1. INTRODUCTION

1.1. The project concept

- Project planning and analysis has a long history in financial and business analysis.
- Project analysis has always been used as a means of checking the profitability of a particular investment by private firms.
- Recent experiences show that project analysis has attracted the attention of development economists.
- Projects are now assessed from the economy's viewpoint instead of only from the firm's perspective.
- The selection criteria have also included economic criteria on top of financial criteria.

- ***A project*** is an instrument of change.
- It is coordinated series of actions resulting from a policy decision to change resource combinations and levels so as to contribute to the realization of the country's development objectives.
- Projects should, according to this definition, be formulated within the framework of the country's development priority objectives which may include agricultural production growth, improving income definition, eradicating poverty and malnutrition, promoting larger public involvement in producing goods and services.
- ***A project*** is people - oriented which responds to people's actions. Example: seeds project is oriented by farmer's response to the improved seed.
- Hence, projects should forecast the response of their ultimate beneficiaries.
- A project within the framework of a national development changes plan into action at a micro-level. Hence, a project is undertaken, among other things, for development reasons which may include:
  - executing national objectives at the micro level,
  - national increases in agricultural production,
  - promoting exports,
  - employment creation,
  - utilizing non-utilized and under-utilized resources - full employment, and
  - Pursuing agricultural diversification policies (minimizing risk).

1.2. Definition of Project

- ***A project*** is a complex set of economic activities in which we commit scarce resources in expectation of benefits that exceed the value of these resources. From this definition, it is clear that a project:
  - has specific objective (private or public);
  - involves set of activities (planning, financing, and implementing);
  - involves resource use;
  - deals with future expectations (risk and uncertainty);
  - involves comparing benefits and costs to occur in the future; and
  - has defined period of life;

- Projects, by Gittinger (1994), are defined as the cutting edge of development
- ***Project*** *can also be defined as an investment activity in which financial resources are expended to create capital assets that produce benefits over an extended period of time*.
- A project is a complex set of activities where resources are used in expectation of return and which lends itself to planning, financing and implementing as a unit.
- The basic characteristics of capital expenditure (also referred to as a capital investment or capital project or just project), is that it typically involve current outlay (or current and future outlays) of funds in the expectation of a stream of benefits extending far into the future.
- Capital investment decisions often represent the most important decisions taken by the firm or other decision maker.
- Capital investment decisions have far reaching impact into the future.
- They are also characterized by irreversibility.
- Thus, a wrong capital investment decision often cannot be reversed without incurring substantial loss.
- They also involve substantial outlay of capital.

- Project exist in every field of endeavour, including designing and/ or constructing a house, designing a new product and introducing a new businesses or software product.
- ***Project management*** is defined as managing and directing time, material, personnel/ labour, and cost to complete a project in orderly, economical manner and to meet the established objectives of time, cost and technical and/ or service results.
- A successful project using the project management approach will consist of three stages: -
- ***Planning:-*** understanding what work has to be done including identifying the individual activities and necessary resources to complete the project; then developing a plan of action in a logical order that can be displayed graphically as a project planning diagram (or network).
- ***Scheduling: -*** Validating when the work activities need to be done. This stage details the time allowed for the project and each activity when they are to be started and completed.
- ***Controlling: -*** Monitoring (tracking) progress of the project as it gets underway, analyzing performance, and then resolving concerns. It also manages status report.

1.3. The linkage between projects and programs

- While a **project** refers to an investment activity where resources are used to create capital assets, which produce benefits over time and has a beginning and an end with specific objectives,
- a **program** is an ongoing development effort or plan which may not necessarily be time bounded.
- Examples could be a road development program, a health improvement program, a nutritional improvement program, a rural electrification program, etc.
- A development plan or program is a general statement of economic policy. National development plans are further disaggregated into a set of sectoral plans.
- A development plan or a program is therefore a wider concept than a project.
- It may include one or several projects at various times whose specific objectives are linked to the achievement of higher level of common objectives. For instance, a health program may include a water project as well as a construction of health centers both aimed at improving the health of a given community, which previously lacked easy access to these essential facilities.
- Projects, which are not linked with others to form a program, are sometimes referred to as “stand alone” projects.
- Projects in such context are the concrete manifestations of the development plans in a specific place and time. One can think of projects as subunits and bricks of programs, which constitute the national plan (usually the direction is from plans to projects). We have to note that projects could be either public or private. It is the smallest operational element prepared and implemented as a separate entity in a national plan or program.

- From the above discussion it can be seen that the major difference between a project and a program is not so much in objectives stated but lies more in scope, the details and accuracy.
- A project is designed with a high degree of precision and details as regards its objectives, features, calculation of returns and implementation plan.
- A program by contrast is general, lacks details and precision and aims at a broader goal often related to a sectoral policy of a country or departmental policy of an organization.
- Perhaps the distinction between projects and programs would be clear if we see the basic characteristics of projects. Projects in general need to be **SMART**.
- **S – Specific**
- A project needs to be specific in its objective. A project is designed to meet a specific objective as opposed to a program, which is broad. A project has also specific activities. Projects have well defined sequence of investment and production activities and a specific group of benefits. A project is also designed to benefit a specific group of people.
- **M - Measurable**
- Projects are designed in such a way that investment and production activities and benefits expected should be identified and if possible be valued (expressed in monetary terms) in financial, economic and if possible social terms. Though it is sometimes difficult to value especially secondary costs and benefits of a project, attempt should be made to measure them. Measure costs and benefits must lend themselves for valuation and general projects are thought to be measurable.
- **A – Area bounded**
- As projects have specific and identifiable group of beneficiaries, so also have to have boundaries. In designing a project, its area of operation must clearly be identified and delineated. Though some secondary costs and benefits may go beyond the boundary, its major area of operation must be identified. Hence projects are said to be area bounded.
- **R – Real**
- Planning of a project and its analysis must be made based on real information. Planner must make sure whether the project fits with real social, economic political, technical, etc situations. This requires detail analysis of different aspects of a project.
- **T – Time bounded**
- A project has a clear starting and ending point. The overall life of the project must be determined. Moreover, investment and production activities have their own time sequence. Every cost and benefit streams must be identified, quantified and valued and be presented year-by-year.

1.4. Project Analysis

- All countries, but particularly the developing countries, are faced with the basic economic problem of allocating resources such as labor at all levels of skill, management and administrative capacity, capital, land and administrative and other natural resources and foreign exchange, to many different uses such as current production of consumer goods and public services or investment on infrastructure, industry, agriculture, education and other sectors.
- These different uses of resources, however, are not the final aim of the allocate process; rather they are the means by which an economy can marshal its resources in the pursuit of more fundamental objectives such as the removal of poverty, the promotion of growth and the reduction of inequality in income. Pursuit of one objective (better income distribution) however, may involve a sacrifice in other objective (rapids growth).
- A choice therefore has to be made among competing uses of resources based on the extent to which they help the country achieve its fundamental objectives. If a country consistently chooses allocations of resources that achieve most in terms of these objectives, it ensures that its limited resources are put to their best possible use.
- Project analysis is a method of presenting this choice between competing uses of resources in a convenient and comprehensible fashion.
- In essence, project analysis assesses the benefits and costs of a project and reduces them to a common denominator.

2. ASPECTS OF PROJECT PREPARATION AND ANALYSIS

- Before the implementation and with in the implementation stage it is very vital to analyze project feasibility from many direction.
- The project analyst must consider several aspects when carrying project analysis. The major aspects of project preparation and analysis are outlined bellow:
- 2.1. **Technical Aspects**
- This aspect may include the works of ***engineers, soil scientists and agronomists*** in case of, say, agricultural projects.
- The technical analysis is concerned with the projects inputs (supplies) and outputs of real goods and services and the technology of production and processing.
- Technical analysis seeks to determine whether the prerequisites for the successful commissioning of the project have been considered and reasonably good choices have been made with respect to location, size, process, etc.
- It is from this aspect analysis that all physical quantity of inputs and outputs will be determined for the estimation of costs and benefits.
- Poor technical analysis will result in under- or over- estimation of quantities related to inputs required by and outputs of the project.
- The projects expected life time must also be determined carefully for it has greater implication on its overall analysis and preparation.
- All these require creative, committed and competent specialists from different fields. It also requires coordination among these specialists, as every technical aspect is interrelated and interacting.

Technical feasibility analysis

- Technical feasibility is the base for all other form of analysis because technically unfeasible project must be either revised or abandoned regardless of its performance.
- In general the technical analysis is primarily concerned with;
  - Material inputs and utilities
  - Manufacturing process and technology
  - Product mix
  - Plant capacity
  - Location and site
  - Machines and equipment
  - Structure and civil works
  - Project charts and layouts
  - Work schedule

2.2. Commercial /Demand and Market/ Aspects

This aspect analysis needs to ensure the existence of effective demand at remunerative price.

It also assesses possible means in which the market will absorb the output without affecting the output price and if it price inevitably be affected, we would have to assess its magnitude.

Similar arrangements need to be done on the input side too (including procurement of equipment and intermediate input supplies).

- Market analysis is basically concerned with two questions:
  1. What would be the aggregate demand of the proposed product/service in future?
  2. What would be the market share of the project under appraisal?
- To answer these questions the project analyst requires a wide variety of information and need to use appropriate forecasting methods. The kinds of information required are:
  1. Consumption trends in the past and the present consumption level
  2. Past and present supply positions
  3. Production possibilities and constraints
  4. Imports and exports
  5. Structure and competition
  6. Cost structure
  7. Elasticity of demand
  8. Consumer behavior, intentions, attitudes, preferences, and requirements
  9. Distribution channels and marketing policies in use
  10. Administrative, technical, and legal constraints.
- All aspects related to demand and supply of inputs and outputs must be examined.

2.3 Institutional-Organizational-Managerial Aspects

- Project analysis must make a detail analysis of project organization and management.
- This analysis aims at answering the following questions:
- Is the organizational set-up of the project adequate?
- Will the project be provided with competent personnel to manage it?
- The first question is about the proposed organization chart of the implementing agency. The latter question aims at ensuring that adequate project staff can be recruited locally or overseas. The problem of project staffing raises many other questions:
  - Is local manpower market enough to provide the project with the required manpower?
  - Can competent staff be recruited freely?
  - Should they be recruited locally or overseas?
- But even if the right staff is available, their success will depend mostly on the institutional set-up i.e., the relationship between the various organizations involved with the implementing agency. Appraising organization therefore includes appraisal of the project related institutions like subsidiary companies, ministries, headquarters, banks, transport companies and others.
  - What are the regulations or procedures?
  - What are the policies – that favor and disfavor the project?
- Once the right institutions to facilitate project implementation are available, the project should be implemented by competent, responsible and committed managers. This requires arrangement of adequate incentives to attract competent managers. Managerial appointment should be a function of competence and commitment, not a function of race, tribe, creed or political opinion.

2.4. Financial Aspects

- Financial analysis seeks to ascertain whether the proposed project will be financially viable in the sense of being able to meet the burden of servicing debt and whether the proposed project will satisfy the return expectations of those who provide the equity capital.
- Here the project analyst is concerned with the financial effects of the proposed project on each of its various participants (firms, farmers/workers, government etc.).
- By examining the financial implications of the project for these parties, the analysts need to identify the projects financial efficiency, incentive impact to the participants in the project, creditworthiness and liquidity (say, could the firm have enough working capital?).
- The financial analysis establishes the magnitude of costs of investment, production and overheads and magnitude of benefits.
- This analysis will be the basis for evaluating the project profitability. Project profitability depends on a comparison of costs versus revenues using realistic market prices of materials, labor and outputs.
- The aspects, which have to be looked into while conducting financial appraisal, are:
  1. Investment outlay and costs of the project
  2. Means of financing; source of finance, credit terms, interest rates, etc
  3. Cost of capital
  4. Projected profitability
  5. Break-even point
  6. Cash flows of the project
  7. Investment worthiness judged in terms of various criteria of merit
  8. Projected financial position
  9. Level of financial risk
- Financial analysis must generate future financial statements such as income statement, balance sheet and uses-and-source-of-fund statement. After these statements are produced, analysts can undertake different financial ratio analysis so as to ascertain financial feasibility. The financial analysis must clearly show fund flows in each period in the project life.

2.5 Economic Aspects

- The economic aspect of project preparation is primarily concerned with the determination of the likelihood of the proposed project, and hence the committing of scares resources, by justifying the significance of the project from **the whole economy** point of view (the society as a whole).
- In such evaluation the focus is on the social costs and benefits of a project, which may often be different from its monetary or financial costs, and benefits.
- The financial analysis views the project form the participants (or owners) point of view, while the economic analysis form the society's point of view.
- Decision makers here are concerned about the investment of scarce capital and other resources that will best further national objectives.
- This is true whether the resources committed are being invested by government directly or by individuals within the economy.
- While financial analysis uses projected market prices to value inputs and outputs, economic analysis uses **'economic prices'** or **'shadow prices'** or **'efficiency prices'** to better approximate the opportunity costs of an input – the amount the economy must give up if the resource is transferred from its present use to the project.
- Similarly, to value project's output, economic analysis uses the marginal value of a given output to approximate the real value – the value that consumers place on that commodity.
- Thus economic analysis requires adjustment of market prices, which may not reflect the real value of resources and outputs, into economic prices.
- It also requires determination of economic prices of those goods that might not have market prices but that involve commitment of real resources.
- The mechanics of adjusting market prices into economic prices will be discussed in detail in the later chapter.

2.6. Social Aspects

- Project analysts are also expected to examine the broader social implications of the proposed project.
- Although the economic analysis will determine the amount of income stream generated over and above the costs of labor and other inputs, it does not specify who actually receive it and hence it does not the issue of income distribution.
- So the social aspect analysis should address the income distribution implications of a project.
- Other closely related aspects as employment opportunities, gender aspects, stimulating or competing effects with other sectors, and other desired objectives must be considered.

2.7. Environmental aspect analysis

- In recent years environmental concerns have assumed a great deal of significance.
- In most developed countries and for projects financed by foreign donors in developing countries, an environmental impact assessment is a prerequisite for project financing.
- Environmental impact of a project refers to the effect of a project on the world of animals, plants, water, air, and humans existing in the project area.
- Ecological analysis should be done particularly for major projects, which have significant ecological implications like power plants and irrigation schemes, and environmental polluting industries.
- In such projects environmental impact assessment is important because economic benefits that may be generated from the project can be counter-balanced by undesirable environmental effects.

3. THE PROJECT CYCLE

- To perform a project planning and management activity effectively & efficiently we should know the natural sequence of project.
- Project cycle means the various stages of information gathering and decision making which take place between a project's inception and completion.
- A project cycle is a sequence of events, which a project follows.
- These events, stages or phases can be divided into several equally valid ways, depending on the executing agency or parties involved.
- Some of these stages may overlap.
- Capital expenditure decision is a complex decision process, which may be divided into six broad phases:
  1. Identification
  2. Project preparation and analysis
  3. Selection and project design
  4. Implementation
  5. Ex-post evaluation

3.1. Identification:

- The first stage in the project cycle is to find potential projects.
- Identification of promising investment opportunities requires imagination, sensitivity to environmental changes, and a realistic assessment of what the firm can do.
- This phase may take two forms.
  - If the project is largely a private venture in a widely market economy context the initiating entity will define the concept, expectation and objectives of the project.
  - On the other hand the project idea can also emanate form government agencies in the context of government development plans.
- In the latter case sectoral information (i.e. the direct and indirect demands of sectors) is an important source of identification. In market economy context anticipated demand for the projects output is important.
- In addition assessment of appropriate technology, scale of the project, timing of the project etc. are important.
- All types of specialists' input are required at this stage.
- The planning phase of a firm's capital investment is concerned with the articulation of its broad investment strategy and the generation and preliminary screening of project proposal.
- The investment strategy of the firm delineates the broad areas or types of investment the firm plans to undertake. This provides the framework, which shapes, guides, and circumscribes the identification of individual project opportunities.

Identification

- In general there are four major sources from which ideas or suggestions for project may come:
  - Project ideas from technical specialists
  - Project ideas from local leaders
  - Project ideas from entrepreneurs
  - Project ideas from government policy and plans
- Note that sometimes at identification stage there could be a number of alternatives that could be examined. Some of these projects may appear for reasons nothing to do with the national plan. In such circumstances it's advantageous to understand the 'political history' of the project.
- The identification of project ideas is based on several aspects of development.
  - Need - a need assessment survey may show the need for intervention
  - Market demand - domestic or overseas
  - Resource availability - opportunity to make available resources more profitable
  - Technology - to make use of available technology
  - Natural calamity - intervention against natural calamity such as flood or drought
  - Political considerations
  - Possible alternative project must be adequately assessed.

3.2. Project preparation and analysis phase

- Once project ideas have been identified the process of project preparation and analysis starts.
- Project preparation must cover the full range of technical, institutional, economic, and financial conditions necessary to achieve the project's objective.
- Critical element of project preparation is identifying and comparing technical and institutional alternatives for achieving the project's objectives.
- Different alternatives may be available and therefore, resource endowment (labor or capital) would have to be considered in the preparation of projects.
- Preparation thus require feasibility studies that identify and prepare preliminary designs of technical and institutional alternatives, compare their costs and benefits, and investigate in more details the more promising alternatives until the most satisfactory solution is finally worked out. It involves generally two steps:
  - Pre-feasibility studies
  - Feasibility studies

Pre-feasibility Study

- The identification process will give the background information for defining the basic concept of the project, which leads to the feasibility study stage. Once a project proposal is identified, it needs to be examined.
- To begin with, a preliminary project analysis is done. A prelude to the full blown feasibility study, this exercise is meant to assess
- Whether the project is prima facie worthwhile to justify a feasibility study and
- What aspects of the project are critical to its variability and hence warrant an in-depth investigation.
- At the pre-feasibility study stage the analyst obtains approximate valuation of the major components of the projects costs and benefits.
- Some of the main components examined during the pre-feasibility study include:
  - Availability of adequate market
  - Project growth potential
  - Investment costs, operational cost and distribution costs
  - Demand and supply factors; and
  - Social and environmental considerations
- Using this preliminary data supplied by the various discipline specialists a preliminary financial and economic analysis will be conducted. If the project appear viable form this preliminary assessment the analysis will be carried to the feasibly stage.

Feasibility Study

- The major difference between the pre-feasibility and feasibility studies is the amount of work required in order to determine whether a project is likely to be viable or not.
- If the preliminary screening suggests that the project is prima facie worthwhile, a detailed an analysis of the marketing, technical, financial, economic, and ecological aspects will is undertaken.
- The focus of this phase of capital budgeting is on gathering, preparing, and summarizing relevant information about various project proposals, which are being considered for inclusion in the capital investment.
- Based on the information developed in this analysis, the stream of costs and benefits associated with the project can be defined.
- At this stage a team of specialists (Scientists, engineers, economists, sociologists) will need to work together.
- At this stage more accurate data need to be obtained and if the project is viable it should proceed to the project design stage.
- The final product of this stage is a feasibility report. The feasibility report should contain the following elements:
  - Market analysis
  - Technical analysis
  - Organizational analysis
  - Financial analysis
  - Economic analysis
  - Social analysis, and
  - Environmental analysis
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3.3. Appraisal

- The feasibility study would enable the project analyst to select the most likely project out of several alternative projects.
- Selection follows, and often overlaps, analysis.
- It addresses the question - is the project worthwhile?
- Wide ranges of appraisal criteria have been developed to judge the worthwhile of a project.
- They are divided into two broad categories, viz., non-discounting criteria and discounting criteria.
- To apply the various appraisal criteria suitable cut off values (hurdle rate, target rate, and cost of capital) have to be specified.
- The level of risk pursued influences these.
- Despite a wide range of tools and techniques for risk analysis (sensitivity analysis, scenario analysis Monte carol simulation, decision tree analysis, portfolio theory, capital asset pricing model, and so on), risk analysis remains the most intractable part of the project evaluation exercise.
- This exercise also involves the undertaking of detailed engineering design; manpower and administration requirement as well as marketing procedures should be finalized.

3.4. Implementation

- After the project design is prepared negotiations with the funding organization starts and once source of finance is secured implementation follows.
- Implementation is the most important part of the project cycle.
- The better and more realistic the project plan is the more likely it is that the plan can be carried out and the expected benefits realized.
- At the project implementation phase tenders are let and contracts signed.
- Project implementation must be flexible since circumstances change frequently.
- Technical changes are almost inevitable as the project progresses; price changes may necessitate adjustments to input and output; political environment may change.
- Project analysts generally divide the implementation phase into three time periods.
  - The investment phase, where the major investments are made. This may extend from three to five years.
  - The development phase, which may also extend from three to five years
  - The project life
  - The implementation phase for an industrial project consists of several stages:
- 1. Project and engineering designs,
- 2. Negotiations and contracting,
- 3. Construction
- 4. Training, and
- 5. Plant commissioning.
- Translating an investment proposal into a concrete project is a complex, time consuming and risk fraught task. Delays in implementation, which are common, can lead to substantial cost overrun.

3.5. Ex-post evaluation:

- The final phase of the project is the evaluation phase. Many usually neglect this stage.
- The project analyst looks carefully at the successes and failures in the project experience to learn how better to plan for the future.
- In this stage it is important to examine the project plan and what really happened.
- Performance review should be done periodically to compare actual performance with projected performance.
- A feedback device is useful in several ways:
  i. it throws light on how realistic were the assumptions underlying the project;
  ii. it provides a documented log of experience that is highly valuable in future decision making;
  iii. it suggests corrective action to be taken in the light of actual performance;
  iv. it helps in uncovering judgment biases;
  v. It induces a desired caution among project sponsors.
- Weakness and strengths should carefully be noted so as to serve as important lessons for future project analysis undertaking. Evaluation is not limited only to completed projects. Ongoing projects could also be evaluated to rectify problems when the project is in trouble. The project management, the sponsoring agency, or other bodies may do the evaluation.

4. IDENTIFYING PROJECT COSTS AND BENEFITS

- We undertake economic analysis of projects to compare costs with benefits and determine which among alternatives project have an acceptable economic return and we do the same for financial analysis.
- The costs and benefits of a project therefore must be identified. Further more, once costs and benefits are known they must be priced and their economic value determined.
- **Objectives, cost and benefits**
- In identifying costs and benefits of a project, objectives play important role.
- In project analysis, the *objectives* of the project provide the standard against which cost and benefits are defined.
- Simply put, a cost is anything that reduces an objective, and a benefit is anything that contributes to an objective.

- The problem with such simplicity, however, is that each participant in the project has many objectives. For example;
- A farmer has the following objectives
  - Increase household income/ Net incremental benefit
  - Educating children
  - Reducing work hours (consuming more leisure)
  - Paying debt
  - Reducing risk
  - Meet social obligations
- etc
- All these considerations affect a farmer's choice of cropping patter and thus the income generating rapacity of a project.
- Yet all are sensible decisions in the farmer's view.
- However, since it is difficult to incorporate all objectives, we will judge the effect of a project on the incremental income & thus, on the new income generated by the project.

- A private business firm can have objectives such as:
  - Maximizing net income (profit)
  - Increasing market share
  - Improving customer satisfaction
  - Reducing risk, etc.
- A society or a nation as a whole may want to achieve the following objectives as:
  - Increasing national income (growth objective)
  - Ensuring equitable distribution between persons, regions, generations, etc. (distributional objective)
  - Improving balance of payments
  - Improving regional integrity
  - Reducing inflation
  - Reducing unemployment
  - Maintaining environment, etc.
- However, the problem with such a number of objectives is there is no formal analytical system for project analysis that could possibly take into account all the various objectives of the society or private business firm.
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- Thus, we will take maximization of net incremental income (profit) for a private firm and maximization of national income for a nation as the *fundamental objectives* in the analysis of a project.
- In financial analysis, which is conducted from the viewpoints of the private project-operator, we will evaluate the project in terms of its contribution to the net income (profit) of the private owner (which is usually considered to be the fundamental objective of the private business firm).
- The project that will generate the highest profit for the owner will be given priority to other alternative projects.
- In contrast to this, in economics analysis, which is conducted from the standpoint of the society as a whole, we will evaluate a project in its contribution to the national income - the value of all final goods and services produced during a particular period, usually a year.
- All other objectives, if very important, can be considered in a separate decision or if possible we will include in the analysis.

- Thus, project that contributes the highest to the national income and also that makes a significant contribution to other social objectives will be selected.
- E.g. If two projects contribute equal income to national income, we will choose one that favor equitable distribution or the one that creates the most jobs, etc.
- Of course, there are analytical techniques, proposed by Squire and van derTak (1992) and Little and Mirrlees (1977), that incorporate especially distributional objectives into the analysis.
- Therefore, when we come to identification of costs and benefits in economic analysis, anything that *reduces* national income is a *cost* and anything that *increases* national income is a *benefit*.
- Hence the analyst task in economic analysis is to estimates the amount of this increase in national income available to the society, i.e. to determine whether, and by how much, the benefits exceed the costs in terms of national income.
- In the economics analysis we will assume that all financing for a project comes from domestic sources and that all returns from the project go to domestic residents, thus we identity cost and benefits b/n terms of GDP instead of GNP.

Costs & benefits: in financial and economic analysis

- The projected financial revenues and cost are often a good starting point for identifying economic benefits and costs but two types of adjustments are necessary. First it is necessary to include (or exclude) some costs and benefits. Second it is necessary to revalue inputs and outputs at their opportunity cost.
- Financial analysis which looks the project from the perspective of the implementing agency identifies the project's net money flows to the implementing entity and assesses the entities ability to meet its financial obligations and to finance future investments.
- Economic analysis, by contrast, looks at a project from the perspective of the entire economy ("society") and measures the effects of a project on the economy as a whole.
- The important difference between financial and economic analysis is in the price that the project entity uses to value the inputs and outputs.
- Financial analysis is simply based on the actual prices that the project entity pays for inputs and receives for outputs.

- The prices used for economic analysis, however, are based on the opportunity costs to the country.
- The economic values of both inputs and outputs usually differ from their financial value (market prices) because:
  - There are different market imperfections;
  - There are government interventions of various kinds (taxes, subsidies, tariff, price control, etc, and;
  - Some goods are public goods by their nature (may not totally have market or the price consumers are willing to pay are less).
- The divergence between financial and economic prices and flows show the extent to which some one in society, other then the project entity, enjoys a benefit or pays a cost of the project. And hence enable the analyst to identify 'gainers' and 'losers'.
- The magnitudes and incidence of transfers are important pieces of information that shed light on the project's fiscal impact, other distribution of costs and benefits and hence on its likely opponents and supporters. By identifying the groups that benefits from the project and groups that pay for its costs, the analyst can extract valuable information's about the incentives that these groups have to see to it that the project implemented as designed.

Categories of Costs and Benefits
1. Costs of inputs

- ***Physical goods*: -** construction materials, raw materials, etc. Here valuation is not a problem but the problem is associated with planning the required amount of input.
- ***Labor*: -** skilled and unskilled. Here the problem of valuation may arise when the project uses family labor.
- ***Land*: -** it is not difficult to identify. The problem is with valuation of land because of the very special kind of market conditions that exist when land is transferred from one owner to another.
- In financial analysis, we directly take the market price if the use of these inputs involves cash outlays. If there are no cash payments for some of these inputs, it will not be considered as a cost. In economic analysis, however, since the use of these inputs is related with the use of real resources, they will be valued at their economic price and entered into economic accounts.

2. Direct transfer payments

- Some entries in financial accounts really represents shifts in claims to goods and services from one entity in the society to another and do not reflect changes in national income. These are the so-called direct transfer payments, which are much easier to identify if our definition of costs and benefits is kept in mind. Common transfer payments in projects are: taxes, subsidies, loans, and debt services (the payment of interest and repayment of principal).
- **Taxes**
- Payment of taxes is clearly cost in financial analysis. When a firm pays a tax, its net benefit is reduced. But the firm's payment of tax doesn't reduce the national income. Rather it transfers income from the firm to the government so that this income can be used for social purposes presumed to be more important to the society than the increased individual consumption (or investment) had the firm retained the amount of the tax. Thus, in economic analysis we would not treat the payment of taxes as a cost in project accounts. Of course, no matter what form a tax takes, it is still a transfer payment - whether a direct tax on income or an indirect tax such a sales tax, an excise tax, or a tariff or duty on an imported input for production. But some conation is advisable here. Whether a tax should be treated as a transfer payment or as a payment for goods and services depends on whether the payment is a compensation for goods and services needed to carryout the project or merely a transfer, to be used for general social purposes, of some part of the benefit from the project to the society as a whole.

- **Subsidies**
- Subsidies are simply direct transfer payment that flow in the opposite direction from taxes.
- If a farmer is able to purchase fertilizer at a subsidize price, that will reduce his costs and there by increase his net benefits thus it is a benefit but the cost of the fertilizer in the use of the society's real resources remain the same.
- Again it makes no difference what form the subsidies takes.
- One form is that which lowers the selling price of inputs below what otherwise would be their market price.
- But a subsidy can also operate to increases the amount a firm receives for what he sells in the market, as in the case of a direct subsidy paid by the government that is added to what the firm receives in the market. In other cases, the market price may be maintained at a level higher that it would otherwise be by, say, levying an import duty on competing imports or forbidding competing imports altogether.
- Although it is not a direct subsidy, the difference between the higher controlled prices set by such measures and lower price of competing imports that would prevail without such measures does represent an indirect transfer from the consumer to the firm. In all these cases, subsidies are simply transfer payments and will not be included as a benefit in economic analysis.

- **Credit transactions**
- Credit transactions are the major form of direct transfer payment in projects.
- From the standpoint of the project owner, receipt of a loan increases the production resources he has; payment of interest and repayment of principal reduce them. But from the standpoint of the economy, these are merely transfers of control over resources from the lender to the borrower. The financial cost of the loan occurs when the loan is repaid, but the economic cost occurs when the loan is spent.
- It is important to note one point here. Financial analysis of projects is based on cash flow analysis.
- For every period during the expected life of the project, the financial analyst estimates the cash likely generated by the project and subtracts the cash likely to be needed to sustain the project.
- The net cash flows result in financial profile of the project. Because the financial evaluation of a project is based on cash flows, omits some important items that appear in profit-and-loss statements.
- In economic analysis, debt service is treated as a transfer within the economy even if the project will actually be financed by a *foreign loan & debt service* will be paid abroad. This is because of the convention of assuming that all financing for a project will come form domestic sources and returns from the project will go to domestic residents. Thus convention separates the decision of how good a project is from the decision of how to finance it.
- **Depreciation allowances**
- Depreciation may not correspond to actual use of resources should therefore be excluded from the cost stream in economic analysis. The economic cost of using an asset is fully reflected in the initial investment cost less its discounted terminal value.

3. Contingency allowance

- Sound project planning requires that provision be made in advance for possible adverse changes in physical conditions or prices that would add to the baseline costs. Contingency allowance may be divided into those that provide for physical contingencies and those for price contingencies.
- In turn, price contingency allowances comprise two categories, those for relative changes in price and those for general inflation.
- ***Physical contingency allowance*** is a real cost & will reduce the final goods and services available for other purposes, i.e. it will reduce the national income and, hence, is a cost to the society. To the extent that physical contingency allowance is a part of the expected value of the project costs, it should be included in the economic analysis.
- ***Price contingency (Change in price)***
- In most practical cases, in project cost estimation it is assumed that there will be no relative changes in domestic or international prices and no inflation during the investment period. It would clearly be unrealistic to rest project cost estimates only on the assumptions of stable price.
- ***Relative changes in price -*** A rise in the relative cost of an item implies that its productivity elsewhere in the society has increased, that is, its potential contribution to national income has risen. Thus, costs that may be incurred due to possible relative changes in prices will be considered as a cost in both financial and economic analysis.

- If the market is perfectly competitive, allocation of resources to alternative uses will be at a point where the MVP of that resource is equal in alternative uses.
- $MVP_X = MPV_Y = -----$
- Resources will then have been allocated through the price mechanism so that the last unit of every good and service in the economy is in its most productive use or best consumption use. No transfer of resources could result in greater output or more satisfaction. But if there are any changes in relative price, the value of commodities will change as the marginal utility in consumption changes. The same holds true for resources.
- ***General change price (inflation),*** however, does not affect national income in real terms & in project analysis the most common means of dealing with it is to work in constant prices, on the assumption that all prices will be affected equally by any rise in the general price level. If inflation is expected to be significant, however, provision for its effects on project costs needs to be made in project financial plan so that an adequate budget is obtained.

4. Sunk costs

- Sunk costs are those costs incurred in the past upon which a proposed new investment will be based.
- When we analyze a proposed investment, we consider only future returns to future costs; expenditure in the past, or sunk costs, ***do not appear*** in both financial and economic accounts.
- Money spent in the past is already gone; we do not have as one of our alternatives not to implement a competed project.
- However ill-advised they may have been, such costs have already been incurred and can no longer be avoided.
- Ignoring sunk costs sometimes leads to seemingly paradoxical, but correct, results.
- If a considerable amount has already been spent on a project, the future returns to the costs of completing the project may be extremely high, even if the project should never have been undertaken. 'Bygones are bygones', only costs that can still be avoided matter in this regard.

Tangible benefits of projects

- ***Increased production*: -** increased physical production is the most common benefit of projects. Whether the increased output is marketed or consumed at home, it represents the benefit of a project.
- ***Quality improvement*: -** to account as a benefit in both financial and economic analysis this must be reflected in the market price of the good.
- ***Change in time of sale*: -** In some projects, especially in agriculture, benefits will arise from improved marketing facilities that allow the product to be sold at a time when prices are more favorable. (Marketing function that adds time utility), the benefits of these projects arise out of the change in "temporal value".
- ***Change in location of sale*: -** Such projects as investment on transport facilities to carry products from the local area where price are low to distant market where prices are higher. The benefits of such projects arise from the change in "location value".
- ***Change in product form (grading & processing)*:-** projects involving agricultural processing industries expect benefits to arise from a change in the form of the agricultural products.
- ***Cost reduction (through mechanization)*:-** The classical example of a benefit arising from cost reduction in projects is the gained by investment in agricultural machinery to reduce labor costs. In other industries also use of improved technologies that substitute labor could be an incremental benefit from the reduction in cost of labor as compared to the 'without' condition.
- ***Losses avoided*: -** The '***with and' without'*** project analysis tends to point out such costs avoided by the project. Similarly risks avoided or reduced can be considered as benefits; sometimes such benefits are reflected by output increment through loss reduction.
- Since all these benefits are real increase in value of commodities or reduction in costs, they will be considered in both analyses.

Externalities

- **Secondary costs and benefits**

- Projects can lead to benefits created or costs incurred outside the project itself.
- Economic analysis must take account of these external, or secondary, costs and benefits so they can be properly attributed to the project investment.
- It is not necessary to add on the secondary costs and benefits separately; to do so would constitute double counting.
- Thus, instead of adding on secondary costs and benefits, we have to adjust the market prices into 'economic' prices there by in effect converting them to direct costs and benefits.
- Although using efficiency prices based on opportunity cost or willingness to pay greatly reduces the difficulty of dealing with secondary costs and benefits, there still remain many valuation problems related to goods and services not commonly traded in competitive markets.
- Price effects caused by a project are also part of externalities. The project may lead to higher prices for inputs it requires and lower price for the outputs it produces.

- What are known as "forward linkages effects" thus may occur in industries that use or process a project's output, and backward linkages in industries that supply its inputs, in that such industries are encouraged or stimulated by increased demand and higher prices for their output or lower prices for their inputs.
- Conversely, other producers may loose because they now face increased competition, and other users of inputs required by the project may have to pay higher prices.
- The project may have wide-ranging repercussions on demands of inputs and outputs and cause gains and losses for producers and consumers and other than those involved in the project itself.
- *Examples of such costs and benefits are:*
  - Technological spill-over or technological externalities
  - Negative or positive ecological effects in construction of dam: - it can increase spread of schistosomiasis and malaria, it can increase/decrease in fish catches, many down-stream effects, etc
  - Multiplier effects of projects - if there had been excess capacity

Intangible costs and benefits

- Almost all projects have costs and benefits that are intangible. These may include creation of job opportunities, better health and reduced infant mortality, better nutrition, reduced incidence of disease, national integration, national security, etc. These benefits do not, however, lend themselves to valuation.
- Likewise in the cost side, a project may displace workers, it may increase disease incidences, it may increase regional income inequality, it may destroy or reduce the scenic beauty of an area, etc. All these are intangible costs of the project, which are not captured by or not reflected in the market prices. All these intangible benefits and costs must be carefully identified and where possible, be quantified although valuation is impossible.
- These costs and benefits will not usually appear in financial accounts and are excluded from financial analysis. However, they should be included in the economic analysis at least in qualitative terms if they are significant and measurable. Whether or not externalities are quantified, they should at least be discussed in qualitative terms.
- In practice, it is not feasible to trace all externalities arising from such market imperfections: the analyst can only hope to capture the grosser distortions on more immediately affected changes in output. Externalities of various kinds are thus clearly troublesome, and there is no altogether satisfactory way in which to deal with them. There is no reason simply to ignore them and if they appear significant, to measure them. In some cases it is helpful to internalize externalities by considering a package of activities as one project.

International effects

- Some external effects of projects may extend beyond the borders of the country concerned.
- Effects on world prices of traded goods (favorable or adverse), environmental effects, etc such external effects on other countries are similar in nature to the externalities within the country and raise similar problem.
- Whether accounts should be taken of these benefits accruing to, or of costs imposed on, other countries depend on value judgment.

With and without project comparison

- Project analysis tries to identify and value the costs and benefits that will arise with the proposed project and compare them with the situation as it would be without project.
- The difference is the incremental net benefit arising from the project investment.
- This approach is not the same as comparing the situation **"before" and "after"** the project.
- The before-and-after comparison fails to account for changes in production that would occur without the project and thus leads to an erroneous statement of the benefit attributable to the project investment.

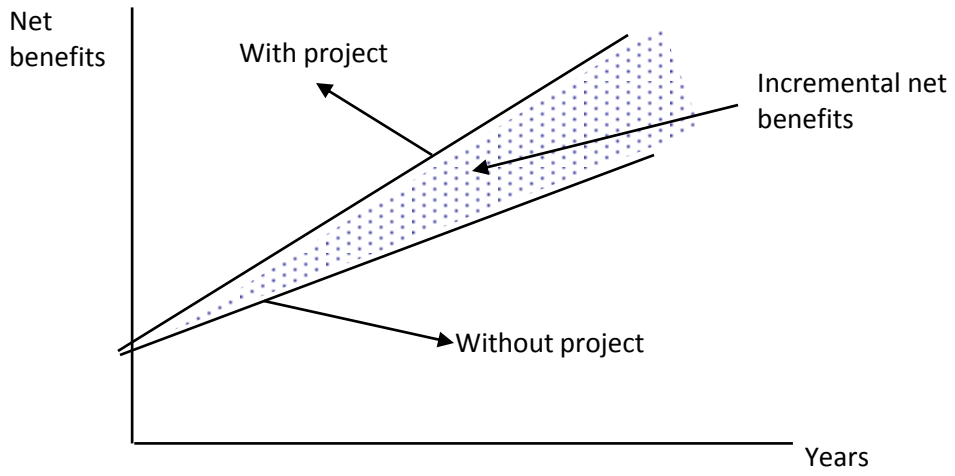

Fig. 1.1 The with/without project comparison

The above figure illustrates a change in output can take place if production is already increasing (decreasing) and would continue to increase (decrease) even without project. Thus, if production without the project were to increase at 3% per year and with the project at 5% per year, the project's contribution would be an increase of 2% per year. A before/after comparison would contribute the entire 5% increase in production, and not just the incremental benefits, to the project. Of course if production were to remain stagnant, the before/after comparison would yield the same result as the with/without comparison.

In some cases, an investment to avoid a loss might also lead to an increase in production, so that the total benefit would arise partly from the loss avoided and partly from increased production. Again a simple before-after comparison would fail to account the benefits realized by avoiding the loss (Fig 1.2. depicts this situation).

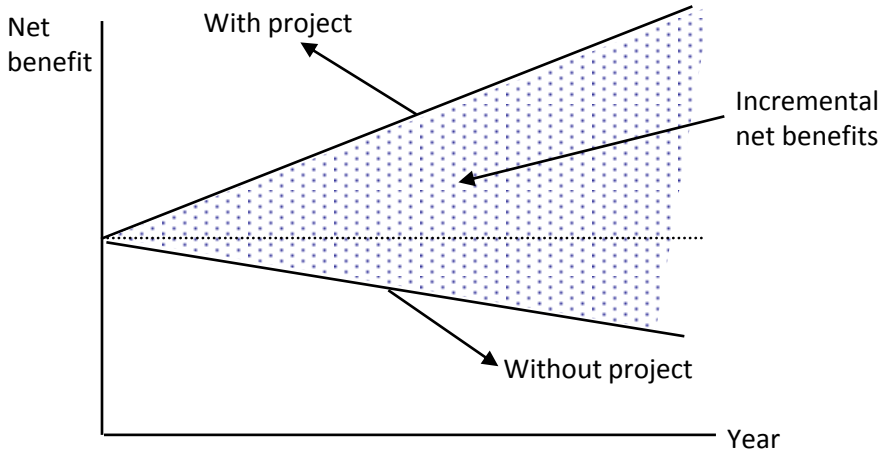

Fig. 1.2 With/without project comparison

Separable Components

- Sometimes a project consists of several interrelated subprojects or components.
- When the components are independent of each other, each component must be treated as if it was a separate project and the analyst must determine whether each component increases or decreases the project's net total present value.
- Any component that has a negative net present value should be dropped, even if the total net present value of all the components is positive. In other words, each separable component must justify itself as a marginal part of the overall project.
- Appraising such a project requires several steps. First, each separable component needs to be appraised independently. Second, each possible combination must be appraised. Finally, the entire project, comprising all of the separable components, must be appraised as a package.

5. FINANCIAL ANALYSIS

5.1 Objectives of Financial Analysis

- ***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.
- ***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.
- ***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?
- ***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 what changes in organization and management may be necessary.

5.2 Market 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.
- Given the importance of market and demand analysis in project analysis it should be carried out in an orderly and systematic manner. The key steps in such analysis are as follows.
  - Situational analysis and specification of objectives
  - Collection of secondary information
  - Conduct of market survey
  - Characterization of the market
  - Demand forecasting
  - Market planning
- **Situational analysis and specification of objectives**
- 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. He/she may also 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?

- **Collection of secondary information**
- In order to answer the questions listed while delineating the objectives of 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. Secondary information provides the base and the starting point for market and demand analysis. It includes what is known and often provides clues for gathering primary information required for further analysis. Several sources of informations including; census data, national sample survey reports, plan reports, statistical abstracts, industry specific sources of data etc.
- **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. The market survey may be a census or a sample survey. 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

- **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
  - Breakdown of demand
  - Prices
  - Methods of distribution and sales promotion
  - Consumers
  - Supply and competition
  - Government policy
- **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. The methods may be divided into qualitative methods, time series projection methods and causal methods.

5.3. 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. Thus, 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. Thus, 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 analyse 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.

- **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.,
- $Px1/Py2 \neq Px2/Py2 \neq Px3/Px4$
- 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. This can be judged from past trend. 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. However, the approach most often taken is to work the project analysis in constant price. 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.
- 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 impact.

5.3.2. Financial export and import parity price

- As indicated earlier, 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 in financial analysis.
- 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)

- 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 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).
- ***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.
- If port charge is in terms of foreign currency, we deduct it before it is multiplied by OER.
- If the project produces import substitutes, this must be deducted because the project is will to have to compete with import substitutes

Example: Valuation of traded goods for Ethiopia case using UNIDO approach

Table: Export parity price for haricot bean

S.N	Items	Market	Economic price	Conversion factors
1	FOB price at Assab	2593.73	3078.00	CF = 1.18
2	Clearing charges	100.00	80.00	CF = 0.8
3	Local port charges	25.30	20.25	CF = 0.8
4	Cost of bags	75.80	60.65	CF = 0.8
5	Cost of packing	12.60	10.00	CF = 0.80
6	Loading and unloading	20.00	16.00	CF = 0.80
7	Inland transport charge	174.00	130.50	CF = 0.75
8	Tariffs	30.00	0.00	
	Party price at project site	2156.03	2760.60	

Table: Import parity price of fertilizer

S.N	Items	Financial price		Economic price		Conversion factors
		DAP	Urea	DAP	Urea	
1	CIF price	207.51	197.57	246.25	234.40	CF = 1.18
2	Local port change	2.53	2.53	2.00	2.00	CF = 0.80
3	Cost of bags	7.58	7.58	6.06	6.06	CF = 0.80
4	Cost of packing	1.26	1.26	1.00	1.00	CF = 0.80
5	Inland transport	21.12	21.12	15.85	15.85	CF = 0.75
	Total cost	240.00	230.00	271.15	259.3	

5.4. Farm Investment Analysis

- Farm investment analysis is undertaken to determine the attractiveness of 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 return (cash flow) 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 value at the end. In general, the analysis is cast in constant prices, although allowances may have to be made for inflation.
- 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. Of course, farmers are price responsive as confirmed by many empirical researches, but this should not be interpreted as if they are profit maximize. Thus, 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, ect).
  - 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

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.
    - **Simple interest rate**
- Pt = Po (rt)
- Po - 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 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**	**6500**	**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.

Compound interest

- This method is common in long-term credits which are lent by formal financial institutions; banks & similar credit institutions. The basic difference between simple interest 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 outs standing interest in addition to the principal.
- The formula can be presented as follow
- $Pt=Po(1+r)^t$
- Po - Principal
- r - Interest rate per period
- t - Period or time
- p_t - total amount

Discounting

- The time value of money

"A bird in hand is worth two in the bush"

- It is the procedure where by the present value of future income is determined.
- The present value of a given income in a future is derived using equation:

$$V = \frac{I}{(1+r)^n}$$

Where V represents the present value, I represents future income, n stands for number of years and r represent discount rate.

Example

- Prefer “Jam today” to “jam tomorrow”
- 100(2011)≠100(2012) ie 100(2011)>100(2012)
- Its present equivalent is computed as follows
- Assume r=10%
- $X2011(1+r)^n=Y2012$
- $X2011=Y2012/(1+r)^n$
- 100(2011)=90.91(2012)
- Discount factor=$1/(1+r)^n$
- Present value=future value x discount factor

Financial Ratios

- From the projected financial statements for an enter prize, 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.
    - **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
- Inventory turnover = cost of good sold/ 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.
- Operating ratio = operating expense/ revenue

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.
- ***Return on sales***
- This shows how large an operating margin the enterprise has on its sales.
- Return on sales = 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. Equity capital is the residual amount left after deducting total liabilities (excluding stockholder's claim) from total assets.
- Return on equity = net income/equity
- 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***
- Return on assets = net income/ asset
- 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.

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 =current asset/ current liability***
- 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.
- ***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.
- Equity ratio=equity/(equity +long term liability)
- Liability ratio = long term liability/(equity +long term liability)
- Debt equity ratio=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.
- Debt service coverage ratio = (debt serv+depr+interest)/(interest +repayment of loan)
- 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.

6. ECONOMIC AND SOCIAL ANALYSIS

- **6.1 Reasons for undertaking economic analysis of projects**
- Basically the reasons for undertaking economic analysis of projects are market failure, government intervention, externalities and linkage effects.
- ***6.1.1. Meaning, sources and implications of market failure***
- In a perfectly competitive market, the opportunity cost of an item would be its price, and this price would also be equal to the *marginal value product* of the item.
- If a non-traded item is bought and sold in a relatively competitive market, the market price is the measure of the ***willingness to pay*** and is generally the best estimate of an ***opportunity cost*****.**
- In a perfectly competitive market, the opportunity cost of an item would be its price which in turn will equal the marginal value product of the item. Most agricultural projects are expected to meet a growing demand for food or fibre and are small relative to the total agricultural production of the nation.

- If that is the case, in general we can accept the market price directly as our estimate of the economic value of a non-traded item.
- Also, if we are valuing a domestically produced project input that is produced by a supply industry operating near full capacity, we can generally accept the market price of the input as its economic value.
- In a neo-classical world, domestic price is presumed to reflect marginal utility of consumption on the one hand, and marginal production cost on the other.
- The legitimacy of such an assumption is conditional upon certain well-known conditions being satisfied; *i.e.* homogeneous goods (in quality), perfect knowledge of all economic agents, large number of competitors, absence of externalities, acceptance of the ruling pattern of income distribution, ability of consumers to be the best judges of their welfare and so on.
- That some, or all, of these conditions may not hold is widely recognized, particularly in the case of LDCs where income disparities are likely to be very wide, markets poorly articulated, and choice information at a premium. Nevertheless, it has usually been convenient to justify valuation decisions 'as if' such conditions did hold.

- Economic analysis will state the cost and benefit to the society of the proposed project investment either in opportunity cost or in values determined by the willingness to pay. The costs or values will be determined in part by both the resource constraints and the policy constraints faced by the project. Basically, one major argument in favor of economic pricing (against financial analysis of projects) is that of *market failure*. What do we mean by market failure and why does the market fail? Divergence between market and economic price is simply what we mean by market failure. It occurs whenever the market fails to function effectively or when the government intervenes. The market fails when it can't value appropriately project costs and benefits!
- Market failure manifests itself in different forms:
- **a. *Failures of competition*:** the existence of various types of monopoly power in the economy, for example the existence of localized trading monopolies on the supply of consumer goods to rural areas or in the purchase of crops from farmers brings absence of competition.
- **b. *Failures of provision / incomplete markets / missing markets*:** the existence of a class of goods and services that private operators are not prepared to supply because once they are made available it is impossible to exclude individuals from making free use of them (public goods) such as street lighting, police force, road in LDCs, national defense, and so on.
- Where markets fail to produce commodities or services for which there is a private demand at prices above production costs, due to transaction cost and moral hazard, and adverse selection problems is another source of market failure. The credit market and the insurance business with high risks of default and high cost of enforcing the agreement in the transaction are possible cases in point.
- **c. *Open access resources*:** resources of communal access (e.g. forestry for firewood, wild life, fishery, where the private cost of using more of resource is lower than the social cost incurred by the community as a whole, resulting in over - exploitation (*over-fishing*, *over-grazing*, and *over-hunting* and possible permanent damage to the resource) which is the result of absence of well defined property rights is another source of market failure.
- ***d. Failures of information*:** a tendency to under-produce (due to private interest) the type of information to which everyone should have access if markets are to work well (e.g. information on prices and technologies) is another source of market failure problem.
- ***e. Macro-economic problems*:** problems that can only be handled by a central authority, for example, money supply inflation, exchange rate, taxation, balance of payment problems and soon are problems which are never the concerns of private investors from whose point of view financial (traditional) CBA is normally done
- **f. *Poverty and inequality*:** the market outcome may result in a degree of inequality or an incidence of poverty that is regarded as socially unacceptable by the majority of people in society.
- **g. *Environmental problems, futures generation and sustainability*:** these are very difficult, controversial and debatable issues of recent origin in the economics literature. They are hardly dealt by the interplay of demand and supply.
- *Therefore, the market fails due mainly to the absence of coincidence of national and private objectives.*

6.1.2. Externalities and linkage effects

- ***6.1.2.1. Externalities***
- ***Externality*** is an economic problem that arises as a result of relationships among economic agents whereby agent 'A' is benefited or dis-benefited by other economic agent (s) without being charged or paid for the benefit derived or the cost incurred. Externalities may be positive or negative.
- ***Positive externalities*** may be production or consumption. Externalities, created by another agent, which have positive production effect to an economic agent without his / her intention, are called *positive production externalities* while externalities of opposite nature are called ***negative production externalities*****.**
- Externalities, created by another agent, which have positive utility (satisfaction) effect to an economic agent without his / her intention, are called ***positive consumption externalities*** while externalities of opposite nature are called ***negative consumption externalities*****.**
- These 'goods - positive externalities' or 'bads - negative externalities' do not have a market price.

- Costs that are not incurred by the private operator but represent dis-benefits to other members of the community, such as the impact on down stream river users of pollution by a private industrial plant **(*negative externality*)**, or benefits that do not accrue to the private operator but represent gains to society, such as the beneficial impact of higher education on the level of skills in the country and workers on the job training **(*positive externality*)** are some of the practical externality problems. Smoke coming from a cigarette smoker in your dormitory is a ***negative consumption externality*.** Waste disposal by a factory to fisherman's river is ***negative production externality*.** The mutual beneficial relationship between the bee keeper and horticulture farmer is a ***positive production externality*** to both economic agents. A garden freely made available to some one by his / her neighbor is ***positive consumption externality*.**
- In addition to the above mentioned ones, externalities may take different forms:
  - Price effects, one form of externality whereby higher price may be the result of undertaking the project for inputs that it requires and lower price for outputs that it produces.
  - For projects that produce an export product or that use an import input, there may be a price externality with an international dimension - effect of the project on world price.
  - Increased competition as a result of the project may be another externality effect
- Unfortunately, externalities are mostly difficult to identify and nearly always difficult to measure. However, whether or not externalities can be quantified, they should at least be discussed some where in the project document in qualitative terms. The general principle in considering externalities in economic analysis is that the effects should be measured and, where possible, valued so that they can be included in the costs and benefits of the project. This is what is sometimes called ***'internalising the externalities'*.** Externalities may be considered as a special class of non-traded goods that may be either positive or negative.

6.1.2.2. Linkage effects

- Linkage effects occur when the activities of one project cause an increase (or a decrease) in economic activity elsewhere in the economy. To some extent this happens with all projects. Forward linkage effects may occur is industries that use or process a project's output, and backward linkages in industries that supply its inputs. Such industries may be encouraged or stimulated by increased demand and higher prices for their output or lower prices for their inputs.
- For economic analysis, what is important is whether the linkage effect is a necessary consequence of the project. For instance, production and processing of the perishable primary products is the case in point. In Ethiopia, this applies particularly to the sugar and tea industries. Sugarcane has little or no economic value outside the immediate production system in which it is produced unless it is processed in a sugar mill. One can find ***forward (input supplying)*** **and** ***backward (output purchasing)*** linkage effects. A project which affects sugarcane production, therefore, necessarily has some consequences for the sugar industry (**a *forward linkage***).
- The economic analysis of a sugarcane production project would, therefore, have to extend the boundaries of the project to include the impact of the project on the sugar industry. The linkage from the sugarcane farm to the sugar mill could be looked at in another way (backward linkage effect) if a new sugar mill were to be established in an area that was previously too inaccessible for sugarcane production to take place. The new sugar mill would not make any sense without a supply of sugarcane and so it would be necessary to include the backward linkage to the sugarcane farmers in the economic analysis of the project.
- The sugarcane example above can be contrasted with the situation in the meat sector. The livestock sector has an export market in the form of live animals. A livestock production project might cause more animals to be sold to meat processing industries but it is not a necessary consequence of the production of the livestock. The decision whether or not to slaughter the animals locally can be regarded as a separate economic decision that depends on whether the meat industry can pay at least as much as the exporters for animals. Since the linkage effect is not a necessary one it would not be included in the economic analysis of the livestock project. Similarly, the decision to establish a meat processing project can be separated from the decision to produce more livestock. If Ethiopia is regarded as a net exporter of livestock, establishment of additional meat processing capacity might have the effect of reducing net livestock exports rather than increasing livestock production. In practice, it is usually only backward linkages that can be picked up.

6.1.3. Government intervention

- As there is market failure, there is also government failure which needs to be taken care of. Government intervention takes different forms - protective trade policies (import taxes, subsidies, quotas, and import licensing); unrealistic rates of fixed exchange rates - overvalued currencies; government controls of interest rates - subsidised interest rate; controls on prices, production, and sales; private monopolist controls of production prices; government or trade union pressure (wage rates exceeding real cost of labor - minimum wage legislation); and so on.
- Therefore, adjustments for all these failures (market failure, government intervention and externality) should be made to market prices. We do these using financial prices as a starting point and then adjust them accordingly depending on the value to the national economy of the item under consideration. The term *'market prices'* is used to refer to prices actually paid for inputs or received for outputs, in contrast to economic values estimated for particular cost or benefit items which are described as *'shadow prices'.* They are also sometimes known as ***'accounting prices' or 'economic prices' or 'efficiency prices' or 'opportunity costs'*** **or** ***'border prices'*** **and/or** ***real prices.*** They are in most cases estimated; not observed. That is why the term shadow is used. Irvin (1978), arguing that they are observable in the form of *'c.i.f.'* or *'f.o.b.'*, prefers to use ***accounting prices*** than ***shadow prices*****.** As ***economic value*** is to a project benefit, ***economic cost*** is to a project cost. Economic costs may be larger or smaller than financial costs. By the same token, economic benefits may be less than or greater than financial benefits.
- The process of estimating shadow prices for items that are important in the national economy is often described as the ***'estimation of national economic parameters'.*** The process of moving from financial prices to economic prices is called ***shadow pricing*****, or** ***efficiency pricing*** **and/or** ***economic valuation*****!** The shadow pricing process can be seen as a way of making allowance to the above distortions (market failure, government intervention, externality, and linkage effects) caused by the production or purchase of goods and services of a project.
- Were markets ideal (no market failure) with no government intervention and externality and no linkage effect, adjustments would not be needed. Market prices would represent the real value of goods and services to society and would equal their shadow prices. In order for the use of shadow prices to be useful it will be necessary for project proposals to provide a fairly detailed breakdown of costs into different categories. Without this it would be necessary to make excessive use of aggregate categories which may not always be representative of the costs involved.

6.3. Purpose of Economic Analysis

- **Selection of alternatives**

- 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.

- **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. Moreover, 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 deigned.

- **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.
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6.3 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. For this reason, is also called ***analysis at market prices*****.**
- The financial aspects of project preparation and analysis encompass the financial effects of a proposed project on each of its various participants: farmers, private sector firms, public corporations, project agencies, and perhaps the national treasury.
- Our decision criterion is dependent on the private costs and benefits of the project from the point of view of the participant.
- The discussions that are made thus far are financial aspects of project analysis.
- Financial analysis attempts to measure the financial viability of the projects, and is a necessary complement to the economic analysis in decisions to undertake the project.

- ***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. However, 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.
- ***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. As long as the original values have been recorded - either as benefits or as costs - the act of transfer should be omitted from benefit - cost calculations carried out from the national point of view.
- 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.
- **Example**: The cost of price supports for crops that are exported is the difference between the farm gate price paid to farmers and the f.o.b. (free on board) export price plus handling and delivery costs to the port of export. For example, if farmers are paid a support price of 700 Birr per ton of wheat, it the *f.o.b.* port of export price of wheat is 560 Birr per ton, and if it costs 105 Birr per ton to prepare and deliver the wheat to port ready for shipment, then the cost of the subsidy to the government is 245 Birr (805 Birr - 560 Birr).
- 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.
- If project costs include an amount paid for hand tools and if the producer of hand tools imports steel banks on which he pays duty, then the extra duty received by the government should also be taken into account. This can be done by adding the duty on steel bars as part of the benefits of the project or by reducing project costs by the same amount.
- Although transfer payments such as taxes and interest are not a resource cost, they do have an impact on the distribution income and possibly on savings. and if the government wishes to use project selection as a means of improving income distribution or increasing savings, then this should be taken into account when determining the costs and benefits of a project and should be reflected in the shadow prices of factor inputs and incomes.
- Other forms of transfer payments are credit transactions. The financial cost of the loan occurs when the loan is repaid, but the economic cost occurs when the loan is spent. For example, a fruit cannery's payment of interest to a credit institution, for overdraft facilities to finance inventories, represents a transfer, and such interest payments are excluded from economic analysis.
- ***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. Hence, 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.

- ***Cost and benefit definition***
- ***Boundary Objective*****:** While the objective of financial analysis is *maximizing private net benefit*, the objective of economic analysis is *maximizing national income*. Economic analysis of projects is concerned with the investigation of the impact of projects on the ***national economy*****.** It can be used to provide information on the impact of projects on key economic variables such as foreign exchange earnings, taxation revenue, employment and income distribution. Economic analysis can also be used to give information on the impact of government policies on the incentive to invest in different branches of the economy. It is also helpful to ensure that public investment funds are used for economically viable projects.
- ***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 imputed 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. Hence, 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*.
- Thus, 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*.

6.4 Shadow pricing / efficiency pricing

- In its simplest form, a *shadow price* is one that comes closer to measuring the real value to society of a good or service than does its market price. According to this concept, the use of shadow prices leads to a higher level of national production or welfare than reliance on market prices. ∴ Use of shadow prices yields higher level of national income.
- Governments have different development objectives including accelerated economic growth rate, increasing government's revenues, building up foreign exchange reserves, raising employment levels, increasing private consumption levels, or raising levels of savings as a percentage of the GNP, and equalizing distribution of income among certain groups. It is clear that these different objectives may conflict. Faced with these conflicts, the situation requires decisions on trade-offs between the country's development objectives.
- The economic analysis is a means of establishing the incremental benefits arising from the project's investments. Therefore, the analysis is concerned not with a '*pre- and post - project'* approach but with the '***without project***' and '***with project***' situation. Therefore, we can't assume a static situation would prevail throughout the project area in the absence of the project, unless all the evidence moves in that direction.

- Efficiency pricing involves pricing of goods, services, and inputs based on their relative ***scarcity*** in the economy. With efficiency prices given by the world market, further '***social adjustments***' to planning prices - that is, adjustments reflecting distributional priorities - are then required to the extent that it is thought necessary to effect selection rather than through fiscal or direct controls on wages and profits. Hence, efficiency pricing is different from social pricing that treats income distribution issue.
- There may be a non-economic case for funding a project with relatively low economic returns. This could be due to the distributional or regional impact of a particular scheme. However, if this form of justification is to be used there would need to be a clearly demonstrated case explaining how the project meets the distributional or regional objective. It should be noted that objectives such as **'*employment*' or *'foreign exchange earning'*** are economic objectives and are already covered in the shadow price estimates and therefore should not be accepted as arguments for accepting projects with low economic returns.
- In shadow pricing, one has to always avoid *double counting* which can arise in two ways:
  - ***External benefits and costs*** may be included (erroneously) even though they are already fully accounted for in the social profit measure of the project. For example, increases in agricultural output may mistakenly be claimed as additional benefits of say, a road project when such benefits are already reflected in the usual measure of the social surplus gained on the transport services to be provided.
  - Benefits may be claimed for employment or for foreign exchange earnings, in addition to the estimated social profit of the project. Provided that labor inputs into the project and the project's foreign exchange costs and savings have been evaluated in relation to shadow prices that represent a comprehensive measure of their value to the economy, any such employment or foreign exchange effects have already been taken into account and should not be added as separate benefits. The contributions of increased employment and foreign exchange earnings to the socioeconomic objective of the government have then been given their full and proper weight in deriving the social surplus of the project.

6.5 The scope of economic analysis

- The scope of economic analysis can be considered under various headings. These are:

i. For which projects should economic analysis be conducted?

ii. For which items should shadow prices be calculated?

iii. Who should be responsible for doing the work?

- ***Which projects?***
- Economic analysis should be conducted where there is a good chance that the cost of doing the analysis will not exceed the likely benefit obtained from the information generated. Economic analysis should therefore be conducted where:

i. The size of the project justifies the expense of doing the analysis;

ii. There is a strong possibility, for a project where the output is sold, that the result of the economic analysis might be significantly different from the analysis conducted at market prices;

iii. Private projects (with government approval, public resources and public welfare);

iv. The costs of the project are borne by people or organisations who are not the same as the project beneficiaries - public projects; and

v. The nature of the project is such that economic analysis can be undertaken in a reasonably meaningful way. This implies either, that both costs and benefits can be measured in value terms or that there are alternative ways of achieving the same objective whose costs can be measured and compared.

- On the basis of the above criteria, economic analysis is less likely to be needed where:

i. The project is small - unless it is a pilot project likely to be replicated.

ii. The project is financially viable and is producing mainly for export with no significant negative externalities and no significant use of undervalued local resources.

iii. The project is financially viable and, although producing primarily for the local market, is receiving no significant protection and involves no significant negative externalities and no significant use of undervalued local resources.

iv. The project is in a sector where valuation of the benefits is not practical and where there is no issue of cost effectiveness in determining the project design. This can occur in the case of social sector projects where benefits may be difficult to value and alternative ways of achieving the same objective cannot be identified. Although methods of valuing social sector benefits do exist, it is often difficult to get agreement on the best way to do so.

- In practice the above conclusions would suggest that economic analysis is of relatively low priority for social sector projects unless there is a clear issue of choice between different project designs and for industrial sector projects unless there are clear issues of high levels of protection, externalities or the use of undervalued resources. Where rates of import duty (government intervention) are fairly low there is no obvious reason why results using shadow prices should be any worse than those obtained using market prices. Presumably, commercial enterprises will unknowingly invest in a project that is not financially profitable. Also it is likely that such projects will be undertaken by the private sector and there is, therefore, no particular reason for the government to be involved unless there are strong conflicts of interest.
- Priority activities for the ***public investment program*** (PIP) involve investment in the economic and social infrastructure required to support the growth of the rest of the economy. Projects supporting the agriculture, energy, transport and water sectors are those most likely to require economic analysis. Investigation of the agricultural sector is also important for making estimates of the economic price of labour, while construction activities are important in most projects.

- ***How do we decide when to use shadow prices?***
- In principle shadow prices should be applied to all items in economic analysis. In practice for many small items, the difference between the shadow price and the market price is unlikely to make a very significant difference to the result of the analysis.
- The significance of any particular cost or benefit item for the overall result of a project appraisal can be determined readily by ***sensitivity analysis*****.** The sensitivity analysis can be used to determine the items for which it is important to use shadow prices.
- The other factor to consider is the extent of the divergence of shadow prices from mark prices. Other things being equal, the greater the divergence the more important it is to use shadow prices in the analysis.

- ***Which items should be economically valued?***
- The parameters to be considered for economic analysis can be divided into five categories. These are:

i. ***Primary factors -*** basically different categories of labour, land and natural resources, domestic resources, and foreign exchange. Land and natural resources are usually valued indirectly through estimation of their productivity in their alternative use rather than as capital values. This is normally taken into account through the '***without project***' situation rather than through adjustment of prices. For this reason there is no national parameter calculated for land for the case of Ethiopia.

ii. ***Traded goods: -*** where there is a significant difference between the border price and the local market price and/or where the item concerned is likely to feature prominently as an input or an output for a number of projects, there is a need to economically value the traded good.

iii. ***Non-traded goods*** - where there may be a significant difference between the local market price and the economic value and/or where the item concerned is likely to feature prominently as an input or an output for a number of projects, there is a need to economically value the traded good.

iv. The rate at which the value of a unit of resources declines over time (***the discount rate****).*

v. ***Average estimates -*** relating to particular sectors where cost data do not allow further breakdown or where the sector concerned is not a high priority for further investigation. As a rough guide, any cost item that makes up more than 10% of operating costs or investment costs or 5% of benefits should be recorded as a separate category. Where possible the categories used should relate to the categories defined in the national economic parameters estimated, otherwise it will be necessary for the individual analysts to make their own shadow price estimate or to use an aggregate category.

- ***Whose responsibility?***
- Shadow pricing is a complex subject that requires good background in theoretical economics. In contrast, application of shadow prices is relatively straight forward. As a result, those in central planning should ideally decide when shadow pricing is needed. They will also usually be the ones who estimate shadow prices. Project planners, on the other hand, are responsible for applying shadow prices in project planning. However, occasions arise when project planners must also estimate shadow prices when central planners are not prepared to do so. When this situation occurs, those making these estimates are advised to coordinate their efforts.
- Responsibility for estimation and dissemination of the shadow prices to be applied in economic analysis rests with MEDaC since these are parameters that apply to projects across different sectors. It is important that the same parameters are used by all the different organisations to ensure that projects are appraised consistently except in cases where there are regional differences (such as in labour costs). If possible the shadow prices should be regionally and sectoral disaggregated! The responsibility for the estimation of costs and benefits at market prices lies with the individual sectoral ministries, public sector organisations and regions preparing projects for consideration in the national development programme.

6.6 Steps in efficiency pricing

- The most important steps in the economic valuation of project costs and benefits include:
- ***Stage 1 - Break down of costs and benefits at constant market prices***
- The first step is to break costs and revenues down into skilled and unskilled labour; foreign expenditures and receipts; receipts and expenditures involving duties, taxes, and subsidies; and other items whose market values do not reflect real values.
- Adjustments are then made to account for economic transfers, and shadow prices, hopefully received from central planning bureau.
- Finally, the resulting cash flow in its modified form is discounted, using the shadow price of domestic capital, unless the rate-of-return method is used. Should this be the case, a rate of return for the project is first calculated and then compared with the shadow price of capital. Should central planning be unable to provide the needed shadow prices, the analyst can make approximations based on the suggestions given earlier.
- + Benefits - investment costs - working capital - operating costs = Net incremental benefits at constant market prices.
- ***Stage 2 - Identifying the items requiring adjustment***
- ***a. Direct transfer payments***
- Transfer payments may include taxes, subsidies, social security payments and any credit transactions. As long as they do not involve any real resource use, they are simply omitted. The first step in adjusting financial prices to economic values is to eliminate direct transfer payments. To do that they are given an accounting ratio of zero by definition. The financial price of an item for which the price has been changed because of an indirect subsidy can be converted to an economic value according to the procedures outlined below for traded items in step 2 and, as appropriate, for non-traded items in step 3.
- ***b. Externalities and linkages***
- + External benefits - external costs + linkage effects = Net benefits at constant market prices adjusted for externalities and linkages.

- ***c. Price distortions in traded items***
- The other task in this stage can be adjustment for distortions in market prices of traded items. Traded items are those for which, if exports, f.o.b. price > domestic cost of production, or the items may be exported through government intervention by use of subsidies and the like, and, if imports, domestic cost of production > c.i.f. price. Adjustment on traded items is done using border (f.o.b. or c.i.f.) prices as a starting point. If the project involves any *export diversion* and/or *import substitution*, we have to make use of ***export parity prices*** **or** ***import parity prices*** where the latter ones are simply adjusted border prices. The adjustment is required to allow for the over or under-valuation of domestic cost components.
- ***d. Price distortions in non-traded items***
- Still another activity is the adjustment for distortions in market prices of non-traded items. Non-traded items are those for which c.i.f. price > domestic cost of production > f.o.b. price, or the items are non-traded because of government intervention by means of import bans, quotas, and the like.
- In here, the adjustment is best done by decomposing the non-traded item to its traded, non-traded, and transfer payment components. This is followed by estimating accounting ratios for each component and then finding accounting ratio for the item under consideration. Indirectly traded goods are treated as partly traded and partly non-traded through the decomposition process.
- ***Stage 3 - Applying shadow prices***
- Here we substitute efficiency prices for market values. This involves carrying out the economic analysis formally. Estimate conversion factors for important cost and benefit items and / or use the central planning bureau estimates. Then, multiply market values of costs and benefits by conversion factors which give net benefits at shadow prices!

- **Example**: The example involves what are called indirectly traded items (locally produced items that use a high proportion of traded inputs, such as locally assembled tractors, or construction that uses imported materials). Consider a project with an economic life 10 years and the following market values (in Birr):
- ***Step 1: Enumeration: identification of private costs and benefits***
- Initial investment cost 1000,000
- Annual sales 500,000
- Annual operating costs 300,000
- Discount rate 15%
- If this project were carried out by a private group of investors, it would be only marginally acceptable as measured by the financial NPW *i.e.*
- Financial NPW = -1000, 000 + 200,000 x $((1+0.15)^{10} -1)/ (0.15 (1+0.15)^{10})$
- = +3,750.
- Now let this project is evaluated from the national economic point of view, shown below (in Birr). Further investigation of the components of the cost and benefit items reveals that investment involves 30 percent for imports, 10 percent for tariffs on imports, 20 percent for unskilled labour, 20 percent for skilled labour, and the rest 20 percent for local materials. All of the project's output will be exported. Annual operating costs will be 40 percent for unskilled labour, 30 percent for local materials, 15 percent for skilled labour, 15 percent for taxes.

- ***Step 2: Identifying costs and benefits that need adjustment***
- Shadow prices obtained from central planning are, for unskilled labour, 50 percent of the market value; for skilled labour, 120 percent of the market value; for foreign exchange, 140 percent of the official exchange rate (the domestic currency is overvalued; foreign currency is under-valued); and for domestic capital, the shadow price of domestic capital is 10 percent instead of its 15 percent market rate. Local materials are assumed to be properly priced which implies that they do not require any adjustment. Given this information the economic appraisal can be undertaken as follows:

- ***Step 3: Undertaking the analysis***

Cost and Benefit items	**financial prices**	**Adjustment**	**Economic values**
Imports	300,000 x	140%	420,000
Tariffs	100,000 x	0%	0
Unskilled labour	200,000 x	50%	100,000
Skilled labour	200,000 x	120%	240,000
Local materials	200,000 x	100%	200,000
Total Investment cost	1,000,000		960,000
Annual sales			
Exports	500,000 x	140%	700,000
Annual operating cost			
Unskilled labour	120,000 x	50%	60,000
Skilled labour	45,000 x	120%	54,000
Local materials	90,000 x	100%	90,000
Taxes	45,000 x	0%	0
Total operating costs	300,000		204,000

- Economic NPW = $-960{,}000 + (700{,}000 - 204{,}000) \times ((1+0.10)^{10} - 1)/ (0.10\ (1+0.10)^{10})$
- $= +2{,}088{,}000.$
- All figures are in Birr

- From the national economy point of view, the project is very attractive. What are the reasons for this difference?
- The sources of this discrepancy include:
- Import duties and taxes are discarded;
- Foreign exchange earning from the project was undervalued;
- Unskilled labour whose marginal productivity was less to the nation than to the private investor is adjusted;
- Skilled labour whose marginal productivity was better to the nation than to the private investor is adjusted; and
- Opportunity cost of capital is less to the nation than to the private investor.
- Therefore, government should give incentives (avoiding taxes, subsidy, public services, attractive investment policies and so on) to get this project invested.
- ***Summary****: Decision tree to determine economic values of project costs and benefits: steps*
- Item to be valued:
-
- 1. Tangible - 1.1. Direct transfer payment
- 1.1.1. Payment to or from government
- 1.1.1.1. Tax -omitted
- 1.1.1.2. Subsidy - omitted
- 1.1.2. Credit transactions
- 1.1.2.1. Loan receipt - omitted
- 1.1.2.2. Dept service
- 1.1.2.2.1. Repayment of principal - omitted
- 1.1.2.2.2. Interest payment - omitted
- 1.2. Involves real resource use
- 1.2.1. Traded
- 1.2.1.1. Project input
- 1.2.1.1.1. Imported with project - import parity price
- 1.2.1.1.2. Exported without project - export parity price
- 1.2.1.2. Project output
- 1.2.1.2.1. Import substitute - import parity price
- 1.2.1.2.2. Export - export parity price
- 1.2.2. Non-traded
- 1.2.2.1. Project input
- 1.2.2.1.1. Non-produced - Land - Opportunity cost:
- - Rent
- - Purchase price
- - Direct estimate
- - Labour - Market wage
- (If fully employed without project)
- - Marginal value product of labour
- (If under-employed without project)
- 1.2.2.1.2. Domestically produced - Market price of input
- (if supplying industry is operating at full capacity)
- - Marginal cost of producing the input
- (if supply industry has excess capacity)
- 1.2.2.2. Project output
- 1.2.2.2.1. Resources saved from other production
- (if it replaces other markets in production)
- 1.2.2.2.2. Meets new demand
- Has effect on market price (large project)
- (It can be valued using average of price with and with-out project)
- Has no effect on market price (small project)
- (it can be valued using market price without the project)
- Note that this is not the only way to approach the problem of economic valuation of project costs and benefits.
- The size is measured in relation to the total market available for the total output supplied.

- **2. Intangible:** Identified and quantified but not valued as it is in practice very difficult.
- Source: Adapted from Price Gittinger, 1994.
- A "decision tree" for determining economic values is given above. Most issues of economic valuation in agricultural projects are covered by this diagram. The decision tree is used by taking an item to be valued in an agricultural project and tracing through the tree, following each alternative as it applies to the item until the end of the tree is reached, where a suggestion about how to value the item will be found.
- To illustrate, we may trace through a few common elements in agricultural projects. Take fertiliser to be used in an irrigation project that will produce cotton. The fertiliser is tangible, involves real resource use, is traded, is a project input, and would be imported without the project. Therefore, it is valued at the import parity price. Or take agricultural labour to be used to apply the fertiliser. It is tangible, involves real resource use, is non-traded, is a project input, is non-produced, and would be under-employed without the project. Therefore, it is valued by taking the marginal value product of the labour in its without-project employment. Or take a tax on the fertiliser. It is tangible, is a direct transfer payment, and is a payment to government. Therefore, it is omitted from the project economic account. Or, finally, take the cotton to be produced in the project. It is tangible, involves real resource use, is traded, is a project output, and will be an export. Therefore, it is valued at the ***export parity price*.**

6.7.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.
- Hence, 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. Some others, 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.
- Making allowance for the effect of a project on income distribution & saving, however, involves some what more complex adjustments than those necessary to estimate ‘efficiency’ prices and it also unavoidably incorporates some element of subjective judgment.

6.7.1. 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). In this method, 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. But, 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.
- This method can be summarized by the following example. Suppose we have a project producing export item that uses both foreign & domestic inputs. The net benefit (ignoring discounting) would be estimated as:
- Net benefit=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:
- $SER=Pd/Pw$
- 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:
- $SER=\Sigma(fi(Pdi/Pwi)$
- - The weight of the i^{th} 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.

6.7.2. 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.
- The stimulus to valuing output (and inputs) at world prices (as a measure of true economic benefit) originally came in the context of import substitution policies pursued by many developing countries in the 1950s & 1960. When it become clear that large number of commercially profitable industries was producing goods at a much higher price than the alternatives available on the international market. It was thought that if a project was analyzed at world prices, this would give an indication first of whether it could survive in the long term in the face of international competition, and secondly of whether its output could be obtained more cheaply from international sources.
- 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. Similarly, 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.
- The above adjustment applies for traded goods (imported or exported goods). 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:
- CF= Economic price/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. In principle, 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. In practice, however, 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. In essence, 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 = Pw(OER/Pd)
- Where P_d = domestic price in domestic currency
- P_w = world price foreign currency
- OER = official exchange rate
- SCF = standard conversion factor
- SCF=1/Pd/Pw(OER)
- Pd/Pw is the shadow exchange rate i.e., the price of goods in domestic currency relative to their world prices
- SCF=1/SER/OER=1/PF
- SER/OER is the shadow price of foreign exchange (PF)
- PF=ξ(fi(Pdi/Pwi(OER)
- Where - Weights for the i^{th} commodity
- P_{di}- 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

6.8 Limitations and difficulties of shadow pricing

- Even though theoretically very plausible, there are some intricate problems with shadow pricing which manifest themselves in different aspects:
- Some of the shadow prices are difficult to estimate so that reliance on market values seems the easier route to follow rather than trying to value intangible costs and benefits. Valuation is extremely difficult in the case of projects having intangible costs and benefits.
- Obviously, shadow prices are non-existent and computed prices - artificial prices. Those not familiar with the concept consider shadow prices unreal. Even worse, they may feel that those who use them are somehow subverting normal cash flow procedures by choosing values to suit themselves. If a value is not derived from the market place, they feel it is not real. What those skeptical of shadow pricing fail to realize is that the government through intervention in the market place, directly or indirectly, influences the prices of goods and services. Computation of shadow prices is difficult, debatable, subjective, and often less accurate. Their values are no less important, however, since proper use of shadow prices leads to better utilisation of a country's resources than with the use of market prices; they are still by far useful than market prices.
- Having decided the best course to take concerning a project and related policies, the government is still confronted with their implementation. For example, a project may be an important employer of unskilled labor whose real productivity is low. Yet if custom dictates that these workers be paid the going wage, then funds will some how have to be raised to meet these requirements. If revenues are lacking, the government may not be able to meet the financial requirements of the project. The economic analysis may have shown that the project is a good use of the country's resources, but financial realities may constrain the project from being implemented.
- Subjective elements surrounding shadow pricing especially social cost benefit analysis involving distributional issues raise another area of difficulty in shadow pricing. The subjectivity implies that if a project is appraised by two group of analysts, they may come up with opposite results.
- The discrepancy between implementation and appraisal during ex-post evaluation is another problematic area in project appraisal. Appraisal, implementation and ex-post evaluation is mostly done by different parties.
- Any attempt to undertake economic analysis using shadow prices on a significant scale is only going to be useful if projects are well prepared and well costed. The process of making adjustments to market price costs and benefits is of little value if the market price values that are being adjusted are wildly inaccurate.
- Like all forms of analysis, economic analysis of projects rests on assumptions, some of which have been indicated above. If the assumptions are wrong, the chances are quite high that the resulting analysis will be wrong. It is therefore necessary to review the assumptions used on a continuous basis and amend them where appropriate if the process of economic analysis is to be successful.

- Economic criteria are derived from economic logic. This is not the only kind of logic and not always the most important. Inevitably many decisions will be made on non-economic grounds. The advantage of economic analysis is that it will make explicit the cost of taking such decisions.
- Economic analysis of projects is similar in form to financial analysis in that both assess the profit of an investment. The concept of financial profit, however, is not the same as the social profit of economic analysis. The finances analysis of a project identifies the money profit accruing to the project operating entity, whereas social profit measures the effect of a project on the fundamental objectives of the whole economy. These different concepts of project are reflected in the different items considered to be costs and benefits and in their valuation. Thus, a money payment made by the project operating entity for, say wages is by definition a financial cost. But will be an economic cost only to the extent that the use of labor in this project implies some sacrifice elsewhere in the economy with respect to output and other objectives of the country. Conversely, if the project has an economic cost that does not involve money outflows from the project entity, it will not be considered as financial cost.
- Similar comments apply to economic & financial benefits. It is important therefore to remember that some costs & benefits that may appear in the financial accounts may not appear in the economic accounts & vise versa. Similarly, some costs & benefits may be lower (higher) in financial but higher (lower) in economic analysis even though that the cost or the benefit appear in both economic & financial accounts. The extent to which economic costs & benefits diverge from their counterpart financial costs and benefits rests on the presence and extent of market imperfections, government interventions of various forms & the fundamental policy objectives.
- It is important to note that judicious use of economic prices (shadow prices, efficiency prices, or accounting prices) is an important means for assessing the economic merits of a project to a country, but is not a substitute for careful analysis of its technical, organizational & managerial, commercial, financial and other relevant aspects to the outcome of a project.

- Once financial price for costs and benefits have been determined and entered in the project accounts, the analyst estimates the economic value of a proposed project to the nation as a whole. The financial prices are the starting point for the economic analysis; they are adjusted as needed to reflect the value to the society as whole of both the inputs and outputs of the project.
- When the market price of any good or service is changed to make it more closely represent the opportunity cost (the value of a good or service in its next best alternative) to the society, the new value assigned becomes the ***"shadow price" or "accounting price" or "economic price" or "efficiency price"***.
- In addition to adjustments made to correct market distortions and market imperfections, the adjusted price could further be weighted to reflect income distribution and savings objectives. Doing so will enable the analyst to consider other social objectives of the society other than the primary objective of maximizing national income.
- Financial appraisal of a project may result a negative NPV but might render positive NPV when it is viewed form societies point of view - economic analysis. Relying on economic appraisal to justify such a project requires that the analyst pay special attention to the project's financial variability. The project's economic variability will be undermined if financial viability is not ensured and expenditures for operations and maintenance will inevitably suffer.
- For projects that are justified because of their positive economic net present value, then, analyst must show explicitly
  - The financial NPV & economic NPV
  - The amount of the financial short fall and the sources of funds to finance it; and
  - The sustainability of the arrangements.

7. Measures of Project worth

- 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. The arithmetic of these discounted methods, and the way we interpret the measures and their limitations, is exactly the same whether we are using them for financial analysis or for economic analysis.
- Before embarking on the methods, it is important to note two critical points. First, there is no one best technique for estimating project worth; each has its own strength & weakness. Second, these financial and economic measures of investment worth are only tools of decision-making, i.e., they are necessary conditions & are not sufficient condition for final decision. There are many other non- quantitative and non-economic criteria for making final decision of whether to accept or reject a project.
- 7.1. **Undiscounted measures of project worth**

7.1.1. Ranking by inspection

- In some cases, we can tell by simply looking at the investment costs and the 'shape' of the stream for the net value of incremental production that one project should be accepted over another if we must choose. The analyst can sometimes simply choose one project among alternatives projects by examining the following:
- Total cost of investment and investment period;
- The structure, & amount of costs and benefits;
- The structure & total amount of the net incremental benefit;
- The lifetime of the project, etc.
- The problem with this method is that the selection lacks objectivity.

7.1.2. 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. That is,

  PBP = cash outlay(investment)/annual cash in flow
- 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.
- If the PBP is shorter than the acceptable PBP, the project is accepted. Otherwise it is rejected.
- The method is very simple. Moreover, 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	20000	-	
	2		2000	31000
	3		8000	
	4		12000	
	5		9000	
II	1	20000	-	
	2		2000	34000
	3		12000	
	4		8000	
	5		12000	
III	1	20000	-	
	2		1000	37000
	3		5000	
	4		6000	
	5		8000	
	6		10000	
	7		5000	
	8		2000	

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

- Project I has a payback period of 0.65 year
- Project II have a payback period of 0.588 year.
- But project III has a payback period of 0.54 years.
- Thus, based on this criterion, project III is selected.
- Therefore, the method fails to consider the time & amount of net incremental benefit after the payback period-
- This method is a measure of cash recovery, not profitability.

7.1.3. 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
- no adjustment for time value of money.
- **7.1.3.1. 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 1.55, 1.7and 1.85, respectively. Hence, according to this criterion, project III will be ranked first.
- **7.1.3.2. 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 0.31, 0.340 and 0.23, respectively. Hence, 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.
- **7.1.3.3. 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 asfollows:

Project	Average net value of incremental benefit	Annual deprecation	Net average income	Average book value	Average income on book value
I	6200	2000	4200	10000	0.42
II	6800	2000	4800	10000	0. 48
III	4625	1250	3400	10000	0.34

$$AD = \frac{\text{Initial cost} - \text{Salvage value}}{\text{Useful life}}$$

Book value (the value in the current time period) is equal to the original cost less the total estimated depreciation from purchase date to date of inventory.

Assume salvage value =10000

7.2. 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.
- 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=At/(1+r)t=2000/(1+0.05)5=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 from 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.

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

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.

However, 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.) discount rate =1%

Year	Investment cost	Benefit streams	Cost streams	Net benefits	Discount factor	Present value
0		-	40000	-40000	1.000	-40000
1		-	50000	-50000	0.990	-49500
2		-	25000	-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**

2. 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.

$$NPV = -1000 + 200X = 0$$

$$X = 1000/200 = 5$$

From the annuity table at 7th year , r is 9%. Therefore, r=IRR

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.

3.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.

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

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

If such a case exists in a particular project, using either the extended yield method or the auxiliary interest rate method can reverse the analytical problem. For further readings when the cost and benefit streams are discounted at the discount rate, In the case of mutually exclusive projects, the benefit - cost ratio can lead to an erroneous investment choice. The danger can be avoided most easily by using the net present worth criterion for mutually exclusive projects. [1]

[1] If such a case exists in a particular project, the analytical problem can be resolved by using eith the 'extended yield' method or the auxiliary 'interest rate' method. For further readings refer Merre and Sykes (1973, pp. 158 - 65) and Grand and Ireson (1970, pp. 546 - 65)

4. 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. That is, 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.

5. Least cost method: Valuing intangible costs and benefits

- This is typically relevant project worth measure in the case of projects having mainly intangible benefits and costs. Intangible issues comprise considerations such as income distribution number of jobs created, or regional development; considerations such as national integration or national security; and environmental considerations that can both be ecological and aesthetic, such as the presentation of productive ecosystems, recreation benefits, or famous spots of scenic beauty.
- Projects having benefits of intangible nature may include health projects, rural electric supply projects, education projects (village schools), domestic water supply projects, agricultural extension, agricultural research and other projects of social objective. Intangible benefits are nevertheless virtually impossible to value satisfactorily in monetary terms. Yet costs for these projects are in general tangible enough. Intangible costs are not, however, uncommon: illiteracy, disease, unemployment, or the loss of a productive environment or treasured scenic beauty. Some tangible costs in agricultural projects (siltation, water logging, salinization and soil loss) are very difficult to quantify and value. However, they should not be ignored.
- So far the basic assumption has been that all costs and benefits are quantifiable. However, clearly this is not always so. Not only there appear to be numerous unforeseen but quantifiable cost and (less frequently) returns during or after project implementation, which must be incorporated in any further evaluation but there are also foreseen costs and benefit that cannot be expressed in monetary terms.
- The first step in the valuation of intangible costs and benefits is to identify them: lives that will be saved, jobs created, kind of education provided, and region to be developed, location of a park, ecosystem or kind of scenery to be preserved. Then quantify numerically all these. Then value those using ways and means of finding their proximate values. For instance, the benefits of education have been valued by comparing the earnings of an educated man with those of one who is uneducated. Health and sanitation projects have been valued in the number of hours of lost work avoided by decreasing the incidence of disease. Nutrition benefits have been valued in terms of increased productivity. Population projects have been valued by attaching a value to the births avoided.

- However, these attempts underestimate the value of intangible benefits - the value of education is much more than just the increase in income; good health is a blessing far in excess of merely being able to work more hours. The same holds for good nutrition!
- In contemporary practice of project analysis in developing countries, the only method used to any extent to deal with intangible benefits is to determine on a present worth basis the least expensive alternative combination of tangible costs that will realize essentially the same benefit which is often called - least - cost combination or cost effectiveness. For example, electricity projects, and education projects. One can compare the costs of the centralized schools that realize economies of scale vis-à-vis smaller schools to which students can walk! Cost minimisation or cost effectiveness is a method appropriate when: there are two alternative ways of doing a project for the same benefit, and the benefits are difficult to value. Given our objective (s), the scope of the project, and similar issues of interest, our intention is to approve a project that can address the problem with the minimum cost.
- In the case of the least cost (cost effective) method, we want to ascertain what alternative methods are available to achieve these objectives, and their cost implications. Comparing the various costs and selecting the cheapest alternative is called the least cost method. But one has to always bear in mind that we do not optimize costs at the expense of out objective!

- A variation of the least cost combination method can be used to deal with intangibles in multipurpose projects. From the total of the project are deducted all those costs that can be directly attributed to tangible benefits - flood damage avoided, irrigation, navigation; and the like. These costs are compared with their associated benefits to determine if the purpose is worthwhile at all. The analyst can ask himself 'Is the flood damage avoided worth the direct costs incurred?'
- Finally, the residual costs for the project are compared with the residual intangible benefits. Is the number of lives saved by the project worth the residual cost that must be incurred? In most agricultural projects, most of the benefits are usually tangible and can be valued. However, there are still some. Example: agricultural extension services. However, their benefits are indirectly more and better production and productivity.
- Finally, if the proposed project is one in which the output is wholly intangible, a least- cost combination approach is appropriate. This would probably be the case for agricultural projects in which the major investment is in extension, education, rural water supply, rural health improvement, or research. Even if it is not possible to quantify, it is desirable to mention somewhere in the project document so that the analyst can use it for final decision especially when projects are marginally acceptable using quantifiable costs and benefits.

7.3. Comparisons among Discounted Measures

- The above measures of project worth may give different ranking if projects that are being comparing are different in their:
  - Cash flow structure
  - Magnitude of costs and benefits
  - Life time
- 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. The former will be less sensitive to changes in discount factor as compared to the latter.
- 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.
- 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.
- However, if there are limited funds, as is often the case, and if different criterion gives rise to different results, a decision must be made as to which criterion to use for selection. Which criterion is then more appropriate to select among such mutually exclusive projects?

Comparisons among discounted measures of project worth

- In most cases we do not bother ourselves for ranking projects for different reasons. Ranking is false as a country won't have readily prepared bunch of projects on its shelf as project planning and analysis is costly. Moreover, there are other factors (outside the rank by discounted or undiscounted measures) that should be considered such as ability (financial and managerial) of the economy to implement the projects.
- The ranking procedure assumes that the standard of estimation of costs and benefits is uniform. If economic criteria are to be used in ranking projects it is therefore important to insist on a common standard of cost and benefit estimation. The quality of the analysis of projects should be scrutinised carefully before the results presented are accepted.
- For independent projects the four criteria (NPW, IRR, B-C ratio and N/K ratio) will identify exactly the same group of projects for implementation. Unlike others, NPW can be used for mutually exclusive projects. Unlike the others, for N/K ratio, the formal selection criterion is to accept projects discounted at the opportunity cost of capital in order, beginning with the largest ratio value and continuing until all investment funds have been exhausted.
- Different factors determine our choice of the specific decision making criterion:
  - Practice in the country;
  - Preference of the financing agencies (World Bank, for instance, prefers IRR saying that it avoids the necessity for having exact level of the opportunity cost of capital;
  - The nature of the project (s) - size and complexity, mutual exclusiveness, independence, risk and uncertainty involved and so on;
  - Level of analysis being made;
  - Nature of the economy for which the analysis is being made; and
  - The need to compute switching values, and so on.

Summary: comparison of discounted measures of project worth

Item	NPW	IRR	B- C ratio	N/K ratio
Selection criterion	Accept all independent projects with NPW of zero or greater when discounted at opportunity cost of capital	Accept all independent projects with IRR equal to or greater than the opportunity cost of capital	Accept all independent projects with B/C ratio of 1 or greater when discounted at opportunity cost of capital	Accept all independent projects with N/K ratio of 1 or greater when discounted at opportunity cost of capital in order of ratio value until available investment funds are exhausted.
Ranking	Gives no ranking for order of implementation	May give incorrect ranking among independent projects	May give incorrect ranking among independent projects	May be used to rank independent projects
Mutually exclusive alternatives	Accept alternative with largest NPW when discounted at the opportunity cost of capital. NPW is the preferred selection criterion for mutually exclusive alternatives	Cannot be used directly; must discount differences between incremental net benefit flows of mutually exclusive alternative projects	Cannot be used directly	Cannot be used directly
Discount rate	Must determine a suitable discount rate, generally the opportunity cost of capital	Determined internally; must determine opportunity cost of capital to use as a cut-off rate	Must determine a suitable discount rate, generally the opportunity cost of capital	Must determine a suitable discount rate, generally the opportunity cost of capital

8. Project appraisal, risk and uncertainty

- **8.1 Introduction**
- Before becoming involved in a project, owners, sponsors and perspective financiers will want:
  - To be assured project feasibility
  - To assess the possibility of threat to the desired outcome;
  - To consider the consequences of potential project risk and be assured that it can be managed.
- There is an element of risk in all projects. In some, the risks are minimal, while others are highly risk prone. Risk management is a continuous process throughout the life of all projects, beginning with the feasibility stage when foreseeable risks are identified, classified and assessed.
- A serious threat may cause the project to be modified or abandoned but in most cases, planning will be able to provide risk avoidance mechanisms to reduce the probability of trauma and/ or minimize the consequences.

- Up to this chapter unbiased estimates have been assumed for the values of future benefits and costs.
- Relying on single estimates for values making up benefit-cost calculations is known as a ***deterministic approach*.**
- In most cases a single estimate of NPV or IRR will be presented on the basis of which the '***accept*' or '*reject*'** decision is made.
- It is not clear if the single estimate is the mean expected value of possible outcomes, a maximum likelihood estimate, or simply the result of a string of arithmetic computations.
- It does not also indicate whether sophisticated statistical methods have been used to establish some project parameters or others merely been guessed at.
- Whether one is appraising a project from a financial or economic or social point of view, project appraisal remains in essence an exercise in using limited information to make predictions about the future contrasting the 'with' and 'without' project situations.
- Since a typical project will involve one or more outputs and a whole series of inputs, the net benefit stream which eventually emerges will be the result of a string of calculations based on projected physical quantities and prices. In most cases, predicting the 'without' case is more difficult than predicting the 'with' case.

- In project planning, risk is the chance of occurrence of unexpected values of different variables: prices, yield, costs, weather, and year of implementation. Risk is a situation whereby known probabilities can be attached to the outcomes while uncertainty is the plurality of outcomes to which objective probabilities can't be assigned. The formal difference between risk and uncertainty is that risk refers to cases where the nature of probability distribution of future events is statistically known while uncertainty refers to cases where probabilities are only guessed, although on the basis of available information. For instance, consider the definition,
- $$NPV = \sum_{t=1}^{n} B_t (1 + r)^{-n}$$
- Where, B_t is net benefit,
- r is interest rate, and n is number of years.
- Calculating the net benefit stream (B_t = 1 ... n) will involve predicting values for each of the various elements entering into the definition of profit, viz. volume of output sold, selling price, required investment, labor costs per unit, maintenance costs of machines and so forth.

8.2 The statistical approaches

CBA typically allows for uncertainty in two ways, *i.e. statistical approach (using probabilistic values*) and the *cost benefit approach* (*sensitivity analysis or switching values).* Under the statistical approaches one can mention the expected value approach, the three point distributions, the game theoretic approach and time series analysis. The choice among these depends on the purpose of the analysis and the data available at hand.

8.2.1 The expected value approach

A probability distribution, *P(x),* is merely an enumeration of the various values *(X_i)* which a variable *(x)* may assume accompanied by an indication of the probability of occurrence of each value *(P_i).* The mean of this distribution is called the expected value of the variate (a variable having a probability distribution is called a variate). As probabilistic information is available in this particular case, expected value is an approach to address problem of risk, not uncertainty.

Expected value is just an average value of all possible outcomes weighted by the probability of occurrence. Tree possible situations are commonly encountered when applying the probabilistic approach. All possible outcomes are known such as the case of card and dice games. All possible outcomes are not known - temperatures, rainfall, sunshine etc. However, using historical data, it is possible to estimate probability of individual occurrences in the existence of stable conditions. The third case is when few data exist to mathematically derive estimates of probabilities. However, still some informed guess can be made even though without any statistical support.

Statistical independence occurs when the probability distribution for one of the element is unrelated to the others. Where dependency exists, the statistical analysis becomes rapidly more complex as the number of statistically dependent elements increases. Problems remain in applying the probabilistic approach to project analysis. Nevertheless, an approach that incorporates expected values customarily provides an improvement over the deterministic approach.

Mathematically, expected value of an outcome can be given as $EV = \sum_{i=1}^{n} P_i x_i$

$$\sum_{i=1}^{n} p_i = 100\%$$

where p_i is probability of the i^{th} event, x_i is value of the i^{th} event, and

Example: Suppose the relationship between crop yields and rainfall is known, together with the probability of rainfall, the expected value of crop yields can be used in place of a single unbiased estimate. Suppose agronomists say that with a rainfall of 400 mm_s during the growing season, a crop will yield 1400kg/ha; with rainfall of 300 mm_s, the yield falls to 1000kg/ha; and with 200mm_s, the yield is only 500kg/ha. Let the probabilities of these levels of rainfall is 15%, 50% and 35%, respectively. Given this information, one can use the mode, the mean or the expected value as a proxy for yield

- To illustrate the application of some of these principles in practice, imagine the case of a firm which is considering whether or not to purchase a second hand machine of given specification and vintage. Because the machine in question is several years old, its operating costs are substantially greater than those of the current model, and it is this stream of extra annual costs incurred over its operating life which will need to be compared to the capital cost savings in order to determine whether the older machine is preferred to the new model.
- The management has calculated that if extra running cost of the second hand machine exceed those of the new one by Birr 2800 per annum, the proposition is uneconomical. Estimates of operating costs of second-hand machines are given below (all figures in Birr x 10^2):

No	**X**	**(X-*X*)**	**(X - *X*)²**
1	21	1	1
2	10	-10	100
3	16	-4	16
4	23	3	9
5	21	1	1
6	14	-6	36
7	30	10	100
8	18	-2	4
9	27	7	49
10	20	0	0
11	7	-13	169
12	33	13	169
Total	240		654

- $\chi = \Sigma X/n = 240/12 = 20$
- S^2 (variance) = $\Sigma(X - \chi)^2 /n-1 = 654/11= 59.5$
- S (standard deviation) = S = 7.7 (= Birr 770)

- From the machine manufacture's records it has been established that 1000 machines were produced in all; unfortunately, only 12 of these can be traced to their present owners. Hence, the operating cost characteristics of the entire population of second-hand machines will need to be estimated from the characteristics of a sample population numbering only a dozen. The true mean (χ) and variance (S^2) of the population of 1000 machines are approximated by calculating the mean (χ) and variance (S^2) of the sample.
- One adjustment has been made in calculating variance, $(X - \chi)^2$ being divided by n - 1 instead of n to allow for small sample size. The computed sample mean is Birr 2000 while the standard deviation is 700 Birr If these sample statistics are unbiased estimates of population statistics, then management can infer that there is approximately an 85 percent chance that the purchased second-hand machine will be more economical than the new one; i.e. that it will have an operating cost of less than Birr 2800. This sample illustrates very roughly how sample information can be used to derive a probability distribution of possible outcomes (through further adjustments could be made here; viz. using student's t - distribution).

8.2.2 Three point distributions

- In some cases, even the sort of information presented above might not be available. A typical situation is where only high (H), low (L) and best guess (B) estimates can be made. This is a typical uncertainty problem. A very useful device is the use of some form of three - point distribution such as the '*triangular*' and the '*Beta*' distributions.
- Suppose that instead of obtaining the above sample information, project management group had only been able to obtain the manufacturer's opinion that operating costs were unlikely to be above Birr 3500 at worst, or below Birr 500 at best, their own best estimate being Birr 2000. Statistics for the triangular distribution are:
- $\chi = \frac{H + 2B + L}{4}$ or $\chi = \frac{3500+4000+500}{4} = 2000$
- $S = \frac{H - L}{4}$ or $S = \frac{3500 - 500}{4} = 7500$
- In the case of the *Beta* distribution, more weight is given to the central value in relation to the extreme point values. Hence, we have:
- $\chi = \frac{H+4B+L}{6}$ or $\chi = \frac{3500+8000+500}{6} = 2000$
- $S = \frac{H - L}{6}$ $S = \frac{3500 - 500}{6} = 500$
- Comparing these results to those obtained from the sample statistics, it will be seen that the estimates of mean value (χ) coincide while those for standard deviation are smaller, particularly in the case of the *Beta* distribution. The coincidence of mean estimates and the fact that extreme values chosen are equidistant from the best estimates (B) suggests that the manufacturers assumed a normal distribution. However, the fact that the standard deviation estimated from the *Beta* distribution is smaller than that estimated from the triangular distribution reflects the smaller weight given to extreme values in the case of the *Beta* distribution.

- Choice of which of these three point distributions to use when one is working with limited information (uncertainty) will clearly depend on the analyst's judgment of how far high and low estimates encompass the entire range of possible outcomes; i.e. judgments of the form 'Is the high (low) estimate merely an infrequent occurrence or an extremely exceptional occurrence?
- In general, though, such approximations can be extremely useful provided that the general characteristics of the underlying population distribution are understood and proper caution is exercised in applying the results derived.
- It will not be enough to trust in the common sense of the appraiser and hope for a 'reasonable' result.
- The common sense of one appraiser might indicate using conservative estimates for key parameters in all case, while another might argue that optimistic assessments are justified, if only to offset the conservative bias of the engineer or the agronomist. Thus the treatment of risk clearly needs to be handled systematically, if only to establish common standards which make one project appraiser's NPV consistent with another. The basic choice to be made is between presenting a single point estimate of profitability (a central tendency measure) and presenting central tendency and dispersion estimates derived from probabilistic information.

- **8.2.3 Game theoretic approach**
- While the above discussion suggests that much can be done by way of systematically organizing and using probabilistic information in project evaluation, nothing has so far been said about how to choose between projects under different conditions (states of nature). Imagine that we have only four bits of information about projects A and B, notably points A, B, a, and b, and that no associated probabilities are given. Such a situation would be one of uncertainty, there being no way of telling, should project A be chosen, which of the two NPVs, A or a, would be most likely. Suppose that projects A and B represent two different versions of an investment proposal for the construction of a fishmeal processing plant.

	With meager Fish (Birr)	**With good Fish catch(Birr)**
Project A	20,000 (a)	100,000 (A)
Project B	-10,000 (b)	150,000 (B)

- Version B is relatively more capital intensive than A, and turns out to be more economical in those years when the fish catch is plentiful and a high volume of throughput can be maintained. Under such conditions the mean NPV of version B is Birr 150,000 while that of A is only Birr 100,000. However, in years when the catch is meager, version A still manages to realize a small positive return while version B shows a negative NPV.
- Several decision criteria applicable to choice under uncertainty have been developed in the context of games theory, the three best known being the ***maxi-max returns principle, maxi-min returns principle*** **and the *mini-max regret principle*.**
- The ***maxi-max returns principl****e* suggests that alternatives should be evaluated on the basis of the larger maximum return (maxi-max) which can be secured should things go in favor of the project.
- On this basis one would be led to choose project B which yields the maximum return of Birr 150,000 in the event of the most favorable state of nature.
- This is an exceedingly liberal principle since it focuses entirely on maximizing gains a favorable situation and ignores the losses to be incurred under unfavorable situations.

- The ***maxi-min returns principle*****,** on the other hand, suggests that alternatives should be evaluated on the basis of the larger minimum return (maxi-min) which can be secured should things go wrong. On this basis one would be led to choose project A which guarantees a minimum return of Birr 20,000 in the occurrence of an unfavorable state of nature. Unlike the previous case, this is an exceedingly conservative principle since it focuses entirely on minimizing losses in an unfavorable situation and ignores the gains to be secured under favorable situations.
- The ***mini-max regret principle*** takes into account potential gains and potential losses under alternative states of nature.
- Thus, in the present case, choice of project B would entail the 'regret' of incurring extra loss of 30,000 (20 - (-10)) in the 'without-fish' situation while choice of project A would entail the 'regret' of sacrificing a potential extra gain of Birr 50,000 (150 - 100) in the 'with fish' situation. If no probabilities can be attached to these alternative states of nature, one must implicitly assume them equally probable, and thus choose B since this choice entails *minimizing 'regret'*.
- Turning now to choice in a situation where probabilities can be assigned to alternative outcomes (choice under risk as opposed to choice under uncertainty), let us suppose that the 'with fish' situation has a 90 percent chance of occurrence while the alternative state has a 10 percent chance. In this case one rule which might be adopted is to choose that version having the highest mean expected value of NPV, or version B.
- Version A: 0.1 (20,000) + 0.9 (100,000) = 92,000
- Version B: 0.1 (-10,000) + 0.9 (150,000) = 134,000
- This rule can obviously be generalized to cover situations where there are more than two discrete outcomes. There are situations, however, when the expected value rule cannot serve as a guide to choice, as for example when two versions of a project have the same E (NPV) but different variance.

- **8.2.4 Time series analysis**
- Here we will try to consider the problems of *prediction* per se; that is, how historical information may be used to make inferences about what is likely to happen in the future. Here one enters the realm of functional relationships which deal with questions of the form 'How far are changes in one variable' the dependent variable, caused by changes in some other variables or set of variables, the independent variable(s). Projection (forecasting) is inevitably subject to a high degree of uncertainty about what will actually happen.
- A proper understanding of causality (cause and effect relationship) underlying a given relationship will be critical both to the interpretation of statistical results and to the choice of the tools of the analysis themselves. The simplest and most widely used prediction technique involves looking at historical data for a given variable and inferring from past behavior what future behavior will be.
- For instance, if we assume some form of relationship between, say GNP, and time, this can be expressed as: Y = f(X) where X = time and, Y = GNP. If the form of relationship can be assumed linear, we may write: $Y = a + bX$, where 'a' is the y-intercept and 'b' the slope. Then by determining values for the parameters a and b, values of Y can be predicted corresponding to desired future values of X (time).
- To determine the values of a and b, one typically uses statistical techniques (simple regression analysis) making assumptions about the characteristics of the data with which one is working, the most important of which is that observations are independent of one another. The following example illustrates the computation of trend line by the use of simple regression techniques. In the example given below, one is concerned to predict the world price of wheat in 1993 using seven observations covering the period 1981 - 1987. Forecasting trend in world wheat price:

Year	Price of wheat (Birr per ton)	Price index (1987 =100)	Wheat at 1987 Constant prices	X Year
1981	64.6	93	69.5	0
1982	66.4	94	70.6	1
1983	69.0	94	73.4	2
1984	67.3	95	70.8	3
1985	68.0	98	69.4	4
1986	71.1	99	71.8	5
1987	65.6	100	65.6	6

,

In column 2, the price of wheat is shown at current prices, and an index of world commodity prices is used to transform the series into constant 1987 prices (in column 4). Y is then regressed on X and *a* and *b* is estimated as follows:

$$y = a + bx$$

$$b = \frac{\sum x_i y_i - n\bar{x}\,\bar{y}}{\sum x_i^2 - n\bar{x}^2}$$

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

Where n = number of observations. This method of obtaining the desired parameters is called the ***'least squares' method*.** In the above case, the estimated trend line is Y = 72.1 - 0.5X, and the predicted value of Y in 1993 is obtained simply by substituting the number of the year (12) for X and solving the equation, which gives us Birr 66.10. One could also estimate confidence intervals (at say, 95 percent probability) for predictions. Finally, one would normally estimate the degree to which variation in the variable Y is explained by variation in X (the coefficient of determination, R^2) as well as test whether the estimated slope coefficient, b, is significant.

8.3 Switching values and sensitivity analysis

- **8.3.1 Switching values**
- The value an element of a project would have to reach as a result of a change in an unfavorable direction before that project no longer meets the minimum level of acceptability as indicated by one of the measures of project worth is called the switching value. When we calculate a switching value, we ask how much an element would have to change in an unfavorable direction before the project would no longer meet the minimum level of acceptability as indicated by one of the measures of project worth. Then those responsible for determining whether to proceed with the project can ask themselves how likely they feel it is that there will be a change of that magnitude.
- **Example 1**: Assume that 25% short fall in net benefit yields an NPW of 11,985 Birr and 30% shortfall yields a negative NPW of -14,044 Birr. Hence, a proportionate fall that will make NPW equal zero at 12 percent opportunity cost of capital is 27% [25 + (30-25){11,985 ÷ (11,985+14044)}]. This is just one of the interpolation formula of the IRR.
- **Example 2**. Think of a hypothetical 1 hectare mango project having sum of present value of benefits equal to Birr 31,278.04 and sum of present value of costs equal to Birr 24093.70. For this particular project, the B-C ratio will be 31,278.04/ 24,093.70 = 1.30. One benefit of the B-C ratio is that it can be used directly to note how much costs could rise (benefits could fall) without making the project unattractive. This is a quick means to estimate switching values because switching value is the amount an element of a project can change before the project becomes an unacceptable investment.

- **8.3.2 Sensitivity analysis**
- Another method popularly thought of as a means of allowing for risk and uncertainty in projects is ***sensitivity analysis*** (also called ***most probable outcome analysis***).
- It is another variant of the switching value.
- This is because they are different ways of asking the same question.
- Sensitivity analysis asks the question 'is the project sensitive to a drop in output price by 30 percent? Computing switching values, on the other hand, needs answering the question 'by how much can prices increase to bring a change from acceptance to rejection or vice versa'. To find switching values for prices, for instance using NPW, substitute 0 for NPW and find corresponding prices.
- As the term clearly indicates the sensitivity analysis is a technique in which the sensitivity of profit (or NPV or IRR) to the change in one particular factor is checked.
- The philosophy that 'only a few factors may warrant management attention' is embedded in the sensitivity analysis.
- The vital few have to be identified, as they make a difference to the success of the project.
- The sensitivity analysis technique is also called 'what if' analysis because it involves a process of recalculating the NPV if a particular factor turns out to be a different level than original estimated.
- The primary reason that sensitivity analysis is important to decision makers is that real world problem exists in dynamic environment.
- Sensitivity analysis essentially involves varying key parameter values, usually one at a time but sometimes in combination, and assessing the effect of such changes on the central tendency estimate of profitability. This can be useful if information about key parameters is such that some common yardstick can be used to assess how far each parameter should be varied; for example, each parameter might be varied by $\pm$ 1 standard deviation.
- Unfortunately, it is more common to vary primary parameters by a fixed percentage (viz. 10 %) which tells us nothing useful about the measurement of dispersion associated with (NPV), although varying each parameter separately may tell us something useful about which of these is most critical in explaining dispersion.
- Sensitivity refers to the relative magnitude of the change in one or more elements of an engineering economy problem that will reverse a decision among alternatives. Thus, if one particular element can be varied over a wide range of values without affecting the decision, the decision under consideration is said not to be sensitive to uncertainties regarding that particular element. On the other hand, if a small change in the estimate of one element will alter the decision, the decision is said to be very sensitive to changes in the estimates of that element. '*Elements*' refers to investment cost, output prices, rate of production expansion, physical quantities of outputs produced, operating costs, time and cost of equipment replacement, project life, and so on.

- Combinations of elements can also be changed. That is, instead of holding all values constant except one, changes can be considered for two or more elements in combination. However, the significance of individual elements is not observed when they are tested in groups. Second, the joint probabilities of extreme events for two or more elements normally become quite small and it is doubtful that management can afford to be adverse to such remote possibilities. Sensitivity calculations themselves do not incorporate probabilistic values, but interpretation of results implicitly, if not explicitly, brings probabilistic values into play because once we decide that a given project is sensitive to a given project cost or benefit item, we need to trace back to the probability of occurrence of that change.
- To sum up, one can list the following ***advantages of sensitivity analysis***:-
  - It enables to judge the reliability of a projected (estimated) profitability; it provides more information for judging the merits of investments than single-valued estimates of profitability;
  - It helps to identify key elements of a project for its success so that project designers, evaluators, and administrators can allocate time and effort accordingly;
  - It enables us to alter the projects in ways that will increase the certainty of favorable results; and
  - It enables to identify those factors responsible for wide variances in results and reduce their impact;

9. Monitoring and evaluation

9.1 Monitoring

Planning without control is a waste of energy and resources. Monitoring keeps track of how the project aligns itself to the established goals with respect to quality, time and resource.

Monitoring is a management process that systematically seeks to supply to the stakeholders information on the progress of implementation of a project in order to facilitate decision making.

The most important objective in monitoring is not to find fault and villains in instance of delay or overspending. The point of prime importance is that the findings of monitoring process can be utilized to benefit the project.

We Consider	Causes and consequences of deviations	Measures taken and proposed
Quality: - goals requirement and ambition		
Schedule: - started and incomplete activities		
Costs: - outcome and budget		
Resources: - access and needs		

In monitoring exercise what is monitored is

Effectiveness: – is the degree or the extent to which the project has achieved its outputs, objectives and reached its target people.

Efficiency: - is the ratio of outputs relative to costs incurred.

Relevance: - is the degree/ extent to which the program activity sense to the target factor or the degree to which the rationale and objectives of a project are, or remain pertinent, significant and worthwhile, in relation to the identified priority needs and concerns of stakeholder.

Impact: - the perceived change in the status quo / the degree to which the beneficiaries are affected positively or negatively by a project.

9.2 Evaluation

- Evaluation judges the value of activity by comparing actual direct outputs, socioeconomic results and wider eventual impact against those targeted during the planning of the project.
- This judgment should be made systematically and objectively, and for the reason it makes use of criteria or standard (e.g. relevance, efficiency, effectiveness, impact and sustainability)
- **Types of evaluation**
- **Ex-ante Evaluation**
- This typically takes place as part of the process of approving an activity (i.e. it takes place before implementation).
- Example evaluation should examine the following consideration
- The relationship and consistency between global objectives, specific objectives and project actions.
- The existence and relevance of output, result and impact indicators.
- The reliability of the qualification of the objectives.
- **Mid term evaluation**
- A mid term evaluation may be useful to provide feed back and allow adjustment to be made if necessary.
- Such an evaluation focuses on the earliest outputs & results from the project, and by comparing the current context with the baseline it shows the evaluation of the situation, thus facilitating a re examination of the objectives.
- Mid term evaluation should examine the degree of effectiveness achieved on the basis of the indicators collected during the monitoring.
- **Ex – post evaluation**
- This takes place after all the project activities have been implemented and should compare the expected objectives with those actually achieved (including impacts).
- It is concerned with the efficiency of actions and tries to assess utility and sustainability. The results of ex post evaluation may be used to allow future activities to be better designed and so respond to development needs in a more effective fashion.
-

- Why monitoring and evaluation?
- **Accountability: -** evaluation is important when receiving public funds as it is important to prove (account for) the efficient use of money provided. This need applies both to external funds and internal co financing.
- **Feed back: -** for development of improved policy making monitoring and evaluation can play an important role in the development of better policies/ interventions. By reviewing project actions and considering theory in terms of their relevance, efficiency and impact, and especially comparing these impacts with the status quo situation (no project actions), we can determine ways to improve policies and interventions.
- **Legal requirement: -** under certain program/ project evaluation is a legal requirement.
-

10. SAM and CGE

- **10.1. Social accounting matrix (SAM)**
- A social accounting matrix (SAM) is a comprehensive, economy wide data framework; typically representing the economy of a nation.
- More technically, a SAM is a square matrix in which each account is represented by a row and a column. Each cell shows the payment from the account of its column to the account of its row.
- Thus, the incomes of an account appear along its row and its expenditures along its column.
- The underlying principle of double-entry accounting requires that, for each account in the SAM, total revenue (row total) equals total expenditure (column total).
- With one exception, it has all of the features required for implementation with the standard CGE model.
- The exception is that in the standard SAM, taxes have to be paid to tax accounts, disaggregated by tax type, each of which forwards its revenues to the core government account.
- The tax types are divided into direct taxes (on domestic nongovernment institutions and factors), commodity sales taxes, import taxes, export taxes, activity taxes, and value-added taxes.
- Also note that, in the standard SAM, payments are not permitted in the blank cells of Table 1.
- Any original SAM that includes such payments should be restructured before being implemented with the standard CGE model.

- Thus the total value of each commodity includes these transaction costs.
- The standard CGE model will also work with SAMs without this treatment of (and these accounts for) transaction costs.
- Third, as noted, the government is disaggregated into a core government account and different tax accounts, one for each tax type.
- This disaggregation is often necessary because the economic interpretation of some payments may otherwise be ambiguous.
- In any given application, the SAM may exclude any (or all) of the individual tax accounts.
- In the SAM, payments between the government and other domestic institutions are reserved for transfers.

10.2. OVERVIEW OF THE STANDARD CGE MODEL

- The standard CGE model explains all of the payments recorded in the SAM.
- The model therefore follows the SAM disaggregation of factors, activities, commodities, and institutions.
- It is written as a set of simultaneous equations, many of which are nonlinear. There is no objective function.
- The equations define the behavior of the different actors. In part, this behavior follows simple rules captured by fixed coefficients (for example, ad valorem tax rates).
- For production and consumption decisions, behavior is captured by nonlinear, first-order optimality conditions, that is, production and consumption decisions are driven by the maximization of profits and utility, respectively.
- The equations also include a set of constraints that have to be satisfied by the system as a whole but are not necessarily considered by any individual actor.
- These constraints cover markets (for factors and commodities) and macroeconomic aggregates (balances for Savings, Investment, the government, and the current account of the rest of the world).
- This chapter summarizes the basic characteristics of the model. Unlike the more detailed presentation, it uses no mathematical notation.

- **ACTIVITIES, PRODUCTION, AND FACTOR MARKETS**
- Each producer (represented by an activity) is assumed to maximize profits, defined as the difference between revenue earned and the cost of factors and intermediate inputs.
- Profits are maximized subject to a production technology, the structure of which is shown in Figure 1.
- At the top level, the technology is specified by a constant elasticity of substitution (CES) function or, alternatively, a Leontief function of the quantities of value-added and aggregate intermediate input.
- The Leontief alternative is the default. The CES alternative may be preferable for particular sectors if empirical evidence suggests that available techniques permit the aggregate mix between value-added and intermediate inputs to vary.
- Value added is itself a CES function of primary factors whereas the aggregate intermediate input is a Leontief function of disaggregated intermediate inputs.
- Each activity produces one or more commodities according to fixed yield coefficients. As noted, a commodity may be produced by more than one activity.
- The revenue of the activity is defined by the level of the activity, yields, and commodity prices at the producer level. As part of its profit-maximizing decision, each activity uses a set of factors up to the point where the marginal revenue product of each factor is equal to its wage (also called factor price or rent).
- Factor wages may differ across activities, not only when the market is segmented but also for mobile factors. In the latter case, the model incorporates discrepancies that stem from exogenous causes (for example, wage differences across activities resulting from considerations such as status, comfort, or health risks).
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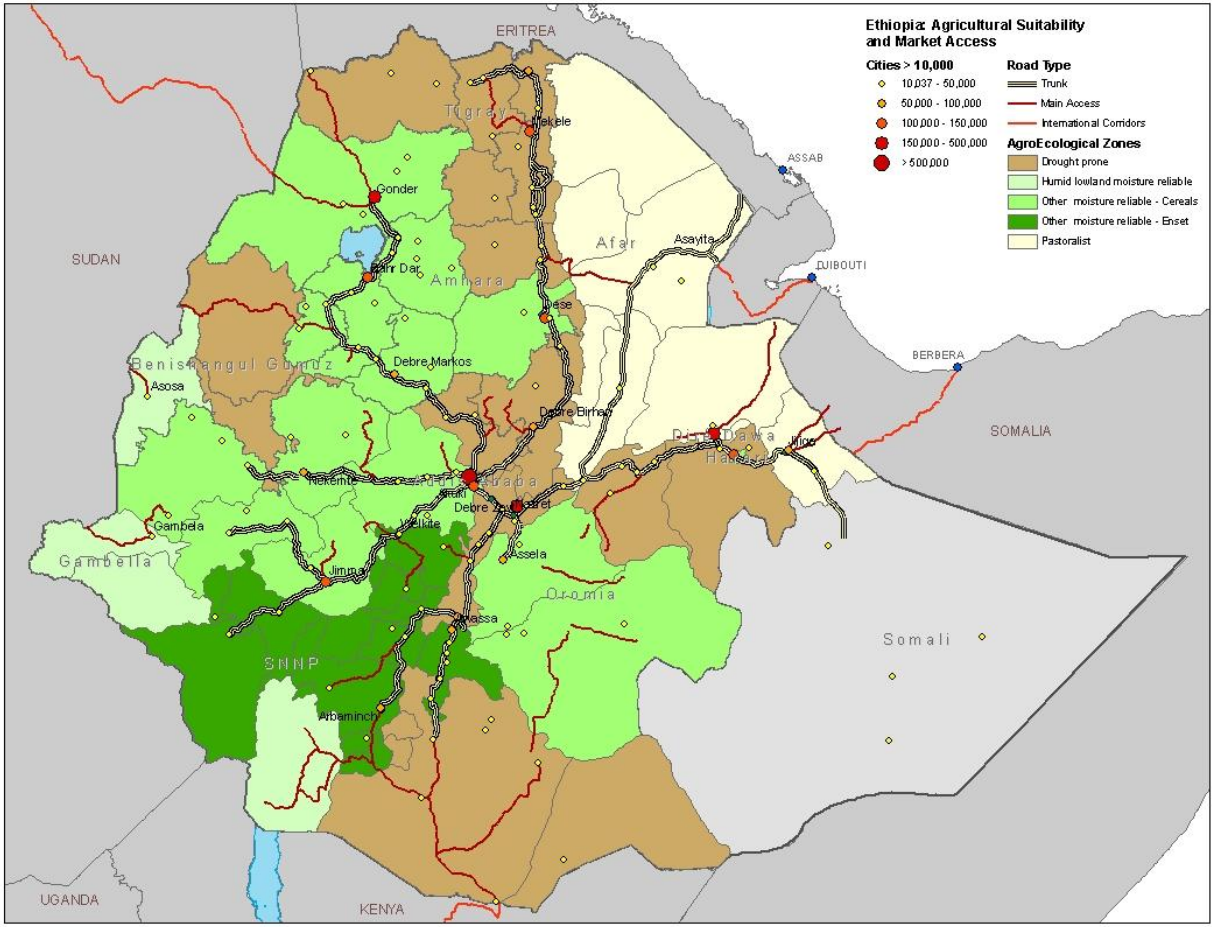
The Data Base
EDRI Social Accounting Matrix 2004/05

- Constructed as part of a project with the University of Sussex (w/support of IFPRI-ESSP2)
- 65 production sectors (24 agricultural, 10 agricultural processing, 20 other industry, 11 services)
- Regional SAM based on the "3 Ethiopias"
  - Rainfall sufficient, drought prone, pastoralist
  - Rainfall sufficient AEZ disaggregated to humid lowlands, enset-based systems, and other (highland) rainfall sufficient areas
- Poor and non-poor groups in rural and urban areas

Agro-ecological Zones
“Three” Ethiopias



The CGE Model

- Production
  - Value added modeled using constant elasticity of substitution (CES) production functions of factor inputs (land, livestock capital, various types of labor and non-agricultural capital)
  - Intermediate inputs into production are determined as fixed shares of the quantity of output.
- Trade
  - Imported goods are assumed to be imperfect substitutes for domestically produced goods;
  - Likewise, exported goods are imperfect substitutes for domestically produced and consumed goods.

The CGE Model (2)

- Incomes and Consumption
  - Payments from each factor of production is allocated to households and other institutions using fixed shares derived from the base SAM.
  - Household consumption is modeled using a Linear Expenditure System (LES) specification.
- Factors of production
  - Non-agricultural capital is fixed by sector, as is agricultural land.
  - Labor is free to move across sectors, but total labor supply is exogenous and the wage rate adjusts to balance supply and demand for labor.

The CGE Model (3)

- Macro-closure
  - Savings-investment closure with investment fixed in real terms, and with the marginal propensity to save of urban households adjusting so that total savings in the economy is equal to total investment.
  - The consumer price index is fixed at its base level (and so serves as the numeraire)
  - Foreign savings is also fixed, and the exchange rate adjusts to help bring about equilibrium in the market for foreign exchange.
  - In the simulations with foreign exchange rationing, rents are modeled using an implicit tariff for all imports that adds to the cost of the foreign exchange.
  - Rents are distributed to institutions in fixed shares.

Simulation 1: Increased Foreign Exchange Inflows

- Increased (exogenous) foreign savings inflows
  - An exogenous increase in foreign savings approximates the case of "Dutch Disease" effects arising from a surge in exports (typically natural resource exports that use very little domestic factor inputs)
  - The surge in foreign capital inflows in Ethiopia from 2005/06 to 2007/08 was not driven by a surge in export earnings or exogenous increase in capital inflows. Rather, a policy of promoting domestic investment led to an increase in import demand that was **accomodated** by permitting foreign borrowing.

Simulation 1: Increased Foreign Exchange Inflows: Simulation Results

- Increased (exogenous) foreign savings inflows adds to pool of total savings, enabling additional investment
  - Using an alternative closure for savings and investment would shift the composition of savings between consumption and investment, but would not affect the main results regarding the real exchange rate appreciation.

- This increased domestic spending (demand) leads to an increase in domestic prices
  - With a fixed nominal exchange rate, this implies a real exchange rate appreciation

Simulation 1: Increased Foreign Exchange Inflows: Simulation Results (2)

- Since prices of tradable goods are (somewhat loosely) tied to world prices and the nominal exchange rate, prices of tradable goods relative to average domestic prices (and especially relative to prices of non-tradables) falls.
  - Incentives for production of exportables falls as do exports
- Since many agricultural products are tradable (especially coffee and other export crops), farm incomes do not rise as fast as urban incomes

Simulation 1: Increased Total Investment and Foreign Capital Inflow

	Base (bn 2005/06 Birr)	Increase in Foreign Savings (% change)
Real GDP	128.6	0.0%
Absorption	158.8	5.9%
Consumption	114.8	6.1%
Investment	28.2	8.5%
Government	15.9	0.0%
Exports	16.8	-32.6%
Imports	47.0	8.4%
Real Exchange Rate	1.0	-21.5%
Nominal Exchange Rate	100.0	-21.5%
CPI	100.0	-4.4%
Real HH Incomes		
Rural Poor	21.1	4.8%
Rural Non-Poor	66.0	6.1%
Urban Poor	4.3	4.9%
Urban Non-Poor	23.4	7.5%
Total	**114.8**	**6.1%**

Simulation 1: Increased Total Investment and Foreign Capital Inflows: Sectoral Results

	Base (bn 2005/06 Birr)	Increase in Foreign Savings (% change)
Agriculture	53.0	-0.3%
Cereals	16.9	1.8%
Export Crops	9.0	-7.4%
Other Crops	9.5	1.0%
Livestock	17.6	0.6%
Industry	14.5	0.8%
Services	54.8	-0.2%
Total Value Added	122.2	-0.1%

Effects of a Decline in Foreign Savings with and without Import Rationing

	Base (bn 2005/06 Birr)	Simulation 2 Reduced Foreign Savings with Import Rationing (% change)	Simulation 3 Reduced Foreign Savings with no Import Rationing (% change)	Simulation 3 relative to Simulation 2 (% change)
Real GDP	128.6	-1.2%	-0.5%	0.7%
Absorption	158.8	-3.9%	-3.3%	0.6%
Consumption	114.8	-2.6%	-3.2%	-0.6%
Investment	28.2	-12.9%	-5.6%	8.4%
Government	15.9	2.6%	-0.5%	-3.0%
Exports	16.8	-0.2%	16.7%	16.9%
Imports	47.0	-10.1%	-4.1%	6.7%
Real Exchange Rate	1.0	0.0%	11.8%	11.8%
Nominal Exchange Rate	100.0	0.0%	11.8%	11.8%
CPI	100.0	0.0%	2.1%	2.1%
Real HH Incomes				
Rural Poor	21.1	-5.3%	-3.2%	2.2%
Rural Non-Poor	66.0	-8.4%	-3.2%	5.7%
Urban Poor	4.3	-5.9%	-2.1%	4.0%
Urban Non-Poor	23.4	16.9%	-3.4%	-17.4%
Total	**114.8**	-2.6%	-3.2%	-0.6%

Effects of a Decline in Foreign Savings with and without Import Rationing (Sectoral Results)

	Base (bn 2005/06 Birr)	Simulation 2 Reduced Foreign Savings with Import Rationing (% change)	Simulation 3 Reduced Foreign Savings with no Import Rationing (% change)	Simulation 3 relative to Simulation 2 (% change)
Agriculture	53.0	0.0%	0.1%	0.1%
Cereals	16.9	-0.9%	-1.1%	-0.2%
Export Crops	9.0	0.5%	3.2%	2.7%
Other Crops	9.5	-1.3%	-0.5%	0.8%
Livestock	17.6	1.2%	-0.1%	-1.4%
Industry	14.5	-1.4%	-0.4%	0.9%
Services	54.8	0.1%	0.0%	-0.1%
Total Value Added	122.2	-0.1%	0.0%	0.1%

Caveats

- The modeling results presented here are meant as indicators of the broad magnitudes of the effect of the policies simulated
  - Annual model (no seasonality or within-year effects)
  - No financial sector (real-side only)
  - Need to include changes in exogenous world prices
- Sensitivity analysis needed:
  - Substitution parameters that determine largely determine elasticities of export supply and import demand
  - Alternative distributions of foreign exchange rents

Concluding Observations

- CGE simulations suggest that there are substantial efficiency and distributional effects of foreign exchange rationing.
- Foreign exchange controls:
  - Result in the creation of large rents that likely accrue mainly to non-poor households.
  - Reduce economic efficiency so that real incomes from factors of production (land, capital and labor) decline, as do overall household incomes (except for those who gain large rents).
  - Inhibit depreciation of the real exchange rate, and thus slow or prevent reversal of the real exchange rate appreciation between 2004/05 and 2007/08 that reduced price incentives for exports.

Concluding Observations (2)

- There are substantial costs to both foreign exchange rationing and real exchange rate appreciation in terms of growth (reduced incentives for production of tradables) and income distribution (large rents accruing to the non-poor).
- Policy reforms need not involve full liberalization of the foreign exchange market, however.
  - Various versions of managed floats and controls in foreign capital markets exist that can gradually reduce economic rents, improve incentives for exports and increase overall economy efficiency.
  - Indeed, policies since late 2008 have effectively reduced the earlier appreciation of the real exchange rate.