CHAPTER FOUR

FINANCIAL ANALYSIS

4.1. Objectives of Financial Analysis

I. Assessment of financial impact

- The ***most important objective of financial analysis*** is

  - **To assess the *financial effects* the project will have on *participants* (farmer, firms, government, etc).**

- This assessment is based on the comparison of each participant's ***current*** *and* ***future*** *financial status* with the project against the projection of his future financial performance as the project is implemented.

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II. Judgment of efficient resource Use

➢ For management especially, overall return is important because managers must work within the market price framework they face.

➢ **Investment analysis & financial ratio analysis** provide the tool for this review.

III. *Assessment of Incentives*

❖ ***The financial analysis*** is of critical importance in assessing the ***incentives*** for different participants of the project.

✓ ***Will participants have an incremental income large enough to compensate them for the additional effort and risk they will incur?***

✓ ***Will private sector firms earn a sufficient return on their equity investment & borrowed resources to justify making the investment the project requires?***

✓ ***For semipublic enterprises****, will the return be sufficient for the enterprises to maintain* ***a self-financing capability and to meet the financial objectives*** *set out by the society?*

IV. Provision of sound financial plan

❖ *The financial plan* provides a basis for determining the

- ***amount and timing of investment***,
- ***debt repayment capacity***, *and*
- ***also helps to coordinate financial contributions***.

❖ *Assessment of financial management competence* **especially for large projects,**

➢ *financial analysis* will enable the analyst

- ***To judge the complexity of the financial management &***
- ***The capability of managers so that he can judge.***

4.2. Market and Demand Analysis

➢ **The market analysis** is also concerned with ***the arrangement for marketing the output to be produced*** and ***the arrangement for the supply of inputs needed*** to ***build*** and ***operate the project***.

➢ **Market analysis usually *ranks top* in the sequence of the core chapters of a feasibility study.**

5.2.1. Role of market and demand analysis

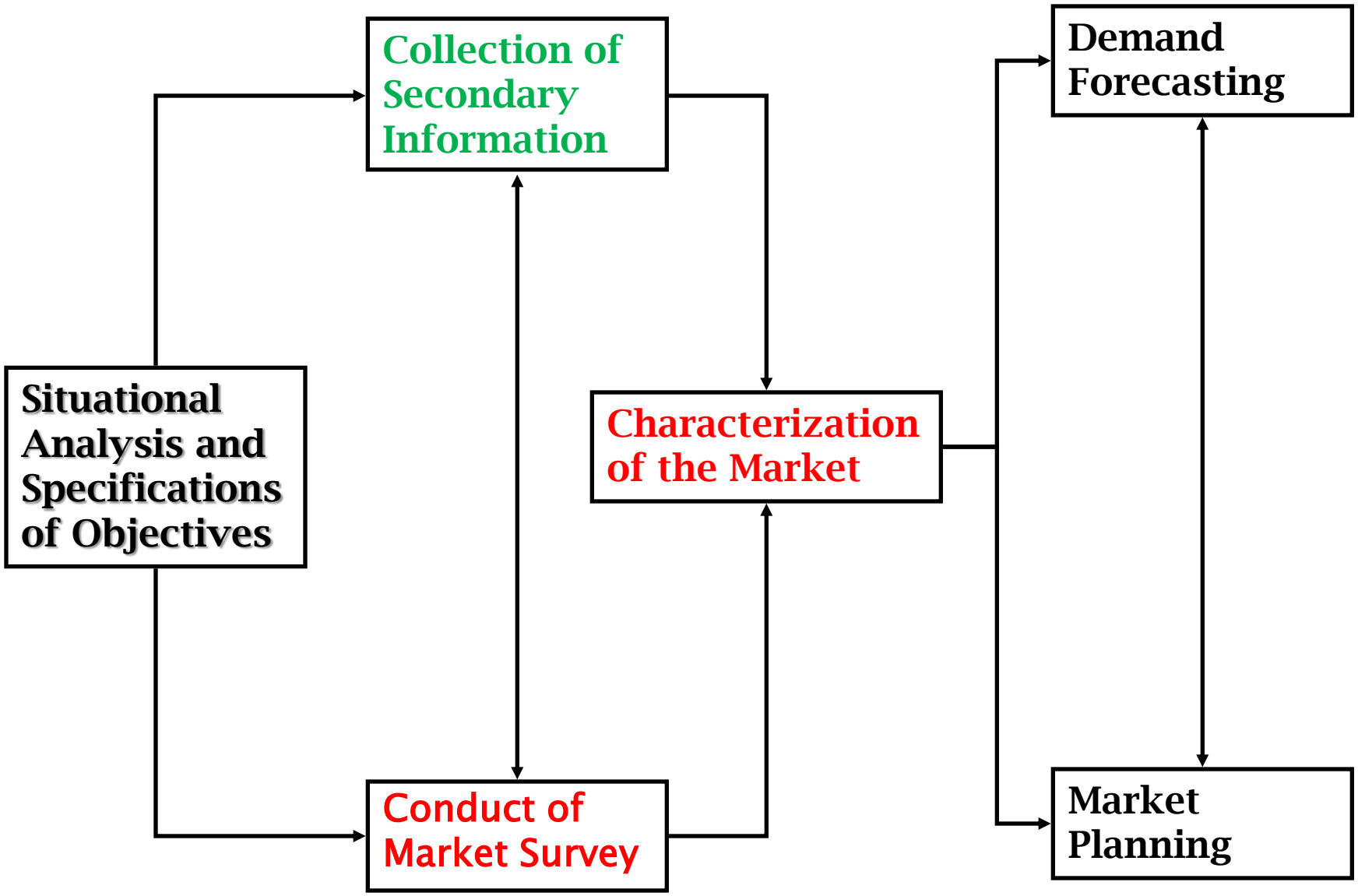
▪ ***A market*** is any place where ***the sellers can meet with the buyers*** where there is ***a potential for a transaction to take place***.

▪ ***Marketing*** is a business activity of ***presenting products or services*** to potential customers in such a way as to make them eager to buy.

▪ **Market analysis** is a process of ***assessing the level of demand*** for the ***product or service to be produced*** by the project.

- ***Analysts who have to calculate*** the socio – economic costs and benefits of a project,
- ***can only start their job***, if market analyst delivers sales forecast and market strategy.
- ***Market analysis*** is obviously ***more ambitious and risky*** in comparison to the other parts of a feasibility study, as it has to fight with the future.
- ***The marketing demand and sales forecast*** is necessarily ***subjective and vague***, since, in the final end it has to deal with the behavior of human beings.

Steps In market and Demand Analysis



A. Situational analysis and specification of objectives

✓An **informal survey** of what information is available in the area.

✓ **In order to get a feel** for the relationship between the ***product and its market***,

- The project analyst may ***talk to consumers, competitors, middlemen, and other in the industry.***

✓ **Look at**:

- ***The preferences and purchasing power of consumer's ´,***
- ***Actions and strategies of competition and***
- ***Practices of the middlemen.***

✓ If such **a situational analysis generates** enough data to measure the market and ***get a reliable projection*** of the ***demand and revenues*** a **formal** study may not need to be undertaken.

✓ In order to carry out such a study it is necessary to **spell out its objective clearly and comprehensively**.

✓ A helpful way of ***spelling out the objectives*** would be to ***structure the objective in the form of questions.***

Example: suppose a given project aims at producing **wheat** in a given locality.

❖ ***The project initiator and implementer need information about where and how to market their product.***

❖ The objective of the market and demand analysis in this case may be to answer some of the following questions.

✓ *Who are the buyers of this product? (Consumers)*

✓ *What is the total current demand for wheat*

- *How is the demand distributed temporally /pattern of sale over the year and geographically?*
- *What price will the consumers be willing to pay for the product?*
- *How can consumers be convinced that wheat could be substituted for other foodstuffs?*
- *What channels of distributions are most suited for the product?*
- *What trade margins will induce distributors to carry it out?*
- *What are the possible immediate sales?*

B. Collection of secondary information

- The ***market study*** information ***may be:***
  - ***obtained form secondary or primary sources.***

✓ ***Secondary information*** is information ***that has been gathered in some other context and is already available.***

✓ ***It is the base and the starting*** point for market and demand analysis.

✓***General Sources of Secondary Information.***

✓ ***Industry Specific Sources of Secondary Information.***

✓ ***Evaluation of Secondary Information.***

✓ It includes what is known and often provides clues for gathering primary information required for further analysis.

- ***SECONDARY SOURCES OF DATA***

1. ***Ethiopian Economic Survey***
2. ***Census of Ethiopia***
3. ***Reports of Export Working Groups on Various Industries***
4. ***Census of Manufacturing Industries***
5. ***Monthly Statistical Bulletin***
6. ***Annual Report of NBE***
7. ***Annual Survey of industries***
8. ***Guidelines to Industries***
9. ***Publications of Advertising Agencies***

Evaluation of Secondary Information

C. Conduct Market study

❖ Secondary information though useful, ***often does not provide a comprehensive basis for market and demand analysis.***

- It needs to be ***supplemented with primary information gathered*** through a market survey, specific to the project being appraised.

- ***Market survey may be a census or a sample survey.***
  - **Some Problems**
    - ✓ **Heterogeneity of the Country**
    - ✓ **Multiplicity of the Languages**
    - ✓ **Design of Questionnaire**

▪ **The information sought in market survey may relate to one or more of the following.**

- ❖ Total demand and rate of growth of demand
- ❖ Demand in different segments of the market
- ❖ Income and price elasticity's of demand
- ❖ Motives for buying
- ❖ Purchasing plans and interventions
- ❖ Satisfaction with existing products
- ❖ Attitudes towards various products
- ❖ Socio economic characterization of buyers

D. Characterization of the market

Based on the secondary sources and through the market surveys the market for the product /service may be described in terms of the following;

- ***Effective demand in the past and present***
  - ***Production + Imports – Exports – Change in stock level.***
- ***Breakdown of demand***
- ***Nature of the product***
- ***Prices***
- ***Methods of distribution and sales promotion***
- ***Consumers group***
- ***Supply and competition***
- ***Government policy***

E. Demand Forecasting

- **After gathering information about various**
  - aspects of the ***market and demand*** from primary and secondary sources,
  - ***an attempt may be made to estimate future demand*.**
- A wide variety of forecasting methods is available to the market analyst.

Two main types: qualitative and quantitative

A. Qualitative (Subjective) Methods

- These methods rely essentially on the **judgment of experts to translate qualitative information into quantitative** estimates
- Used to generate forecasts if historical data are not available (e.g., introduction of new product)

The important qualitative methods are:

- Jury of Executive Method
- Delphi Method

B. Quantitative (Objective) methods

❖ Employ one or more mathematical models that ***rely on historical data and/or causal/indicator variables*** to forecast demand.

Major methods include:

- ❖ Time series projection methods
- ❖ Causal models

JURY OF EXECUTIVE OPINION METHOD

- **Rationale**
  - ***Upper-level management has best information*** on latest product developments and future product launches.
- **Approach**
  - ***Small group of upper-level managers*** collectively develop forecasts
- **Main advantages**
  - Combine knowledge and expertise from various functional areas

- ***People who*** have best information on future developments generate the forecasts

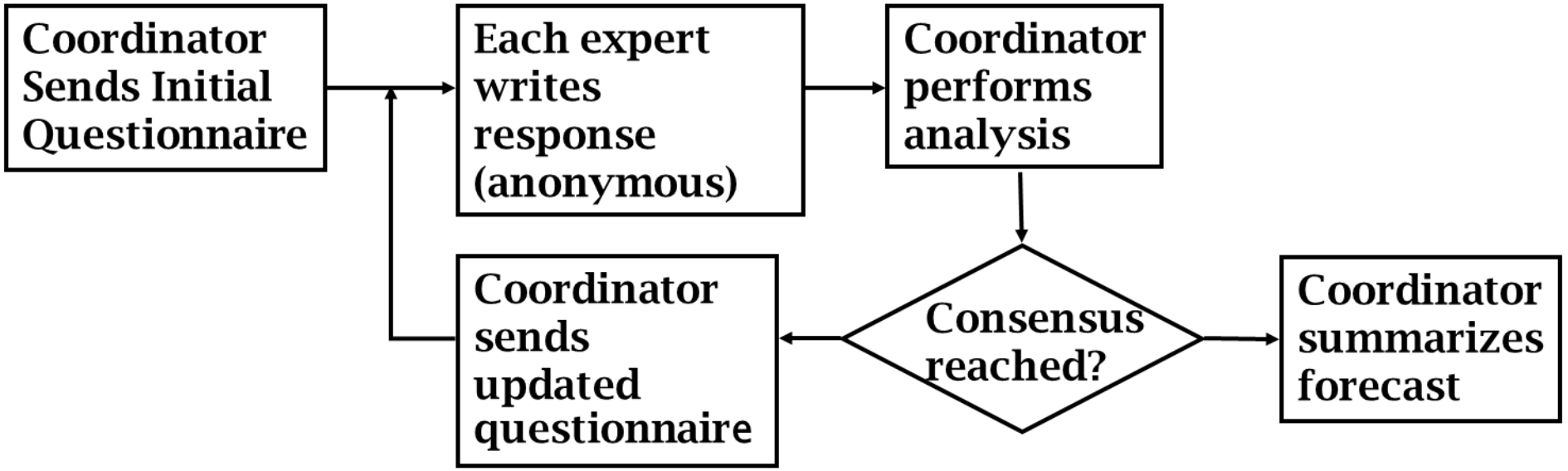
Main drawbacks

- Expensive
- No individual responsibility for forecast quality
- Risk that few people dominate the group

DELPHI METHOD

- **Rationale**
  - ***Anonymous*** written responses encourage honesty and avoid that a group of experts are dominated by only a few members.

➢ Approach



- **Main advantages**
  - Generate consensus
  - Can forecast long-term trend without availability of historical data

- **Main drawbacks**
  - Slow process
  - Experts are not accountable for their responses
  - Little evidence that ***reliable long-term*** forecasts can be generated with Delphi or other methods

Quantitative (Objective) methods

- Employ ***one or more mathematical models*** that rely on historical data and/or causal/indicator variables to forecast demand.
- ***Major methods include***:
  - Time series projection methods and
  - Causal models

I. *TIME SERIES PROJECTION METHODS*

- These methods generate forecasts on the basis of an analysis of the historical time series.
- ***The important time series projection methods are:***

  A. Trend Projection Method

  B. Exponential Smoothing Method

  C. Moving Average Method

A. Trend Projection Method

- Used for forecasting ***linear trend*** line
- Assumes relationship between response variable, ***Y, and time, X, is a linear function***

- **Y= a + bx where,**
  - y = Computed value of the variable to be predicted (Dependent variable)
  - a = y - axis intercept
  - b = Slope (the rate of change in y for given changes in x)
  - x = Independent variable
- Estimated by least squares method
  - Minimizes sum of squared errors
- Slope (b): Estimated Y changes by b for each 1 unit change in X
- $b = \frac{\Sigma XY - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2}$
- Y-intercept (a): Average value of Y when $X = 0$; $a = \bar{y} - b\bar{x}$

- ***With a series of data overtime, the computations can be reduced if the values of the X- variable (time) are transformed to simpler numbers that sum to zero.***

Year	Time Period (X)	Generator Sales (Y)	X^2	XY
1981	-3	74	9	-222
1982	-2	79	4	-158
1983	-1	80	1	-80
1984	0	90	0	0
1985	1	105	1	105
1986	2	142	4	284
1987	3	122	9	366
	$\Sigma X = 0$; $X = \Sigma X/n = 0$	$\Sigma Y = 692$; $Y = \Sigma Y/n = 98.86$	$\Sigma X^2 = 28$	$\Sigma XY = 295$

Then, the computations are as follows:

$$b = \frac{\Sigma XY - nXY}{\Sigma X^2 - nX^2}$$

$$b = \frac{295 - 7(0)\,(98.86)}{28 - 7(0)}$$

$$b = \frac{295}{25}$$

$$b = \underline{\underline{10.54}}$$

$$a = \bar{y} - b\bar{x}$$

$$a = 98.86 - 10.54(0)$$

$$a = \underline{\underline{98.86}}$$

- **Hence, the least squares equation is Y = 98.86 +10.54X**.
- To project sales in 1988, we first denote the year 1988 in the new coding system as **X = 4.**
- ***Y (Sales in 1988) = 98.86 + 10.54(4) = 141.02 or 141 Generators.***

Exponential Smoothing Method

- forecast results are ***modified in light of observed errors*** in the past
- Requires smoothing constant **(α)**
  - ***Ranges from 0 to 1***
  - ***Subjectively chosen***
- Involves little record keeping of past data
- $F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$
  - F_t = ***Forecast value***
  - A_t = ***Actual value***
  - α = ***Smoothing constant***

Illustration:

You want to forecast sales for 2012 using exponential smoothing ($\alpha = .10$).

The 2007 (made in 2006) forecast was 175.

Actual data:

2007	180
2008	168
2009	159
2010	175
2011	190

$$F_t = F_{t-1} + \alpha (A_{t-1} - F_{t-1})$$

Time	Actual	Forecast, F_t (α = .10)
2007	180	175.00 (Given)
2008	168	175.00 + .10(180 - 175.00) = 175.50
2009	159	175.50 + .10(168 - 175.50) = 174.75
2010	175	174.75 + .10(159 - 174.75) = 173.18
2011	190	173.18 + .10(175 - 173.18) = 173.36
2012	NA	173.36 + .10(190 - 173.36) = 175.02

3. Moving average method

- MA is a series of arithmetic means
- Used if little or no trend, seasonal, and cyclical patter
- Used often for smoothing
  - Provides overall impression of data over time
- Equation

$$MA = \frac{\sum \text{Demand in Previous } n \text{ Periods}}{n}$$

You're manager of a museum store that sells historical replicas. You want to forecast sales of item (123) for *2012* using a 3-period moving average.

2007	4
2008	6
2009	5
2010	3
2011	7

Time	Response Y_i	Moving Total (n=3)	Moving Average (n=3)
2007	4	NA	NA
2008	6	NA	NA
2009	5	NA	NA
2010	3	4+6+5=15	15/3=5.0
2011	7	6+5+3=14	14/3=4.7
2012	NA	5+3+7=15	15/3=5.0

Weighted Moving Average Method

- Used when trend is present
  - Older data usually less important
- Weights based on intuition
  - Often lay between 0 & 1, & sum to 1.0
- Equation

$$WMA = \frac{\Sigma(\text{Weight for period } n)(\text{Demand in period } n)}{\Sigma \text{ Weights}}$$

II. Casual methods

- ***Casual methods*** seek to develop forecasts on the basis of ***cause-effects relationships*** specified in an explicit, quantitative manner.

  I. ***High-Low method***

  II. ***Chain Ratio Method***

  III. ***Consumption Level Method***

  IV. ***End Use Method***

  V. ***Leading Indicator Method***

  VI. ***Regression analysis***

I. High-Low method

- it uses only the ***highest and lowest observation*** values of the dependent and independent variables.
- The demand function is estimated by ***using these two points to calculate the slope coefficient and the constant or intercept.***
- *b* = difference between the ***highest demand and lowest demand*** in the past divided by the difference between the highest and the lowest of the independent variable.
- a = Y-bX (take either highest or lowest observation values for X and Y)

The following data were about ***sales of a certain product and no. of households*** of over the past five years. Use no. of households as determinant for demand.

$$\text{Slope} = b = \frac{\textit{higest demand} - \textit{lowest demand}}{\textit{higst idependent variable} - \textit{lowest independent variable}} = \frac{y2-y1}{x2-x1}$$

$$\text{Slope} = b = \frac{162{,}000-110{,}000=52{,}000}{710-450=260} = 200 \qquad b = \bar{y} - b\bar{x} = 136000 \_ 200 \times 580 =$$

$136{,}000 \_ 166000 = 20000$, $y = 20{,}000 + 200x$

Year	No. of house holds	Actual sales in thousands
2006	500	120
2007	450	110
2008	600	135
2009	660	140
2010	710	162
	X=710+450/2= 580	Y= 162+110/2=136

II. *CHAIN RATIO METHOD*

- Market Potential for Men leather coats with fur in Ethiopia
  - Population next year(U)= ***100,000,000***
  - Proportion of U that are age over 18 (A) = ***75%***
  - Proportion of A that are men (M) = ***50%***
  - Proportion of M that have annual incomes over Br 65000 (I) = **50%**
  - Proportion of I that live in cold areas (C) = ***50%***
  - Proportion of I that are fashion conscious (F) = ***30%***
  - Proportion of F that are early adopters (E) = ***10%***

- Average number of coats purchased per year (Y) = 0.5 coats
- Average price per coat (P) = Br 2000

❖ What is ***potential demand for this product next year***?

III. CONSUMPTION LEVEL METHOD

- This method is used for those products that are directly consumed. This method measures the consumption level on the basis of elasticity coefficients. The important ones are
  - ***Income elasticity of demand***
  - ***Price elasticity of demand***

- ***Income Elasticity*: This reflects the *responsiveness of demand to variations in income*. It is calculated as:**

- **$E1 = [Q2 - Q1 / I2 - I1] * [I1 + I2 / Q2 + Q1]$**

- ***Where***

- *E1 = Income elasticity of demand*

  Q1 = quantity demanded in the base year

  Q2 = quantity demanded in the following year

  I1 = income level in the base year

  I2 = income level in the following year

- The aggregate demand is estimated using the following formula:

Agg. dd = **Proj. Popn** (present per capita dd) (1+ (per capita change in income level x Ei))

- Q1=120; Q2=140; I1=1000; I2=1200
- ***Increase in per capita income*** level next year = 10%
- Present per capita demand for coffee = 3kgs
- Projected population next year = 120 million

Calculate the aggregate demand for coffee next year.

Soln

- ✓ Ei = 0.851
- ✓ **Aggregate dd** for coffee next year = 390.6 millio

IV. END USE METHOD

- This method forecasts the demand based ***on the consumption coefficient of the various uses of the product.***
- Is mostly used for intermediate products:

It involves the following steps:

- Identify the possible uses of the product
- ***define the consumption coefficient*** of the product for various uses
- project the output levels for the consuming industries
- derive the demand for the product

- **Illustration**: ***A specialty wheat flour is used by four industries***. The Consumption Coeff., the projected output levels for these industries and the projected dd for ***specialty wheat flour for next year are shown below.***

Projected Demand for specialty wheat flour			
	Consumption Coefficient	Projected Output next year	Projected Demand for sp wheat flour next year
Alpha	2.0	10,000	20,000
Beta	1.2	15,000	18,000
Kappa	0.8	20,000	16,000
Gamma	0.5	30,000	15,000
		Total	**69,000**

V. LEADING INDICATOR METHOD

- This method uses ***the changes in the leading indicators*** to predict the changes in the lagging variables.
- **Two basic steps:**
  1. Identify the ***appropriate leading indicator***(s)
  2. Establish the ***relationship between the leading*** indicator(s) and the variable to forecast.

UNCERTANITIES IN DEMAND FORECASTING

- **Data about *past and present* markets.**
  - Lack of standardization
  - Few observations

- Influence of abnormal factors

Methods of forecasting

- Inability to handle unquantifiable factors
- Unrealistic assumptions
- Excessive data requirement

Environmental changes

- Technological changes
- Shift in government policy
- Developments on the international scene
- Discovery of new source of raw material

IIV. Regression Analysis

- ***Regression analysis*** is a **causal forecasting model**, which usually considers several variables that are related to the variable being predicted.
- Once the related variables have been found, **a statistical model is built** and used to forecast the variable of interest.
- ***Regression analysis uses the least squares*** approach on **one or more independent variables to develop a forecasting model.**

- **Assume that Triple A:** Construction Company renovates old homes. Overtime, the company has found that their dollar volume of renovation work is dependent on the Albany area payroll.
- **The figures for Triple A's** revenues and the amount of money earned by wage earners in Albany for the years 1982-87 are presented below.
- **Now, Triple A wants to establish a mathematical relationship that will help predict sales.** Least squares regression analysis may be used to establish the statistical model.

- The same basic model applies: $\hat{Y} = a + bx$ and the calculations for a and b follow.

Sales (Y)	Payroll (X)	X^2	XY	Y^2
2.0	1	1	2.0	4.0
3.0	3	9	9.0	9.0
2.5	4	16	10.0	6.25
2.0	2	4	4.0	4.0
2.0	1	1	2.0	4.0
3.5	7	49	24.5	12.25
$\Sigma Y = 15.0$	$\Sigma X = 18$	$\Sigma X^2 = 80$	$\Sigma XY = 51.5$	$\Sigma Y^2 = 39.5$

$$\bar{x} = \frac{\Sigma x}{n} \Rightarrow 18/6 \Rightarrow 3$$

$$\bar{y} = \frac{\Sigma y}{n} \Rightarrow 15/6 \Rightarrow 2.5$$

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2} \Rightarrow \frac{51.5 - (6(3)(2.5))}{80 - 6(3^2)} \Rightarrow \frac{51.5 - 45}{26} \Rightarrow \frac{6.5}{26} \Rightarrow \underline{\underline{0.25}}$$

$$a = \bar{y} - b\bar{x} \Rightarrow 2.5 - 0.25(3) \Rightarrow \underline{\underline{\underline{1.75}}}$$

Therefore, the estimated regression equation is:

$$Y = 1.75 + 0.25X; \text{ i.e., } \quad \text{Sales} = 1.75 + 0.25 \text{ (Payroll)}$$

Lastly, we have to measure how strong the linear relationship is between the two variables, which are the sales and payroll, by using the correlation coefficients for Regression Lines (r):

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y2 - (\sum y)^2]}}$$

Four values of the correlation coefficient:

a) Perfect positive correlation when $r = 1$
b) Perfect negative correlation when $r = -1$
c) Positive correlation when $0 < r < 1$
d) No correlation when $r = 0$

Then the correlation coefficient for Triple A Construction Company is:

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y2 - (\sum y)^2]}}$$

$$= \frac{(51.5) - (15x18)}{\sqrt{[6(80) - (18)^2][6(39.5) - (15)^2]}}$$

$$= \frac{309 - 270}{\sqrt{(408 - 324)(237 - 225)}}$$

$$= \frac{39}{\sqrt{(156 * 12)}}$$

$$= \frac{39}{\sqrt{1872}}$$

$$= \frac{39}{43.27} \Rightarrow r = 0.901,$$

This r-value appears to be a significant correlation and helps to confirm the closeness of the relationship of the two variables.

- **Market Planning**

Marketing plan is product specific, market specific , or company-wide plan that describes activities involved in achieving specific marketing objectives within a set time frame.

It has the following key components

1. ***Current marketing situation***: market situation, competitive situation, distribution situation, macro-environment, etc.

2. ***Opportunity and issue analysis***: SWOT analysis

3. ***Objectives***: clear-cut, specific, and achievable.

4. ***Marketing strategy***: Target segment, positioning, product line, price, distribution, sales force, sales promotion, adverting, etc.

5. ***Action program:*** what will be done, when it will begin or be completed, who will accomplish the tasks, etc.

4.3. Pricing Project Costs and Benefits

- **Once costs and benefits have been identified**, if they are to be compared they must be valued.
- Since the only practical way ***to compare differing goods and services*** directly is to give each a money value, ***we must find the proper prices for the costs and benefits in our analysis***.

5.3.1. Finding Market Prices

- Project analysis characteristically are built ***first by identifying the technical inputs and output for a proposed investment***,
- Then by ***valuing the inputs and outputs at market prices*** **to construct the financial accounts**, and finally by adjusting the financial prices so they better reflect economic values.

- ✓ ***The first step** in valuing **costs and benefits** is finding the market prices for the **inputs and outputs**.*
- ✓ ***The project will have to consult many sources such as merchants, consumers, experts, published statistical bulletins, etc.***

➢ Point of first sale and farm-gate price

- ❖ ***In project analysis***, a good rule for determining ***a market price*** for agricultural commodities produced in the project is to seek the price at the **"point of first sale".**
- ❖ The increased value added of the product as it goes to higher markets in the channel arises as a payment for marketing services.
- ❖ If the project includes such ***marketing services*** in its design, we can take these higher prices.

- ***Even in this case***, the analyst **must make the project as small as possible** and ***try to analyses the marketing service*** component independently of the production component .
- If the product is sold only in **central markets**, no local market, then the analyst must **find out the value of marketing service** to arrive at price at project site.
- ***Prices for some products like agricultural products*** generally are subjected to substantial seasonal fluctuation.
- If this is the case as it may often is **some decision must be made** about the price in the seasonal cycle at which to choose the price to be used for the analysis.

- **A good starting point** is the farm-gate price at the peak of the harvest season.
- This is probably close to the lowest price in the cycle.
- The reasoning is that the rise in price is due to marketing services.

Predicting Future Prices

- Since project analysis is **about judging future returns from future investment**, **we have to judge what the future prices of inputs and outputs may be.**
- **The best starting point** is to **see the trend of these prices over the past few years.**
- Having this data, the project analyst **can forecast the price with certain degree of precision.**

- However, even then **judgment is important to arrive at what price we have to use to value inputs and outputs of the project.**
- Moreover, **we have to keep in mind that**, as projects involve distant future, the prediction power of the model will decline as we go far from the present.

5.3.2. Change in prices

- **Change in prices** could be **general change in price** or ***change in relative prices of goods***.

➢ ***Change in relative price***

If relative price of inputs or outputs are variable over time, i.e.

$$\frac{P_{XO}}{P_{YO}} \neq \frac{P_{X1}}{P_{Y1}} \neq \frac{P_{X2}}{P_{Y2}} - - -$$

Changes in relative prices have a real effect ***on the project objective*** and ***must be reflected in project accounts*** in the years when such changes are expected.

- For instance, **the price of agricultural products to price** of inputs (manufactured) may rise over time.
- This would have **a real effect** on the **net benefit** of the firm.

❖ ***Inflation (an increase in general prices of goods)***

- **Inflation** is common for every country although the magnitude may vary between countries.
- The approach most often taken is to **work the project analysis** in constant price.

- ✓ It is quit possible, however, **to work the whole project analysis in current (not constant) prices**.
- ✓ Its advantage is it will **reflect the true costs and benefits** of the project.
- ✓ Moreover, it is possible to **quantify the financial requirement** of the project.
- ✓ **The problem** with this approach is it involves **predicting inflation** rates of both domestic and foreign countries that would have substantial/ significant impact.

- ***It is assumed that inflation will affect most prices to the same extent so that prices retain their same general relations.***
- The analyst then need only adjust future price estimates for anticipated relative changes, not for any change in the general price level.

4.3.3. Financial export and import parity price

❖ Financial analysis will be made **based on market price**.

❖ The project may use **imported inputs and export its output**, to foreign markets.

- If there are **domestic markets for these inputs and outputs**, and if the firm is free to sell or buy at the domestic or world market, **we take the domestic price with appropriate adjustment to reflect the price at the project site.**
- If, on the other hand, commodities of the project are produced ***only for foreign market*** or ***if the domestic demand cannot absorb the firm's output,*** **we will take export-parity and import-parity prices ever in financial analysis.**
- **In financial analysis**, we use **export and import parity (uniformity) prices** if the project will export its output to and import inputs from foreign markets.

- **A project for several reasons** may use imported inputs or export outputs even though there are domestic markets.
- ***In both cases what we need to determine*** is **the amount of income the project receives from its exports** or ***the amount the project pays for imports at the project location.***
- Suppose a project ***exports*** **coffee to Canada**, we start with ***c.i.f***. price at Canada port.

❑ ***Export Parity Price***

C.i.f. at point of import **(Canada port)**

Deduct- unloading at **point** of import

Deduct- freight to point of import (in this case ship freight)

Deduct – insurance

Equals – *f.o.b.* at point of export (Djibouti port)

Convert foreign currency to domestic currency at official exchange rate **(OER)**

Deduct –tariff (export duties)

Add - subsidy

Deduct - local port charges

Deduct - local transport & marketing costs **(if not part of project)**

Equals export parity price at project boundary

Deduct - local storage, transport & marketing costs (if not part of project cost)

Equal export parity price at project location (farm gate)

- If port charge is in terms of foreign currency, we deduct it before it is multiplied by OER.

- **A parallel computation leads to the import parity price.**

- Here the issue can be ***finding the price of project's output*** that is intended to substitute previous imports.
- If this import substitute would have to compete with foreign products when it is sold in the domestic markets.
- In this case we need to determine the **import parity price of the project's output.**

- Similarly if a project uses an imported **input in bulk**, we may want to know the **import parity price**.

In either case, **the import parity price** can be derived as follows.

❑ *Import Parity Price*

F.o.b. price at point of export

Add-freight charges to point of import

Add-insurance charges

Add- unloading from ship to **pier at port**

C.i.f. Price at the harbor/port of importing countries

Convert foreign currency to domestic one (multiply by OER)

Add-tariffs (import duties)

Deduct-subsidies

Add-local port charges

Add-transport & marketing costs to relevant wholesale market

Equal price at wholesale market

Add-local storage & other marketing costs (if not part of project cost) -this is the marketing margin between central market and the project site.

Equals *import parity price* at project location (Farm/project gate price).

- **If the project produces import substitutes,** this must be deducted because the project is will to have to compete with import substitutes.

- ***OER (official exchange rate)*** is the rate at which one currency (say, Birr) is exchanged for another currency (say, Dollar).
- It is official because **it is the rate established by monetary authorities of a country not by the market mechanism**.
- In financial analysis the ***OER*** would always be used.
- Before calculating the ***export or import parity price at the project site***, **we need to forecast the future *c.i.f.* or *f.o.b.* price at the border.**
- This may require assessment of the ***past trend of this border price***.
- After we determined the future ***c.i.f.* or *f.o.b***. price, we then continue to calculate export parity price.

4.4. Farm Investment Analysis

- **Farm investment analysis** is undertaken to determine ***the attractiveness a proposed investment to framers*** and **to other participants, including the society as a whole.**
- It projects **the effect and farm income of a particular** investment and **estimates the rectum** to the capital engaged.
- The analysis is **projected over the useful life of the investment**.
- The **initial** investment is shown ***at the beginning of the projection***, and **a residual valve at the end**.
- In general, the analysis is **cast in constant prices**, although **allowances** may have to be made for **inflation**.
- **Off – farm income** is included.

- Farm investment analysis can be ***prepared for farms of any size.***
- ***Large commercial farms & plantation*** how ever are more like other **business enterprises** than they are like small, family – operated farms.
- **In considering small farms**, the analysis will be particularly concerned with the effect of the project on the total income of the farm family.
- **The basic difference between small farm family and the business firm is on *their fundamental objective*.**
- ✓ ***The fundamental objective*** of the business firm is ***profit maximization*** though there are other ***subsidiary objectives.***
  - Like increasing market share.

- ***Customer satisfaction creation of good public image, etc.***

➢ **The fundamental objective of a farm family**, however, could be different and it depends up-on ***the cultural setting and risk environment.***

- ***The analysis must assess the attitude of the farmer towards many aspects to identify the fundamental objective of the household***.
- **Maximizing just net income** of the household may not come out as the fundamental objective ***rather securing food for the household or minimizing risk*** could be the **main objective**.
- **Farmers are price responsive** as **confirmed by many empirical researches**, but this should not be interpreted as if they are profit maximize.

- **The analysis** must take the **cultural and risk environment** into account **in the investment analysis**.
- **Backed by this understanding of the particular cultural environment**, the analyst will prepare **the farm investment analysis as realistic as possible** to determine what the family gains by participating in the project.
- ***The effectiveness of the proposed new technology*** on small farms must be **realistically assessed**, and the technological assumptions must be checked to ensure that they reflect **on-farm conditions** and not those of an experiment station.

- **The analyst must form a judgment about how rapidly farmers will be willing to adopt new practices.**
- **The analyst must test the effect of risk on family income by *undertaking sensitivity analysis.***
- **He must ask such questions as *what will happen to their income*, *if price fall below expectation*.**
- **If the expected output is not realized, if input requirement, if farmers face bad weather condition etc.**
- **Sensitivity analysis must be done for both technical as well as price deviations.**

Principal elements of farm investment analysis farm resource use.

Land use – allocation of each piece of land (cultivated area and crop type pasture, forest houseplant, etc.).

Land use calendar when will the piece of land be used for what purpose?

Labor use

- Annual labor requirement by crop operation for 1 ha
- Labor distribution by crop & month per hectare
- Labor requirement by crop & month
- Hired labor by crop and month
- Off-farm labor

Farm Production

- **Crop and pasture**

  Yield and carrying capacity

  Crop & pasture Production

- **Livestock**

  Herd Projection

  Herd composition, purchases & saves

  Herd productivity

Feeding period & daily ration

  Feed requirement and production

  Yield per animal

Valuation

- **Farm gate prices**
- **Value of production**
- **Crops**
- **Livestock**

Incremental residual valve

Farm inputs

- **Incremental**
- **Physical**
- **Foreign exchange component**
- **Valve of investment**
- **Operating expenditure**

Crop

Livestock

Incremental working capital

Farm Budget

Without project

With project

Net benefit before financing

Debt service

Net benefit after financing

Cash position

- **Herd productivity** - it is a measure of the efficiency of the herd.
- It relates the number of head sold plus the increase in heard size to the number of head carried at the beginning of the year.

$$\text{Herd Productivity} = \left(\frac{\text{Stock at the end} + \text{head Sold} + \text{head consumed} - \text{head purchased} - \text{stock at begining}}{\text{Stock at the begining}} \right)$$

Yield per animal - milk, egg, etc. which are animal products per head for each type of animal must be calendared to determine the benefit.

5.5. Computing Debt service

In many farm budgets there will be a credit element, and **the analyst will have to calculate the amount of the debt service**.

4.5.1. Simple interest rate

$$P_t = P_o (1+rt)$$

P_o - initial loan, principal

r - Interest rate

t - Time

P_t - final amount

- If the farmer borrowed **5,000** Birr at interest rate of 10 % ***per year repayment can be made in different ways.***
- **The following table shows two types of installments/ repayment** or debt servicing.
- **Repayment** of **equal amounts** of **principal** (using simple interest rate).

Year	Loan Receipts	Out stand balance	Debt service (1)			Debt service (2)		
			Principal	Interest	Total	Principal	Interest	Total
0	5000	5000	-	-	-	-	-	-
1	-	5000	-	-	-	-	-	-
2	-	5000	-	-	-	-	-	-
3	-	5000	1000	1500	2500	1000	300	1300
4	-	4000	1000	400	1400	1000	400	1400
5	-	3000	1000	300	1300	1000	500	1500
6	-	2000	1000	200	1200	1000	600	1600
7	-	1000	1000	100	1100	1000	700	1700
Total			**5000**	**2500**	**7500**	**5000**	**2500**	**7500**

Case (1) - interest calculation on the out standing balance (declining interest payment)

Case (2) - interest calculation on the principal for the nth year

- **Year 0 to year 2** - are considered as grace periods (a period in which the borrower need not pay principal & sometimes the interest depending on their agreement).
- ***The simple interest rate is commonly applied for short-term credits lent for seasonal expenses.***

5.5.2. Compound interest

- **This method is common** in long-term credits which are lent by formal finical institutions; banks & similar credit institutions.
- **The basic difference between** simple and compound interest is that in the latter, the calculation of interest after year one (i.e. year two and then after), **will be based on the total outstanding principal plus interest of the previous year.**

- In short, interest calculation in year two will be (***outstanding principal plus interest of year one***) multiplied by interest rate.
- This means we calculate interest for the outstanding interest in addition to the principal.
- **The formula can be presented as follow**

$$P_t = P_0(1+r)^t$$

- ***Po - Principal***
- ***r - Interest rate per period***
- ***t - Period or time***
- ***p_t - total amount***

A loan of 5000 at interest rate of 10% that will be paid starting from year 3 can be calculated as:

Year	Loan receipt	Outstanding balance	Debt service (1)			Debt service (2)		
			Principal	Interest	Total	Interest	Principal	Total
0	5000	5000	-	-	-	-	-	-
1	-	5000	-	-	-	-	-	-
2	-	5000	-	-	-	-	-	-
3	-	5000	1000	1655	2655	1000	331.0	1331.0
4	-	4000	1000	400	1400	1000	464.1	1464.1
5	-	3000	1000	300	1300	1000	610.5	1610.5
6	-	2000	1000	200	1200	1000	771.6	1771.6
7	-	1000	1000	100	1100	1000	948.7	1948.7

Case (1) interest on outstanding balance or declining balance.

Case (2) interest on the principal paid at the n^{th} year.

- **The first 2 years are called grace periods**
- **The above calculation is on the assumption that the compounding period is a year.**
- **But if the compounding period is less than year; such as monthly, quarterly or biannually, the formula may be formulated as:**

$$A_t = P_0\left(1 + \frac{r}{c}\right)^{t \times c}$$

A_t = total amount including principal

r – Interest rate per year

c – Compounding period

t – Number of years

If for example the compounding period is monthly, we divide the interest rate by 12 and multiply the time by 12. In the above case, for the 3rd year

$$A_t = 5000(1 + \frac{0.1}{12})^{3\times12}$$

Equal installments with interest being capitalized

- In some loan transactions, the lender can agree to **"capitalize"** the ***interest due during the grace period***.
- ***This means, the borrower need not pay any interest during the grace period;*** the interest due is, in effect, added to the principal of the loan.
- When repayment begins, the amount borrowed plus the interest added to the principal during the grace period is then repaid in a serious of equal installments.

$A_t = 5000(1+0.1)^2 = 6050$

The interest for the grace period is included with the principal. Starting from year 3, the project is expected to repay its total capitalized debt of 6050 in a serious of installments. The annual repayment can be calculated as follows.

$$A_m = \frac{P^*(1+r)^t \times r}{(1+r)^t - 1}$$

Where r - is interest rate

T - Time or period

A_m - annual payment of interest plus principal

P^* - capitalized principal

$$A_m = \frac{6050(1+0.1)^5 \times 0.1}{(1+0.1)^5 - 1} = 1596.0$$

- Accordingly, the annual payment will be **1596.0 for 5 years**.
- **This method of installments** is common in many formal financial institutions.

It has the following advantages:

1. ***It balances the interest between borrower and lender*** in that it is in between the two compounding methods presented in case 1 and case 2.
2. **It is suitable for both the borrower and the lender because** it eases both computation and the collection and repayment of the loan.

4.6. Financial Ratios

From the projected financial statements for an enterprise, the financial analyst is able to calculate financial ratios that allow him to form a judgment about the efficiency of the enterprise, its return on key aggregates and its credit worthiness.

5.6.1. Efficiency Ratios

Inventory turnover

This measure the number of times that an enterprise turns over its stock each year and indicates the amount of inventory required to support a given level of sales.

It can be computed as

$$\text{Inventory turnover} = \frac{\text{cost of goods sold}}{\text{the inventory}}$$

- The ***inventory turnover*** can also relate to the average length of time a firm keeps its inventory on hand.
- A low ratio may mean that the company with large stocks on hand may find it difficult to sell its product, and this may be an indicator that the management is not able to control its inventory effectively.
- Thus a low ratio, though good, may indicate cash shortage & the firm might sometime be forced to sell by forgoing sales opportunities.

Operating ratio

This is obtained by dividing the operating expenses by the revenue.

$$\text{Operating ratio} = \frac{\text{Operating expenses}}{\textit{revenue}}$$

4.6.2. Income ratios

The long-term financial viability of an enterprise depends on the funds it can generate for reinvestment and growth and on its ability to provide a satisfactory return on investment.

This shows how large an operating margin the enterprise has on its sales.

$$\text{Return on sales} = \frac{Net income}{revenue}$$

Return on equity

- It is an amount received by the owner of the equity.
- It is obtained by dividing the net income after taxes by the equity.
- Equity - an ownership right or risk interest in an enterprise.

$$\text{Return on sales} = \frac{Net income}{revenue}$$

- This ratio is frequently used because it is one of the main criteria by which owners are guided in their investment decisions.

Return on assets

$$\textbf{Return on assets} = \frac{\text{Operating income}}{\text{Assets}}$$

- The **earning power** of the assets of an enterprise is viral to its success.
- The return on assets is the financial ratio that comes closest to the rate of return on all resources engaged.
- A crude rule of thumb is this value should exceed interest rate.

4.6.3. Creditworthiness Ratios

- The purpose of creditworthiness ratios is to enable a judgment about the degree of financial risk inherent in the enterprise before undertaking a project.
- It also helps to estimate the amount and terms finance needed.

Current ratio

- This is computed by dividing the current assets by the current liabilities.
- Though it needs caution, as a rule of thumb, a current ratio of 2 is acceptable.

$$Current = \frac{\text{Current asset}}{\text{Current liability}}$$

Debt-equity ratio

- This is an important ratio for credit agencies.
- It is calculated by dividing long-term liabilities by the sum of long-term liabilities plus equity to obtain the proportion that long-term liabilities are to total debt and equity, and then by dividing equity to obtain the proportion that equity is of the total debt and equity.
- These are then compared in the form of a ratio.

$$\text{Equity Ratio} = \frac{\text{Equity}}{\text{Equity} + \text{Longterm liability}}$$

$$\text{Liability ratio} = \frac{\text{Longterm liability}}{\text{Equity} + \text{Long term liability}}$$

$$\text{Debt - Equity Ratio} = \frac{LR}{ER}$$

- It tells us, of the total capital, how much proportion is equity & how much is debt.
- If for example liability ratio is 0.40 and equity ratio is 0.60, it means that of the total capital 40% is debt and 60% is equity.
- Then debt equity ratio is 1.5 to 1.
- For each one birr liability a project has 1.5 birr equity.
- In general strong equity base is good for a project to overcome risk & uncertainty.
- Especially in some risky projects, low ratio of long-term liability to equity is a necessary condition.

Debt service coverage ratio

- The most comprehensive ratio of creditworthiness is the debt service coverage ratio.
- This is calculated by dividing net income plus depreciation plus interest paid by interest paid plus repayment of long-term loans.

$$\text{Debt service coverage ratio} = \frac{\text{Net income} + \text{Depr.} + \text{Interest}}{\text{Interest} + \text{repayment of loan (p)}}$$

- ➢ It tells us how a project can absorb any shocks without impairing the firm's ability of meeting obligations.
- ➢ In contrary to this it can also tell us how the firm chose an appropriate credit term. Normally, financial institutions regard a debt service coverage ratio of 2 as satisfactory.

CHAPTER FIVE .
ECONOMIC AND SOCIAL ANALYSIS

5.1. Purpose of Economic Analysis

- **The main purpose of *project economic analysis*** is to help design and select projects **that *contribute most to the welfare of a country***.
- When used solely, **economic** analysis serves only a very limited purpose and hence should not be the only basis **for financial decision**.
- **Optimal decision** must be made based on the **relative merit** of all aspects **financial**, economic, **fiscal** impact, environmental impact, etc.
- ***The tool of economic analysis can help*** us answer various questions about the project's impact on ***the entity undertaking the project***, **on society, on the fiscal impact** and **on various stakeholders**, and ***about the projects risks and sustainability.***

5.1. Identification of winners and losers: who enjoys the music? Who pays the piper?

- **A good project contributes** to **the country's economic output**; hence it has the potential to **make everyone better off.**
- Nevertheless, normally not every one benefits, and some one may lose.
- **Groups** that ***benefits*** from a project are not necessarily those that incur the costs of the project.
- Identifying **those who will gain**, **those who will pay** and ***those will lose gives*** the analyst insight into the incentives that various stake holders have to see that the project is implemented as designed.

Environmental impact

- A very important difference between **society's point** of view and the **private point** of view concerns **costs (or benefits) attributable** to the project but not reflected in its cash flows.
- **The effects of the project on the environment**, both negative (costs) and positive (benefits), should be taken into account and if possible, quantified and assigned a monetary value.
- The impact of **these costs and benefits** on spearfish groups within **socially is borne in mind.**

5.3. Financial, economic and social CBA compared

❖ Depending on ***the nature and objective of the project***, project appraisal can be done at three levels:

A- Financial / Private CBA: **In financial CBA market prices (nominal prices) of *inputs and outputs are used*;**

➢ The analysis is made ***from the point of view of the investor***;

➢ It is done for **profit oriented** projects; and

➢ ***Costs and benefits*** are only those which can be ***expressed* in money terms.**

➢ This reason, is also called ***analysis at market prices*.**

***B- Economic / National CBA*:** Unlike financial CBA, economic CBA uses **economic prices (accounting prices) or shadow prices**; and

- It is done **from the point of view** of the **national economy**.
- For this reason, it is also called ***analysis at efficiency prices*.**
- Economic analysis of projects is similar in form to financial analysis in that ***both assess the profitability of an investment***.
- The financial and economic analyses are thus ***complementary*.**
- **In summary, the most important differences between economic and financial analysis include.**

***Prices*: In financial analysis, *market prices are normally used*.**

❖ Market prices are also called ***financial prices* or *nominal prices* and or / *private prices*/.**

❖ **In economic analysis**, however, some **market prices** may be changed so that they ***more accurately reflect economic values***.

❖ ***While financial feasibility uses market prices*, economic feasibility utilizes economic prices.**

❖ **Both financial and economic analysis** use projected prices and hence both rely on hypothetical prices.

❖Unlike financial analysis, all accounts used in project economic analysis are **calculated in real prices**.

❖ **For successful shadow pricing**, the level of accuracy in the estimation of **costs and benefits** at market prices should be reasonably good.

❖ **Shadow price** adjustments to ***an inaccurate market price*** figure ***will not necessarily improve decision making***.

A. Treatment of transfer payments: In economic analysis taxes and subsidies are treated **as transfer payments** whereas market prices take into account **taxes** (duties, income taxes, excise taxes, depressed export prices, and sales or purchase taxes) and ***subsidies*** (export subsidies, provision of services below cost, interest rates below the market interest rate, purchased farm inputs, mechanization services provided at concessionary prices and so on).

➢**In financial analysis**, **taxes** are treated as a cost and subsidies as a return.

➢ From the **national economy point of view**, subsidy is an expenditure of resources that the economy incurs to operate the project.

➢ While impinging on the financial situation of the enterprise or the farmer, **taxes do not represent new claims on the country's resources**.

➢ The same applies to dividend payments to shareholders.

➢ While these are considered as **costs in the financial analysis**, they are **not deducted from the income stream in the economic analysis.**

- The deciding factor, as to whether an item is included in ***the economic analysis or not, is whether it makes a direct claim on the resources of the*** **country or whether it merely represents a transfer of ownership** of the resource **from one group or entity or individual to another.**
- Both **tariffs** and **subsidies** represent neither costs nor benefits.
- **Economic transfer is neither a benefit nor a cost** to the society but only a shift of resources within the society.
- That is, **income** is neither created nor expended; it is only redistributed.
- ***Direct transfer payments are payments that represent not the use of real resources but only the transfer of claims to real resources from one person in the society to another.***

- **In agricultural projects**, the most **common** transfer payments are taxes, direct subsidies, and credit transactions that include loans, receipts, repayment of principal, and interest payments.
- **Two credit** transactions that might escape notice are ***accounts payable and accounts receivable.***
- All these entries should be taken out before the financial accounts are adjusted to reflect economic values.
- **From the national point of view**, income taxes are excluded as costs.
- **Benefits** can **calculated** at the consumer **price** and **costs** as those for investment and operation exclusive of excise taxes.
- **If excise taxes are sufficiently high,** investment will appear very attractive, indicating that the government should promote the investment.

- In its role as **guardian** of **broad public interests**, government passes along many benefits to society in the form of economic transfers.
- These show up in various ways including free education, medical care, and unemployment assistance; provision of economic infrastructure such as transportation, power, water, sewerage, and telecommunications whenever fees are **less than the cost of service**; and
- **Regulated prices of basic commodities** at ***below free-market prices in the hope of controlling the cost of living*** and **thereby checking inflation.**
- **Economic transfer** to producers (subsidies) may include basic research to **develop new technologies**, **price supports** (above world prices), and **provision of low cost inputs** (fertilizers) and so on

- **Private producers** receive a subsidy whenever the ***full costs of these inputs, services, and facilities are not recovered through government changes or when price supports exceed world market prices.***
- ***In contrast to taxes***, subsidies are included in the economic analysis, since they represent a cost to the country as a whole and are part of the country's investment in resources allocated to the project.
- If fertilizers, for example, are ***imported***, their real cost to the economy is the ***c.i.f***. import price plus **the costs of handling and delivery to the farmers.**
- **Many important subsidies** in agriculture operate not by means of direct payments but through mechanisms that change market prices.

- These subsidies are ***not direct subsidies*** treated as ***direct transfer payments*** but rather are ***indirect*** subsidies.
- ***In evaluating services and infrastructure projects***, **benefits and costs** are normally considered from the national point of view since the government is the main provider of these services.
- Benefits are frequently **difficult to measure**, however, since **the value of many services is not set in the market place**.
- In carrying out projects of this type, benefits may have to be imported or else target levels of service set and cost-effective procedures applied.

- ***Participants*: While financial feasibility is undertaken from the point of view of the private investor, economic feasibility is undertaken from the point of view of the national economy.**

- **While the participant (s) in financial CBA is (are) the private investor (s), the participants in the economic CBA are all individuals within the national economy.**

***Numeraire*: While the *numeraire* in financial CBA is the unit of domestic currency, the numeraire in economic analysis is the unit of national income in domestic currency.**

- ***Treatment of interest*:** In economic analysis **interest on capital** is **never separated and deducted from the gross return** because it is part of the total return to the capital available to ***the society as a whole and because it is that total return, including interest, that economic analysis is designed to estimate.***

- **But interest inputted or '*paid*'** to the entity from whose point of view the financial analysis is being done is **not treated as a cost because the interest is part of the total return to the equity capital contributed by the entity.**

- It is a part of the **financial return** that entity receives.

C- Social CBA (SCBA): Social CBA is ***concerned with the evaluation of policies, programs and projects*** by ***government*** or ***public sector agencies.***

The analysis is done here **from the point of view of the society**; **intangible benefits** and **costs** (education, health, pollution, externalities, environmental issues and so on) are ***explicitly*** entertained; **poverty and income distribution are taken care of**; and **monetary** and **non-monetary** costs and benefits are accounted for.

In social CBA, a cost or a benefit of **100 Birr incurred** (earned) by the poor is given a higher weight as compared to the same cost or benefit incurred (earned) by the rich.

- The prices used in ***SCBA*** are called ***social prices*** and for this reason the analysis is also **called *analysis at social prices***.
- When we talk about the ***project appraisal*** decision making criteria, we have to make a distinction among: financial, economic and social *NPW*; financial, economic and social *IRR*; financial, economic and social *B/C ratio*; financial, economic and social payback period; financial, economic and social ***net benefit investment ratio.***

5.4. Two approaches of measuring economic costs & benefits of a project

There is conceptual difference between **social costs - benefits and economic cost - benefit analysis.**

- The ***results of social cost-benefit analysis*** may ***diverge from the results of economic cost-benefit analysis***.
- **Economic costs and benefits** when they are adjusted to consider other objectives of society as **distributional consequences & other objectives**, ***they become social costs & benefits of a project***.
- This depends on the method used in the analysis.
- **If the market prices are adjusted** only for **market distortions of various kinds**; direct transfer payments & externalities, it is simply economic cost-benefit analysis.
- If on the other hand this adjustment process systematically considers other objectives as distributional aspects, it will become **social cost-benefit analysis**.

- **Economic costs-benefit analysis** limits itself only to the analysis of effects of a project on **real national income** of the country.
- Some analysts simply ***adjust financial cost & benefits into*** efficiency prices and leave other social aspects for **subjective judgments**.
- Particularly **Squire & van der Tak (1992)** recommend **evaluating proposed projects** first by using essentially the same efficiency prices then by further adjusting these prices to **weight them for income distribution effects** & for **potential effects** on further investment of the benefits generated.

❖**Still some others, Little and Mirrlees (1974), & UNIDO Guidelines for project evaluation (1972a)**

- **Propose** evaluating the **project first by establishing its economic accounts** in efficiency prices then by adjusting these accounts to **weight them for income distribution and saving effects**.

A. UNIDO Approach

✓ **In this method economic benefits & costs may be measured at domestic prices using consumption** as the ***numeraire***, with adjustment made for divergence between market prices and economic values, and making domestic and foreign resources comparable using shadow exchange rate (SER).

- ✓ **If commodities are traded**, first all these traded goods will be **adjusted for any distortions in the domestic markets**.
- ✓ **After this adjustment is made** the adjusted domestic price will be multiplied by **SER** to make domestic resources be comparable with foreign resources.
- ✓ The easiest way for adjusting domestic market distortions is **to use border prices**, ***c.i.f.***, for imports and *f.o.b.* for exports and then multiply this border price expressed in foreign currency by ***SER*** to arrive at economic border prices.

- **If the commodities are non-traded**, i.e. ***if f.o.b. prices are less than domestic prices*** & **domestic prices less than *c.i.f***. prices and if the market prices are good estimates of opportunity cost or willingness to pay, we directly take the market price as economic value of the item
- But **if the prices of non-traded items** (goods and services or factors of production) are **distorted**, we will adjust the market price to eliminate distortions and then use these estimates of opportunity cost as **the shadow price to be entered in the economic analysis**.

- Suppose we have **a project producing export item** that uses both foreign & domestic inputs.
- **The net benefit (ignoring discounting)** would be estimated as:

$$\text{Net benefit} = \text{SER}(X - M) - D$$

Where *X - border price of exports in foreign currency*

M - Border price of imported goods in foreign currency

D - Adjusted (economic) values of domestic goods in domestic currency

SER - is the shadow exchange rate (assuming the official exchange rate does not accurately reflect the true value of foreign currencies to the economy).

➢ Shadow Exchange Rate

The need to determine the foreign exchange premium arises because in many countries, as a result of national trade policies (including tariffs on imported goods & subsidies on exports), people pay a premium.

- This premium is not adequately reflected when the price of traded goods are converted to domestic currency equivalent at the official exchange rate.
- The premium, thus, represents the additional amount that users of traded goods, on average & throughout the economy are willing to pay to obtain one more unit of traded goods.
- The premium people are willing to pay for traded goods, then, represent the amount that, on average traded goods is missing priced in relation to non-traded items when the official exchange rate is used to reconvert foreign exchange prices in to domestic values.

The derivation is a follows:

$$SER = \frac{P_d}{P_w}$$

Where P_d - domestic price

P_w - world price in foreign currency

To derive an average and representative, estimates of SER that can be applied across all traded goods, we need to take the weighted mean of relative value of all imported & exported goods. Thus:

$$SER = \sum_{i=1}^{n} f_i \left(\frac{P_{di}}{P_{wi}} \right)$$

f_i - **The weight of the ith good.**

The weights (f_i) are a function of the quantities imported and exported and of the elasticity's of demand for the various imports and the elasticity's of supply for the various exports.

Little-Mirrlees Approach

- The other method of adjusting market prices into economic prices is the Little-Mirrlees approach (see Little & Mirrlees, 1969, 1974),
- **In this approach benefits and costs may be measured at world price to reflect the true opportunity cost of outputs and inputs** using public saving measured in foreign exchange as the *numéraire* (that is, converting everything into its foreign exchange equivalent).
- The fact that foreign exchange is taken as a *nureraire* does not mean that project accounts are necessarily expressed in foreign currency.

- The unit of account can remain the domestic currency, but the values recorded are the foreign exchange equivalent that is, how much net foreign exchange is earned.
- If world prices are used, the economic price at which to value a project's output is its export price if it adds to exports, or its import price if domestic production leads to a saving in imports.
- On the cost side, the price at which to value a project input is its import price if it has to be imported, or export price if greater use leads to a reduction in exports.
- But if the goods or inputs in question are non-traded goods, the analyst needs to use conversion factor to translate domestic prices into their border price equivalent.

- **A conversation factor (CF)** is the ratio of the economic (shadow) price to the market price, that is:

$$\text{CF} = \frac{\textit{Economic price}}{\textit{Market price}}$$

- **So the economic price for a non-traded good** is its market price multiplied by the conversion factor.
- How are conversion factors derived?
- The true cost of any good is its marginal cost to society.
- **To find the world price of non-traded goods**, each good could be decomposed into its **traded and non-traded components** in successive rounds - backwards through the chain of production.

- **It is not feasible to differentiate conversion factors** between all non-traded goods and only special outputs (and inputs) are treated this way because the procedure is difficult, time consuming and costly.
- Shortcuts are, therefore, needed that provide a reasonable approximation.
- All the shortcuts involve some degree of averaging for a group of **non-traded items** and, therefore, some degree of error if average or standard conversion factor is applied to a particular non traded good rather than its own specific conversion factor.
- ***The derivation is as follows***:

$$SCF.P_d = P_w.OER$$

$$\text{SCF} = \quad SCF = \frac{P_w(OER)}{P_d}$$

Where P_d = *domestic price in domestic currency*

P_w = *world price foreign currency*

OER = official exchange rate

SCF = standard conversion factor

$$SCF = \frac{1}{P_d / P_w(OER)}$$

P_d/P_w is the shadow exchange rate i.e., the price of goods in domestic currency relative to their world prices

$$SCF = \frac{1}{SER/OER} = \frac{1}{PF}$$

SER/DER is the shadow price of foreign exchange (PF)

$$PF = \sum f_i \left(\frac{P_{di}}{P_{wi}(OER)} \right)$$

Where fi - Weights for the i^{th} commodity

P^{f}_{idi}- domestic price of the i^{th} commodity in domestic currency

P_{wi}- world price in foreign currency

PF- shadow price of foreign exchange

Taking the following example can summarize Little-Mirrlees approach of adjusting domestic prices into economic prices. A project that produces export goods can be assessed as follows.

Net Present Value (NPV) = OER (X-M) - SCF.D

Where -OER- official exchange rate

X- Exported goods in foreign currency

M- Imported goods in foreign currency

SCF- standard conversation factor

D- Price of non-traded goods in domestic currency

- **To summarize**, as long as SCF is the ratio of OER to SER, the two approaches - UNIDO and Little-Mirrless - differ only to the extent that SER is different from the actual exchange rate.

Chapter Sex

6. Measures of Project Worth (for Financial Analysis)

- **When costs and benefits have been identified quantified** and **priced (valued).**
  - The analyst is trying to determine **which among various projects to accept**, which to reject.
- There are ***two methods for measuring the worthiness of projects***
  - **Undiscounted &**
  - **Discounted methods.**

6.1. Undiscounted measures of project worth

A. Ranking by inspection

❖ **The analyst can sometimes simply choose one project among alternatives projects by examining the following**:

1. Total cost of investment and investment period;
2. The structure, & amount of costs and benefits;
3. The structure & total amount of the net incremental benefit;
4. The lifetime of the project, etc.

- ***The problem with this method*** is that the selection ***lacks objectivity***.

B. Payback Period

- **The payback period (PBP)** is **the length of time from the beginning of the project** until
  - The **sum of net incremental benefits of the project** equal to **total capital investment.**
- **It is the length of time** that **the project requires to recover** the investment cost.
- **If a project generates constant annual cash inflows,** the payback period can be computed by dividing the initial cash outlay by the annual cash inflow.

$$PBP = \frac{Cash outlay (investment)}{Annual cash inf low}$$

- **If the cash inflow is not uniform, the pay back period is calculated by totaling the inflows starting from the first year and equating it with the initial outlay on the project.**
- **Decision rule the firm has to pre-determine the acceptable pay back period than the acceptable.**
- **If the PBP is shorter PBP, the project is accepted. Otherwise it is rejected.**
- The method is very simple and it is a good measure **when the project has problem of liquidity**.
- ***The pay-back period is also a common***, rough means of choosing among projects in business enterprise, especially when the choice entails high degree of risk.

- Since risk generally increases with **futurity**, the criterion seems to favor projects that are ***prima facie* less risky.**
- **This method has two important weaknesses**:

- **First**, ***it fails to consider the time & amount of net benefits after the payback period.***
- **Second**, ***it does not adequately take into account the time value of money even in the payable periods***.
- The only concern behind the payback period method is ***the recovery of initial capital.***

Consider the following alternative projects

Alternative projects	Year	Investment cost	Net incremental benefits	Commutation net incremental benefits
I	1	2000	-	
	2		2000	
	3		8000	
	4		12000	
	5		9000	29000
II	1	20000	-	
	2		200	
	3		12000	
	4		8000	
	5		12000	32000
III	1	20000	-	
	2		1000	
	3		5000	
	4		6000	
	5		8000	
	6		10000	
	7		5000	
	8		2000	37000

- Note that the incremental net benefit could be financial or economic incremental net benefit

- **Project I & II have a payback period of 4 year.**
- But project III has a payback period of 5 years.
- Based on this criterion, **project I & II have equal higher rank than project III.**
- ***The method fails to consider*** the time & amount of net incremental benefit after the payback period- project III.
- The method results equal rank for both project I and II.
- **We know by inspection that we would choose project II over project I *because more of the returns to project II are realized earlier.***
- This method is a measure of cash recovery, not profitability.

C. *Rate of return on investment*

- ***The rate of return***, also referred to as ***the average rate of return***, ***has many variants due to differences in how it is computed***.

- **All the variants, however, have two features in common;**

✓ Use of accounting concepts ***in calculating benefits*** and

✓ Not adjustment for ***time value of money***.

1. Proceeds per unit of outlay

- **Investments are ranked** by the proceeds (cumulative of net incremental benefits) per unit of outlay (investment cost).
- **It is the total net value** of **incremental net benefits** divided by the total amount of investment. In the previous example, project I, II & III have a proceeds per outlay of 1.45, 1.6 and 1.85, respectively.
- According to this criterion, project **III** will be ranked first.

2. Average annual proceeds per unit of outlay

- To calculate this measure, **first the total net incremental benefits will be divided by the time it will be realized to arrive at average annual net incremental benefits**, and **then this average value will be divided by total investment costs.**
- **In this method**, project I, II & III will have average annual proceeds per unit of outlay of 0.36, 0.40 and 0.26, respectively.
- **Project II will be chosen. This criterion has serious flaws.**
- By failing to take into consideration the length of time of the benefit stream, **it automatically introduces a serious bias toward short-lived investments with high cash proceeds**.

Average income on book value of the investment

- ***This is* the ratio of average income *to* *the book value of the assets (i.e. the value after subtracting depreciation) stated in percentage terms.***
- This measure is **useful and commonly used** way of assessing the **performance of an individual firm**.
- ***It is also sometimes used as an investment criterion***.
- This measure, as the previous one, does not take into consideration the timing of the benefit stream.
- In the above example, assuming strait-line deprecation for all projects, ***average income on book value can be calculated*** as follows.

Project	Average net value of incremental benefit	Annual deprecation	Net average income	Average book value	Average income on book value
I	7050	5000	2250	10000	0.225
II	8000	5000	3000	10000	0.300
III	5285.7	2857.1	2428.6	10000	0.242

6.2. Discounted measure of project worth

Time value of money

- **Money has time value**.
- **A birr today** is more valuable than a birr a year hence. **Why?**

➢ Individuals, **in general, prefer current consumption to future consumption.**

- **Capital can be employed productively** to generate **positive** returns.
- ***An investment of one birr today*** would **grow to (1+r)** a year hence (r is the rate of return earned on the investment).
- **In an inflationary period** a birr today represents a greater real purchasing power than a birr a year ***hence/future.***
- **Present values** are better than the same values in the future and earlier returns are better than later.
- **This shows that money has time value**.
- Most financial problems involve **cash flows occurring at different points of time.**
- ***These cash flows have to be brought*** to the same point of time for the purpose of comparison and aggregation.

- Thus, ***to include the time dimension in our project evaluation, we have to use discounting methods***.
- **Discounting** is essentially a technique that **'reduces'** future benefits and **costs to their 'present worth'**.
- ***The rate used for discounting is called discount rate***.

- Suppose someone promises to give you ***Br. 1,000 three years hence***. What is the present value of this amount ***if the interest rate is 10%?***
- ***The present value can be calculated by discounting Br. 1000, to the present point of time, as follows***:

Value three years hence = Br 1000

Value two years hence = Br 1000 (1/1.10)

Value one year hence = Br 1000 (1/1.10) (1/1.10)

Present value = Br 1000 (1/1.10) (1/1.10) (1/1.10)

Suppose a bank lends 1567.05 Birr for a project at 5% interest rate. The project owner is supposed to repay the principal & interest rate after 5 years. **How much the *owner will have* to pay at the end of *5 years*?**

$A_t = P(1 + r)^t$

A_t = total amount after t years

r = interest rate

t = time

$A_5 = 1567.05 (1 + 0.05)^5$

= **2000 B**

- Suppose again a project is expected to obtain ***2000 B after 5 years***.
- Value of this money today can be calculated as:

$$P = \frac{At}{(1+r)^t} = \frac{2000}{(1+0.05)^5} = \underline{\underline{1567.05}}$$

- **The difference between this & the previous is only the** viewpoint.
- ***The interest rate used*** **for** **compounding assumes a viewpoint from here to the future,** whereas **discounting looks back ward form the future to the present.**

1. Net Present Values

- ***The net present value of an investment proposal*** is the present value of expected future net cash flows,
- **Discounted at the costs of capital, less the initial outlay**.

$$NPV = \sum_{t-1}^{n} \frac{At}{(1+r)^t} - I$$

- NPV- net present value
- A_t = net cash flow for the year t
- K - Cost of capital
- n- Life of the project

If the investment period is longer, the investment cost must also be **discounted**. **Thus the formula must be modified as**:

$$NPV = \sum_{t-1}^{n} \frac{At}{(1+r)^t} - \sum_{t-1}^{J} \frac{I_t}{(1+r)^t}$$

➢ Choosing the discount rate

- To be able ***to use discounted measures of project*** worth ***we must decide upon the discount rate to be used*** for **calculating the net present worth.**
- For financial analysis, ***the discount rate is usually the marginal cost of money to the firm (project owner).***
- This often will be the rate at which the enterprise is able to borrow money.
- **If the incremental capital to be obtained** is a mixture of **equity and borrowed** capital the discount rate will have to be weighted to take account of the return necessary **to attract equity capital on the one hand and the borrowing rate on the other**.

$$r = \frac{Equity}{Total\ \text{cap}} x\ \text{return needed to attract capital} + \frac{\text{Borrowed capital}}{Total\ \text{captial}} x\ \text{borrowry rate}$$

- ***For economic analysis***, there are different alternative ways.
- ***Probably the best discount rate*** to use is **the opportunity cost of capital.**
- **It is the return on the last or marginal investment made.**
- **If set perfectly**, the rate would reflect **the choice made by the society as a whole between present and future returns**, & hence, the amount of total income the society is willing to save.
- **In the net present value method, the higher the NPV, the more desirable the project is**.
- **All projects that have a positive NPV** are accepted and projects that have a negative NPV are rejected.

- **In ranking mutually exclusive project** (if one is chosen, the other cannot be undertaken), ranking based on NPV depends on the dissonant rate used.
- **That is if we have two mutually exclusive projects, projects project A and project B -** project A may be ranked first in some ranges of discount rates but may turn out to be second in some other ranges.

Assume a project has the following investment cost, operating cost and benefit streams (Table 7.1.)

Year	Investment cost	Benefit streams	Cost streams	Net benefits	Discount factor	Present value
0		-		-40000	1.000	-40000
1		-		-50000	0.990	-49500
2		-		-25000	0.980	-24500
3		75000	70000	5000	0.971	4855
4		80000	70000	10000	0.961	9610
5		90000	75000	15000	0.951	14265
6		100000	95000	20000	0.942	18840
7		110000	92000	22000	0.933	20526
8		120000	95000	25000	0.923	23075
9		130000	105000	25000	0.914	22850
10		120000	100000	20000	0.905	18100
	NPV					**18121**

▪ Internal Rate of Return (IRR)

The internal rate of return is defined as **the rate of discount**, which brings about **equality between the present value of future net benefits & initial investment**. It is the value of *r* in the following equation.

$$I = \sum_{t=1}^{n} \frac{At}{(1+r)^t}$$

I – *investment cost*
A_t – *Net benefit for year t*
R - *IRR*
N - *Life of the project*

Illustration: Suppose a project has the following net benefit flows of its project life of 4 years.

Year	Net Benefit
0	-100
1	200
2	400
3	500
4	700

The IRR can be calculated as:

$$1000 = \frac{200}{(1+r)^1} + \frac{400}{(1+r)^2} + \frac{500}{(1+r)^3} + \frac{700}{(1+r)^4}$$

r can be found **through trial & error method**.

- When **r = 23.068** percent the value in the above equation in the right hand side will be equal to about **1000.00** which is equal to the value in the left hand side.
- **The problem with this method is that the value of r (IRR)** can ***only be found by trial and error.***

The procedure can be described as follows:

1. Select an arbitrary value of r;
2. Calculate the value of the right hand side equation with this value of r.

- **If the RHS** value is lesser than the value in the left hand **reduce the value of r.**
- ***If the RHS is greater than the LHS***, increase the value of r; continue until this the ***RHS is very close to the LHS.***
- ***When the RHS is more or less equal to LHS***, it is that value of r, which is the IRR
- A project may result **more than one possible IRR though it is extremely rare.**
- **This can only occur when a project has negative net returns after successive positive returns**

- **This can arise, for instance, when there is a replacement investment around the mid way in the life of the project.**
- In such instances, a project will have positive return then after.
- **This condition may give rise to two IRR.**
- This is one of the criticisms of IRR method since no similar problem exists with the other methods.

3. Benefit Cost Ratio

- A third discounted measure of project worth is ***the benefit-cost ratio***.
- This is the ratio obtained when ***the present worth of the benefit stream*** is divided by the ***present worth of the cost stream***.
- The mathematical formula is given below:

$$B - C = \frac{\sum_{t-1}^{n} \frac{Bt}{(1+r)^t}}{\sum_{t-1}^{n} \frac{Ct}{(1+r)^t}}$$

- Where - Bt - are the benefits in period t

  Ct - are the costs in period t

  n - project life

  r - discount rate

- **The formal selection criterion** for the **benefit-cost ratio** measure of project worth is to **accept all independent projects with a benefit-cost ratio of 1 or greater.**

1.Net Benefit - investment Ratio

- This criterion is **suitable and convenient for ranking projects** especially when sufficient budget is not available to implement all projects that satisfy other criteria.
- **Two or more projects may all have a positive *NPV, IRR that exceeds the discount rate*, both financial and economic discount rates**, and ***a benefit-cost ratio of greater than one***.
- In this case, ranking could be made using ***net Benefit - investment ratio.***
- This can be calculated as:

Net benefit - investment ratio = $$\frac{\sum_{t=1}^{n} \frac{(Bt - Ct}{(1+r)t}}{\sum_{t=1}^{n} I/(1+r)^t}$$

- Where - Bt Benefits, C+ - costs, I- investment, r-discount rate, I- investment cost
- ***It is simply the present value of net benefits divided by the net present worth of the investment***.
- The formal selection criterion for ***the net benefit - Investment ratio*** measure of project with is to accept all projects ***with a ratio of 1 or greater*** when they are discounted with appropriate rate - in order, beginning with the larges ratio value and proceeding until available investment funds are exhausted.
- ***This ratio determines*** if project will have a net benefit greater than the investment at some stated amount of return on capital.

- In the previous example, ***using 12% discount rate***, ***project A & B result NB 1 ratio of 1.298 and 1.266, respectively.***

1. Comparisons among Discounted Measures

❑ ***The above measures of project worth may give different ranking*** if projects that are being comparing are different in their:

1. Cash flow structure
2. Magnitude of costs and benefits
3. Life time
4. Some projects may give high return in the early stage of the project & decline thereafter & some other projects may give lower return in the early stage & grow later in the life of he project.

1. The former will be **less sensitive to changes in discount factor** as compared to the latter.
2. For some projects the **costs & benefits** could be large in magnitude than other projects.

- In this case ranking based on NPV & IRR may not give same result.

3. Some projects have shorter life than others. Here also the ranking could be different in different erasures.

- ***If a firm or government has unlimited funds***, ***which is rare in reality***, these differences have no significant implication in the decision.

- **In such cases**,

✓ **Projects with a positive NPV**,

✓ ***The IRR value of greater than opportunity cost of capital (discount rates),***

✓ ***The B-C ratio & Net return-investment ratio of greater than one will all be chosen***.