacturing Industry in Maharashtra?

2. How can financial accounting methods have relationship to manufacturing technology?

3. Does the method of accounting used have positive impact on investment in advanced manufacturing technology?

4. Does the method of accounting used have positive impact on performance measurement?

5. Does the method of accounting used have positive impact on continuance of current manufacturing technology?

**3.5 Objectives of the study**

Researcher by examining and analyzing the financial reports of the Pharmaceutical companies in the State of Maharashtra has taken into
consideration the following objectives to examine the mentioned problems and to conclude appropriately.

The main research objectives are summarized as follows:

1. Identifying and understanding the methods of financial accounting used in pharmaceutical industry.

2. Identifying and analyzing relationship between the methods of financial accounting used and investment in advanced manufacturing technology.

3. Identifying and analyzing relationship between the method of financial accounting used and performance measurement.

4. Identifying and analyzing relationship between the methods of financial accounting used and continuance of current manufacturing technology.

5. Achieving the Justification and factors that Pharmaceutical manufacturing companies use while deciding on investment in advanced manufacturing technologies.


7. Examining and analyzing difference between accrual and cash methods in various variables.

8. Identifying and analyzing the relationship between effective variables over Justification of investment in advanced manufacturing technology.
performance evolution with the levels of Technology inputs and the size of the Pharmaceutical manufacturing companies.

9. Providing an adjustment mode of financial accounting on the basis of Accounting practices and manager’s views.

3.6 Hypotheses

A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event. A useful hypothesis is a testable statement which may include a prediction. In other words, the hypotheses are a powerful tool that can link all to theory and theory to all⁴. Based on what mentioned in this Chapter, the research hypotheses examine the effects of methods of accounting used in pharmaceutical industries on making decisions relevant to investment in manufacturing technology and performance measurement. In this study, the hypotheses are:

Hypothesis 1:
Methods of accounting used in pharmaceutical industry have positive impact on making decision regarding to investment in advanced manufacturing technology.

Hypothesis 2:
Methods of accounting used in pharmaceutical industry have positive impact on making decision regarding the performance measurement.
Methods of accounting used in pharmaceutical industry have positive impact on decision making regarding to continuous of current manufacturing technology.

3.7 Research methodology

(A) Primary data collection;

This is first hand information; the researcher has collected primary data through survey, personal interview of executives and questionnaire filled on the basis of interviews.

(B) Secondary data;

This is the published information: the researcher has collected secondary data through Pharmaceutical companies in India(Maharashtra), research journals & magazines, annual reports, publications of stock exchange, references and text books, information published by government department etc, the secondary data also collected through various libraries situated in India particularly, in Pune. The secondary data is mainly selected from:

A) Books
B) Journals
C) Annual reports
D) Internet
E) Libraries
And by referring to the India stock exchange (BSE) and the available information banks, the data were collected in the form of the checklists. The financial statement and capital market data for our research were obtained from publicly available databases maintained by center for monitoring the Indian economy (CMIE).

### 3.8 Scope of the Study

The scopes of this study are as follows:

#### 3.8.1 Subject scope

According to hypotheses and objectives mentioned in current research, researcher has scope of studying the financial accounting methods applied in pharmaceutical manufacturing industry in the state of Maharashtra (India).

Researcher has examined impact of financial accounting methods on decision making regarding:

1. Investment in advanced manufacturing technology
2. Performance measurement
3. Continuance of current manufacturing technology

Researcher has considered Research and Development Exp. i.e. the expenditure which affects the updating of the system producing modern and high-quality of the products, increasing customer’s satisfaction and bring about competitive capabilities for the company.
3.8.2 Geographical Scope:

This study has been conducted in pharmaceutical companies in the state of Maharashtra.

3.8.3 Time Scope:

The related interval under study for examining the accounting systems and evaluating the performance of the pharmaceutical companies is 5 fiscal years from 2005-06 to 2009-10 fiscal years.

3.9 Population and sampling

The statistical population under study is the active Pharmaceutical companies in the State of Maharashtra. 40 Pharmaceutical companies are active in this area. From among the aforementioned companies 9 have been selected as sampling companies. All 9 companies are active in Bombay Stock Exchanges (BSE) and so choosing the statistical sample is not accidental and the statistical sample includes the nine companies as follows.

1. Cipla ltd.
2. Sun Pharmaceutical Ltd.
3. J.B Chemical Ltd.
4. Wockhardt Ltd.
5. Glen mark Ltd.
6. Lupin Ltd.
7. FDC Ltd.
8. Aarti drugs Ltd.

9. Elder Ltd.

### 3.10 Data analysis

In this study, the information content has been examined using the usual statistical tools like t-test and simple coefficient correlation.

Coefficient of correlation is used to describe how well one variable is explained by the other variable. It reveals the magnitude and direction of relationship. The magnitude is the degree to which variables move in the same or opposite direction. The co-efficient signifies the direction of the relationship.

- **t-** Statistics is used for testing the significance of a dependent variable over the independent variable. There are two methods of testing the relationship with the help of t-statistics:

1) - To compare the values of t-calculated with that of t-tabulated. In this case if the calculated t-value is greater than that of table value null hypothesis has to be rejected and alternative hypothesis has to be accepted.

2)-To compare the p-value with the level of significance:

- If the p-value is greater than or equal to level of significance, the null hypothesis is accepted.
- If the p-value is less than the level of significance, the null hypothesis has to be rejected.
3.10.1 Concept of hypothesis testing (tests of significance)

What we really want to know is: “Is the observed association due to chance?”, or “How likely is it that the observed association is due to chance?” This probability is sometimes referred to as the “posterior [a posteriori] probability”, the probability that the hypothesis is true given the observed results. (The “prior [a priori] probability” that the hypothesis is true is our belief in the hypothesis before we have the results in question).

The frequents school of statistics, from which significance testing derives, cannot answer this question directly. Instead, significance tests and p-values attempt to provide an indirect answer, by reformulating the question as: “How often would an association as strong as that observed occur by chance alone?”. The role of chance is played by a suitable probability model, chosen to represent the probability structure of the data and the study design. But most epidemiologic studies deviate rather markedly from the probability models on which statistical tests are based (e.g., see Sander Greenland, Randomization, statistics, and causal inference), so although statistical theory is extremely precise, it must be thoughtfully applied and thoughtfully interpreted.

A compromise version of the question that underlies a significance test is “How consistent are the numerical data with what would be expected ‘by chance’ – as played by a suitable probability model”. The probability model is most often one that assumes no systematic difference between groups, partly because such models are easier to derive and also because it is often convenient for the hypothesis-testing framework. The result of the significance
test is a probability (the p-value), which provides a quantitative answer to this compromise question. (Note: The statistical “null hypothesis” is rarely of interest from a substantive perspective. A study hypothesis should be stated in terms of no association only if that is indeed what the investigator hopes to demonstrate. In fact, it is quite difficult to demonstrate the absence of association, since the evidence for no association is related to the Type II error probability (1 – statistical power) for the study, which is generally considerably greater than the significance level – see below).

The p-value itself can be regarded as a descriptive statistic, a piece of evidence that bears on the amount of numerical evidence for the association under study. When a decision is called for, though, then some method of assigning an action to the result of the significance test is needed.

Decision-making entails the risk of making errors. Ideally the loss function (the costs of errors of various types) is known explicitly. Under broadly applicable assumptions, though, the theory of decision-making provides a technique for decision-making based on the results of a statistical test. That technique is statistical hypothesis testing.

As noted, the hypothesis to be tested is generally a “null hypothesis” (usually designated H0). H0 is the probability model that will play the role of chance (for example, the red socks model). In the present context, that model will be based on the premise that there is no association. If there is sufficient numerical evidence to lead us to reject H0, then we will decide that the converse is true, that there is an association. The converse is designated as the
"alternate hypothesis" (HA). The decision-making rule is to reject H0, in favor of HA, if the p-value is sufficiently small, and to otherwise accept H0.

Since we have a decision between two alternatives (H0 and HA) we can make two kinds of errors:

Type I error: ERRONEOUSLY reject H0 (i.e., conclude, incorrectly, that data are not consistent with the model)

Type II error: ERRONEOUSLY fail to reject H0 (i.e., conclude, incorrectly, that data are consistent with the model).

(The originator of these terms must have been more prosaic than the originators of the terms "significance", "power", "precision", and "efficiency".) Traditionally, the Type I error probability has received more attention and is referred to as the "significance level" of the test. In a strict decision-making mode, the result of the significance test is "Reject null hypothesis" or "Fail to reject null hypothesis" (Note that "fail to reject the null hypothesis" is not equivalent to declaring that the null hypothesis is true.) However, rarely must a decision be made based on a single study, so it is preferable to report the calculated p-value (probability that the assumed probability model would produce data as extreme or more so).

The p-value gives more information than the statement "results were significant at the 5% level", since it quantifies the degree to which the data are incompatible with "chance" (as played by the probability model), allowing the reader to apply his/her tolerance for a Type I error. Note that the p-value is not a direct index of the strength of an association in an epidemiologic sense or of
its biologic, clinical, or epidemiologic “significance”. The p-value simply assesses the compatibility of the observed data with the assumed probability model that serves to represent H0.

There are many methods for obtaining a p-value or conducting a test of statistical significance. The choice depends upon the level of measurement of the variables (dichotomous, nominal polychromous, ordinal, continuous), the sampling design from which the data came, and other factors. The statistical test illustrated above is an “exact” test (Fisher’s exact test), since it is based on a model that considers all possible outcomes and in how many ways each can occur. In an exact test, the probability model is readily apparent.

3.10.2 Types of variables - levels or scales of measurement

Constructs or factors being studied are represented by “variables”. Variables (also sometimes called “factors”) have “values” or “levels”. Variables summarize and reduce data, attempting to represent the “essential” information.

Variables can be classified in various ways. A continuous variable takes on all values within its permissible range, so that for any two allowable values there are other allowable values in between.

A continuous variable (sometimes called a “measurement variable”) can be used in answer to the question “how much”. Measurements such as weight, height, and blood pressure can, in principle, be represented by continuous variables and are frequently treated as such in statistical analysis. In practice, of course, the instruments used to measure these and other
phenomena and the precision with which values are recorded allow only a finite number of values, but these can be regarded as points on a continuum.

Mathematically, a discrete variable can take only certain values between its maximum and minimum values, even if there is no limit to the number of such values (e.g., the set of all rational numbers is countable though unlimited in number). Discrete variables that can take any of a large number of values are often treated as if they were continuous. If the values of a variable can be placed in order, then whether the analyst elects to treat it as discrete and/or continuous depends on the variable’s distribution, the requirements of available analytic procedures, and the analyst’s judgment about interpretability.

3.10.2.1 Types of discrete variables

1. Identification – a variable that simply names each observation (e.g., a study identifying number) and which is not used in statistical analysis,

2. Nominal – a categorization or classification, with no inherent ordering; the values or the variable are completely arbitrary and could be replaced by any others without affecting the results (e.g., ABO blood group, clinic number, and ethnicity). Nominal variables can be dichotomous (two categories, e.g., gender) or polychromous (more than two categories).

3. Ordinal – a classification in which values can be ordered or ranked; since the coded values need only reflect the ranking they can be replaced by any others with the same relative ranking (e.g., 1,2,5; 6,22,69; 3,5,4,2, 6.9 could all
be used in place of 1, 2, 3). Examples are injury severity and socioeconomic status.

4. Count – the number of entities, events, or some other countable phenomenon, for which the question “how many” is relevant (e.g., parity, number of siblings); to substitute other numbers for the variable’s value would change its meaning. In epidemiologic data analysis, count variables are often treated as continuous, especially if the range is large.

### 3.10.2.2 Types of continuous variables

1. Interval – differences (intervals) between values are meaningful, but ratios of values are not. That is, if the variable takes on the values 11-88, with a mean of 40, it is meaningful to state that subject A’s score of 60 is “twice as far from the mean” as subject B’s score of 50. But it is not meaningful to say that subject A’s score is “1.5 times the mean”. The reason is that the zero point for the scale is arbitrary, so values of the scores have meaning only in relation to each other. Without loss of information, the scale can be shifted: 11-88 could be translated into 0-77 by subtracting 11. Scale scores can also be multiplied by a constant.

   After either transformation, subject A’s score is still twice as far from the mean as is subject B’s, but subject A’s score is no longer 1.5 times the mean score. Psychological scales (e.g., anxiety, depression) often have this level of measurement. An example from physics is temperature measured on the Fahrenheit or Celsius scale.
2. Ratio – both differences and ratios are meaningful. There is a non-arbitrary zero point, so it is meaningful to characterize a value as “x” times the mean value. Any transformation other than multiplying by a constant (e.g., a change of units) will distort the relationships of the values of a variable measured on the ratio scale. Physiological parameters such as blood pressure or cholesterol are ratio measures. Kelvin or absolute temperature is a ratio scale measure.

Many variables of importance in epidemiology are dichotomous (i.e., nominal with two levels) – case vs. noncash, exposed vs. unexposed. For an apparently ordinal or continuous variable, the phenomenon itself may not warrant treatment as such. It is necessary to ask such question as: “Is ‘more’ really more?” and “Are thresholds or discontinuities involved?” Again, the underlying reality (or, rather, our conceptual model of it) determines the approach to quantification. Variable values are often collapsed into a small number of categories for some analyses and used in their original form for others.

3.10.3 One-sided versus two-sided p-values

Recall that the p-value is the probability of obtaining an association as strong as (or stronger than) the association that was observed. It turns out, though, that the phrase “as strong as (or stronger than)” is ambiguous, because it does not specify whether or not it is intended to include inverse associations, i.e., associations in the opposite direction from the putative association that motivated the study. For example, if we observe a 2.5 relative risk, does “as strong” mean only relative risks of 2.5 or larger, or does it also mean relative risks of 0.4 or smaller? If the former (only 2.5 and larger), then the
corresponding p-value is “one-sided” (or “one-tailed”). In contrast, if HA is “either greater than or equal to 2.5 or [inclusive] less than or equal to 0.4”, and then a two-sided p-value is indicated.

The issue of one-sided versus two-sided p-values can arouse strong emotions. For a given calculated value of Z, the one-sided p-value is exactly half of the two-sided p-value. Proponents of two-sided p-values argue that a one-sided p-value provides an inflated measure of the statistical significance (low probability of obtaining results by chance) of an association. Appropriate situations for using one-sided p-values are sometimes characterized as ones where the investigator has no interest in finding an association in the opposite direction and would ignore it even if it occurred.

3.11 Variables definition

3.11.1 Net Profit Ratio

The Net Profit Percentage is the ratio of after-tax profit to net sales. It reveals the remaining profit after all costs of production and administration have been deducted from sales, and income taxes recognized. As such, it is one of the best measures of the overall results of a firm, especially when combined with an evaluation of how well it is using its working capital. Net profit is not an indicator of cash flows, since net profit incorporates a number of non-cash expenses, such as accrued expenses and depreciation.

The formula for the net profit ratio is $\frac{\text{Net profit}}{\text{Net sales}} \times 100$
The net profit ratio is really a short-term measurement, because it does not reveal a company's actions to maintain profitability over the long term, as may be indicated by the level of capital investment or research and development expenditures. Also, a company may delay a variety of discretionary expenses, such as maintenance, to make its net profit ratio look better than it normally is. Consequently, you show evaluate the net profit ratio alongside a variety of other metrics to gain a full picture of a company's ability to continue as a going concern.

Another issue with the net profit margin is that a company may intentionally keep it low in accordance with a low-pricing strategy that aims to grab market share in exchange for low profitability. In such cases, it may be a mistake to assume that a company is doing poorly, when in fact it may own the bulk of the market share precisely because of its low margins.

The net profit margin, also known as net margin, indicates how much net income a company makes with total sales achieved. A higher net profit margin means that a company is more efficient at converting sales into actual profit. Net profit margin analysis is not the same as gross profit margin. Under gross profit, fixed costs are excluded from calculation. With net profit margin ratio all costs are included to find the final benefit of the income of a business. Similar terms used to describe net profit margins include net margin, net profit, net profit ratio, net profit margin percentage, and more. To calculate net profit margin and provide net profit margin ratio analysis requires skills ranging from those of a small business owner to an experienced CFO. This depends on the size and complexity of the company.
Using the net profit margin ratio formula, though essential, is a fairly simple process. The difficulty is taking steps every day to keep the proper financial information to calculate this and other financial ratios. Use this formula as a net profit margin calculator:

\[
\text{Net profit margin} = \frac{\text{Net income}}{\text{Total revenue}}
\]

Financial calculators exist which can simplify the process of net profit margin calculation.

In order to convert NPR under accrual to cash method, at first net sale and expenses should be converted to net sale and expenses as per cash method.

For conversion of net sale is used the following formula:

Net Sale as per accrual method
Less (-): Closing sundry debtors
Plus (+): Opening sundry debtors
Equal (=) Net Sale as per cash method

For conversion of Raw material costs, the following formula is used:

Raw material costs under accrual method
Less (-): Closing sundry creditors
Plus (+): Opening sundry creditors
Equal (=): Raw material costs as per cash method

For conversion of Manufacturing, salary and wages expenses, the following formula is used.

Total Manufacturing, salary and wages expenses under accrual method
Less (-): Closing other liabilities
Plus (+): Opening other liabilities
Equal (=): Total Manufacturing, salary and wage expenses as per cash method
As per statements mentioned financial managers of companies outstanding salary and wages expenses and outstanding manufacturing expenses have been cleared on other liabilities and raw material expenses has been cleared on sundry creditors in balance sheet.

Difference between net sale as per cash method and expenses as per cash method is net profit and NPR through the following formula is calculated:\textsuperscript{10}

\[
\text{Net Profit Ratio} = \frac{\text{Net Profit}}{\text{Net sale}} \times 100
\]

3.11.2 Operating Profit Ratio

A measure of a company’s earning power from ongoing operations, equal to earnings before deduction of interest payments and income taxes. Also called EBIT (earnings before interest and taxes) or operating income.

The profit earned from a firm’s normal core business operations. This value does not include any profit earned from the firm’s investments (such as earnings from firms in which the company has partial interest) and the effects of interest and taxes.

Calculated as:

\[
\text{Operating profit ratio} = \frac{\text{Operating Profit}}{\text{Net Sale}} \times 100
\]

In order to convert operating profit under accrual to cash method, net profit obtained as per cash method in previous page is added to tax and interest. The formula is below:
Net profit as per cash method + Tax + Interest = Operating Profit as per cash method.

3.11.3 Gross Profit Ratio

Gross profit ratio shows the relationship between gross profit of the concern and its net sales. Gross profit ratio can be calculated in the following manner:

\[ \text{Gross Profit Ratio} = \left( \frac{\text{Gross profit}}{\text{Net sales}} \right) \times 100 \]

Where:

Gross profit = net sales - cost of goods sold

Net sales = total sales - sales return

The basic components for the calculation of gross profit ratio are gross profit and net sales. Net sales mean those sales minus sales returns. Gross profit would be the difference between net sales and cost of goods sold. Cost of goods sold in the case of a trading concern would be equal to opening stock plus purchases, minus closing stock plus all direct expenses relating to purchases. In the case of manufacturing concern, it would be equal to the sum of the cost of raw materials, wages, direct expenses and all manufacturing expenses. In other words, generally the expenses charged to profit and loss account or operating expenses are excluded from the calculation of cost of goods sold.
Gross profit ratio may be indicated to what extent the selling prices of goods per unit may be reduced without incurring losses on operations. It reflects efficiency with which a firm produces its products. As the gross profit is found by deducting cost of goods sold from net sales, higher the gross profit better it is.

There is no standard GPR for evaluation. It may vary from business to business. However, the gross profit earned should be sufficient to recover all operating expenses and to build up reserves after paying all fixed interest charges and dividends.

It should be observed that an increase in the GP ratio may be due to the following factors.

1. Increase in the selling price of goods sold without any corresponding increase in the cost of goods sold.

2. Decrease in cost of goods sold without corresponding decrease in selling price.

3. Omission of purchase invoices from accounts.


On the other hand, the decrease in the gross profit ratio may be due to the following factors.

1. Decrease in the selling price of goods, without corresponding decrease in the cost of goods sold.

2. Increase in the cost of goods sold without any increase in selling price.
3. Unfavorable purchasing or markup policies.

4. Inability of management to improve sales volume, or omission of sales.

5. Over valuation of opening stock or under valuation of closing stock

Hence, an analysis of gross profit margin should be carried out in the light of the information relating to purchasing, mark-ups and markdowns, credit and collections as well as merchandising policies.

We calculated Operating profit as per cash method in calculating operating profit ratio and also converted manufacturing expenses and net sale to cash method in calculating net profit ratio in previous pages. In annual reports of pharmaceutical industry operating expenses consist of manufacturing and salary and wage expenses. The attention to above description Gross profit ratio is calculated as per cash method through the following formulas\(^\text{12}\):

\[
\text{Operating profit} + \text{Operating expenses} = \text{Gross profit} \\
\text{Gross profit ratio} = \frac{\text{Gross profit}}{\text{Net sale}} \times 100
\]

**3.11.4 Return on Equity**

Disarmingly simple to calculate, return on equity is a critical weapon in the investor's arsenal, as long as it's properly understood for what it is. ROE encompasses the three pillars of corporate management -- profitability, asset management, and financial leverage. By seeing how well the executive team balances these components, investors can not only get an excellent sense of
whether they will receive a decent return on equity but can also assess management’s ability to get the job done.

Return on equity is calculated by taking a year's worth of earnings and dividing them by the average shareholder equity for that year. The earnings number can come directly from the Consolidated Statement of Earnings in the company's most recent annual filing with the SEC. It can also be figured as the sum of the past four quarters' worth of earnings, or as the average of the past five or 10 years' earnings, or it can even be an annualized figure based on the previous quarter's results. However, investors should be careful not to annualize the results of a seasonal business, in which all of the profit is booked in one or two quarters.

The shareholder-equity number is located on the balance sheet. Simply the difference between total assets and total liabilities, shareholder equity is an accounting convention that represents the assets that the business has generated. It's assumed that assets without corresponding liabilities are the direct creation of the shareholder capital that got the business started in the first place.

The usual way investors will see shareholder equity displayed is as "book value" -- the amount of shareholder equity per share, or the accounting book value of the business beyond its market value or intrinsic economic value. A business that creates a lot of shareholder equity is a sound investment, because the original investors will be repaid with the proceeds that come from the business operations. Businesses that generate high returns
relative to their shareholder equity pay their shareholders handsomely and create substantial assets for every dollar invested. These businesses are typically self-funding and require no additional debt or equity investments.

To quickly gauge whether a company is an asset creator or a cash consumer, look at the ROE it generates. By relating the earnings to the shareholder equity, an investor can quickly see how much cash comes from existing assets. If the ROE is 20%, for instance, then 20 cents of assets are created for every dollar originally invested. As additional cash investments increase on the asset side of the balance sheet, the ROE number shows whether additional dollars invested are dollars of return from previous investments.

If return on equity is simply:

\[
\text{ROE} = \frac{\text{one year's earnings}}{\text{shareholder equity}}
\]

Then how is it that we can see the profit margin, asset management, and financial leverage through this one calculation? If we expand the equation, we can start to take into account other variables.

\[
\text{ROE} = \left(\frac{\text{one year's earnings}}{\text{one year's sales}}\right) \times \left(\frac{\text{one year's sales}}{\text{assets}}\right) \times \left(\frac{\text{assets}}{\text{shareholder equity}}\right)
\]

Because the sales and the assets are both in the numerator and the denominator of the entire equation, they cancel one another out. When we break the equation apart in this manner, the three component parts of ROE come to light. Earnings over sales are profit margin, sales over assets are asset
turnover, and assets over equity are the amount of leverage the company has. We'll discuss each one, and after we complete our analysis, we'll come back to ROE and how this composite number can be used to evaluate companies. We'll also explore its limitations as an analytical tool.

Return on equity (ROE) measures the rate of return on the ownership interest (shareholders’ equity) of the common stock owners. It measures a firm's efficiency at generating profits from every unit of shareholders' equity (also known as net assets or assets minus liabilities). ROE shows how well a company uses investment funds to generate earnings growth. ROEs between 15% and 20% are considered desirable.

ROE is equal to a fiscal year’s net income (after preferred stock dividends but before common stock dividends) divided by total equity (excluding preferred shares), expressed as a percentage. As with many financial ratios, ROE is best used to compare companies in the same industry.

High ROE yields no immediate benefit. Since stock prices are most strongly determined by earnings per share (EPS), you will be paying twice as much (in Price/Book terms) for a 20% ROE Company as for a 10% ROE company.

The benefit comes from the earnings reinvested in the company at a high ROE rate, which in turn gives the company a high growth rate. The benefit can also come as a dividend on common shares or as a combination of dividends and reinvestment in the company. ROE is presumably irrelevant if the earnings are not reinvested.
- (The sustainable growth model shows us that when firms pay dividends, earnings growth lowers. If the dividend payout is 20%, the growth expected will be only 80% of the ROE rate.

- (The growth rate will be lower if the earnings are used to buy back shares. If the shares are bought at a multiple of book value (say 3 times book), the incremental earnings returns will be only 'that fraction' of ROE (ROE/3).

- (New investments may not be as profitable as the existing business. Ask "what is the company doing with its earnings?"

- (Remember that ROE is calculated from the company's perspective, on the company as a whole. Since much financial manipulation is accomplished with new share issues and buyback, always recalculate on a 'per share' basis, i.e., earnings per share/book value per share.

The DuPont formula, also known as the strategic profit model, is a common way to break down roe into three important components. Essentially, roe will equal the net margin multiplied by asset turnover multiplied by financial leverage. Splitting return on equity into three parts makes it easier to understand changes in roe over time. For example, if the net margin increases, every sale brings in more money, resulting in a higher overall roe. Similarly, if the asset turnover increases, the firm will generate more sales for every unit of assets owned, it will result in a higher overall ROE. Finally, increasing financial leverage means that the firm uses more debt financing relative to equity financing. Interest payments to creditors are tax deductible, but dividend payments to shareholders are not. Thus, a higher proportion of debt
in the firm's capital structure leads to higher ROE. Financial leverage benefits diminish as the risk of defaulting on interest payments increases. So if the firm takes on too much debt, the cost of debt rises as creditors demand a higher risk premium, and ROE decreases. Increased debt will make a positive contribution to a firm's ROE only if the matching return on assets (ROA) of that debt exceeds the interest rate on the debt.

\[
\text{ROE} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Average stockholder equity}}
\]

So, \( \text{ROE} = \frac{\text{Net income}}{\text{Shareholders' equity}} \times 100 \)

We converted net income or net profit as per accrual method to cash method in calculating NPR. Shareholders' equity is not changed and in both methods is similar. Then ROE is obtained by the above formula under cash method.

3.11.5 Return on Investment

Return on Investment (ROI) analysis is one of several commonly used approaches for evaluating the financial consequences of business investments, decisions, or actions. ROI analysis compares the magnitude and timing of investment gains directly with the magnitude and timing of investment costs. A high ROI means that investment gains compare favorably to investment costs.

In the last few decades, ROI has become a central financial metric for asset purchase decisions (computer systems, factory machines, or service
vehicles, for example), approval and funding decisions for projects and programs of all kinds (such as marketing programs, recruiting programs, and training programs), and more traditional investment decisions (such as the management of stock portfolios or the use of venture capital).

Most forms of ROI analysis compare investment returns and costs by constructing a ratio, or percentage. In most ROI methods, an ROI ratio greater than 0.00 (or a percentage greater than 0%) means the investment returns more than its cost. When potential investments compete for funds, and when other factors between the choices are truly equal, the investment—or action, or business case scenario—with the higher ROI is considered the better choice, or the better business decision.

One serious problem with using ROI as the sole basis for decision making is that ROI by itself says nothing about the likelihood that expected returns and costs will appear as predicted. ROI by itself, that is, says nothing about the risk of an investment. ROI simply shows how returns compare to costs if the action or investment brings the results hoped for. (The same is also true of other financial metrics, such as net present value, or internal rate of return). For that reason, a good business case or a good investment analysis will also measure the probabilities of different ROI outcomes, and wise decision makers will consider both the ROI magnitude and the risks that go with it.

Formula: Net Income / Value of Assets = ROI
Income / Value of Assets = ROI

(Better) alternative:

Net Income + Interest (1-Tax Rate) / Book value of Assets = Return on Investment

For conversion of ROI from accrual method to cash, there is need to convert net profit and total asset to cash method.

As mentioned net profit was converted from accrual method to cash in calculating net profit ratio but for conversion of total assets the following formula is used:

Total assets under accrual method

Less (-): Account Receivables

Less (-): Prepaid Expenses

Equal (=): Total assets under cash method

So ROI is calculated by the following formula:

$\text{ROI} = \frac{\text{Net profit}}{\text{Total assets}} \times 100$

3.11.6 Return on Working Capital

Working capital (abbreviated WC) is a financial metric which represents operating liquidity available to a business, organization, or other entity, including governmental entity. Along with fixed assets such as plant and equipment, working capital is considered a part of operating capital. Net
working capital is calculated as current assets minus current liabilities. It is a derivation of working capital that is commonly used in valuation techniques such as DCFs (Discounted cash flows). If current assets are less than current liabilities, an entity has a working capital deficiency, also called a working capital deficit.

Working Capital = Current Assets

Net Working Capital = Current Assets − Current Liabilities

Net Operating Working Capital = Current Assets − Non Interest-bearing Current Liabilities

Equity Working Capital = Current Assets − Current Liabilities − Long-term Debt

A company can be endowed with assets and profitability but short of liquidity if its assets cannot readily be converted into cash. Positive working capital is required to ensure that a firm is able to continue its operations and that it has sufficient funds to satisfy both maturing short-term debt and upcoming operational expenses. The management of working capital involves managing inventories, accounts receivable and payable, and cash.

Working capital represents the funds required to conduct daily business operations. It shows what readily available resources the business has at its disposal in order to meet the obligations coming due in the short term. The ratio of the current assets divided by current liabilities is known as the current ratio. It represents a key liquidity measure of business solvency.
Accounting for adequate working capital is an essential element of buying a small business. For many small businesses, the working capital needs change throughout the year. As a business buyer you need to determine what these seasonal fluctuations are, and provide for sufficient working capital at all times.

In order to convert Return on working capital under accrual method to cash method, net profit and working capital should be converted.

Net profit has been converted from accrual method to cash in calculating Net profit ratio on previous pages. But for conversion of working capital the following formula is used:

Current assets – account receivables – prepaid expenses

And about current liabilities:

Current liabilities are not taken in working capital as per cash method\(^3\).

3.11.7 Research and Development Ratio

R&D Ratio indicates relationship between Research and Development expenditure and net sale and is calculated below:

\[
\text{Research & Development} \times 100 \quad \frac{\text{Net sale}}{\text{Net sale}}
\]

R & D activities are defined as activities to further the research and development of new products and innovative technologies which do not negatively affect the environment or which restrict the negative effects on environment.\(^3\) With respect to research personnel, the activities are defined as creative work systematically undertaken to improve knowledge and the use of
this knowledge to invent new applications, such as the development of new products and new processes. Furthermore it includes the construction, development and testing of a prototype including the development of software in as far as it includes a scientific and technological progress.

R&D is an investment in a potential future stream of revenues from the sale of successful new drugs. Unlike other kinds of investments, such as a new manufacturing plant, the success of pharmaceutical R&D investment is highly uncertain and may take many years to be realized. The investors in pharmaceutical R&D must be able to "expect" not only to recoup their actual cash outlays for R&D but also to be compensated for the risk they took of losing their investment altogether and for the time they spent waiting for the investment to pay off. Without such an expectation, no investor would put his or her money on the line.

The full cost of the R&D investment can be thought of as the minimal "expected" payoff required inducing the investor to layout the money at each step of the research project. The "expected" payoff does not mean an assured payoff; rather, it means the minimal payoff required from the drugs that successfully reach the market after taking into account the chances of success and failure and the expected development time involved.

Pharmaceutical R&D is the process of discovering, developing, and bringing to market new ethical drug products. Most pharmaceutical R&D is undertaken by private industrial firms, and this report is about how and why industrial pharmaceutical companies make decisions to undertake, what they stand to gain from such investments, and how they are helped or hindered by
public policies that influence the process. Industrial R&D is a scientific and an economic process. 

Research and Development expenditure is divided two parts:
1. Revenue R&D expenditure, example: Raw material exp, laboratory exp.
2. Capital R&D expenditure, example: R&D building, R&D plant & machinery

Revenue expenditure on Research and Development is charged against profit of year in which it is incurred.

Capital expenditure on Research and Development is shown as addition to Fixed Assets.

In order to convert Research and Development expenditure under accrual method to cash method, we use the following formula:

R&D expenditure under accrual method
-(less)
Outstanding R&D expenditure
-(less)
Non cash R&D expenses
+(plus)
Prepaid R&D expenditure
=
R&D expenditure under cash method

The above formula is related to Revenue R&D expenditure. Capital R&D expenditure is not changed and in both methods is similar because capital expenditure on Research and Development is shown as addition to Fixed Assets.
3.12 Limitations of the study

Although financial statement analysis is highly useful tool, it has four limitations. These four limitations involve the comparability of financial data between companies and the need to look beyond ratios.

a) Comparison of one company with another can provide valuable clues about the financial health of an organization. Unfortunately, differences in accounting methods between companies sometimes make it difficult to compare the companies' financial data. For example if one firm values its inventories by Lifo method and another firm by the average cost method, then direct comparison of financial data such as inventory valuations and cost of goods sold between the two firms may be misleading. Sometimes enough data are presented in foot notes to the financial statements to restate data to a comparable basis. Otherwise, the analyst should keep in mind the lack of comparability of the data before drawing any definite conclusion. Nevertheless, even with this limitation in mind, comparisons of key ratios with other companies and with industry average often suggest avenues for further investigation.

b) An inexperienced analyst may assume that ratios are sufficient in themselves as a basis for judgment about the future. Nothing could be further from the truth. Conclusions based on ratios analysis must be regarded as tentative. Ratios should not be viewed as an end, but rather they should be viewed as starting point, as indicators of what to pursue in greater depth. They raise many questions, but they rarely answer any question by themselves.
c) In addition to ratios, other sources of data should be analyzed in order to make judgment about the future of an organization. The analyst should look, for example, at industry trends, technological changes, changes in consumer tastes, changes in broad economic factors, and changes within the firm itself. A recent change in a key management position, for example, might provide a basis for optimization about the future, even though the past performance of the firm (as shown by its ratios) may have been mediocre.

d) The present Research work is mainly related with limited Pharmaceutical companies in the state of Maharashtra (India). For the purpose of study 9 important limited companies from Maharashtra have been selected. There are more than 9 Pharmaceutical companies in Bombay Stock Exchange. But their annual reports are not available and there are some limitations for collection of data of companies. This study is based on the data for the five years data for a period from 2005-2006 to 2009-2010. Most probability purposive (judgment) sampling method will be adopted.
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