

Chapter two

Financial analysis of projects

Introduction: What is financial analysis and when is Such Analysis Required?

Every project has to be first analyzed in terms of its timely implementation and financing. Commercial profitability analysis or financial analysis of a project amounts to reviewing it from the angle of the entity (private or public) that will be responsible for its execution. The necessity to determine the financial profitability of a project to the project implementer calls for undertaking financial analysis. It aims at verifying that under prevailing market conditions the project will become and remain viable. It is concerned with assessing the feasibility of a new project from the point of view of its financial results. It will be worthwhile to carry out a financial analysis if the output of the project can be sold in the market or can be valued using market prices

In other words, the financial analysis is all about the **assessment, analysis and evaluation** of the required project inputs, the outputs to be produced/generated/ and the future net benefits, (expressed in financial terms) with the aim of determining the viability of a project to the private investor or the executing entity public body.

The commercial/financial analysis deals with two issues:

1. Investment profitability analysis, with different methods of analysis;

a. Simple methods of analysis of rate of return/static methods/ non-discounted techniques/. This includes:

- Simple rate of return;
- Pay-back period;

b. Discounted-cash-flow methods/dynamic methods

- Net Present Value/NPV/;
- Internal Rate of Return/IRR/

2. Financial analysis/ ratio analysis/.

- Liquidity analysis;
- Capital structure analysis (debt-equity ratio).

The two types of analysis are complementary and not substitutable. In fact in the relevant literature commercial analysis and financial analysis are used interchangeably. Whatever the terminology, the **investment profitability analysis** is the measurement and assessment of the profitability of the resources put into a project, more directly the return on the capital no matter what the sources of financing. Thus, investment profitability analysis is an assessment of the potential earning power of the resources committed to a project without taking into account the financial transactions occurring during the project's life. On the other hand, **financial analysis** (ratio analysis) has to take into account the financial features of a project to ensure that the disposable finances shall permit the smooth implementation and operation of the project.

Why one undertakes Financial Analysis? or When to undertake financial analysis?

Commercial/financial analysis applies to private and public investments. A private firm will primarily be interested in undertaking a financial analysis of any project it is considering and seldom will it undertake an economic analysis.

The issue of financial sustainability of a public project justifies the need for undertaking financial analysis. But commercially oriented government authorities that are selling output such as railway, electricity, telecommunications, etc., will usually undertake a financial and an economic analysis of any project it is undertaking. Even non-commercially oriented government institutions may sometimes wish to choose between alternative facilities on the basis of essentially financial objectives. In the case of a hospital service the management of the hospital may be required to provide the cheapest services.

Under such circumstances a cost minimization or cost effectiveness exercise will be undertaken.

Commercial profitability analysis is the first step in the economic appraisal of a project. A comprehensive financial analysis provides the basic data needed for the economic evaluation of the project and is the starting point for such evaluation. In fact economic analysis mainly involves of adjustments of the information used in financial analysis and of a few additional ones. The procedure and methodology in financial analysis is basically the same with that of economic analysis. Yet one has to recognize

and realize the differences between the two.

It has to be noted that the financial analyst should be able to communicate and know what to ask from the different team members to collect relevant information on:

1. Revenue, both forecasted sales and selling price; (from the chapter on Demand and Market Study)
2. Initial investment costs distributed over the implementation of the project; (from the chapters on Engineering, Site Development as well as Materials and Inputs);
3. Operating costs of the envisaged operational unit/firm/ over its operating life. (from the chapters on Engineering, Site Development as well as Materials and Inputs);

The issues and concerns of financial analysis are:

1. Identification of required data;
2. Analysis of the reliability of data;
3. Analysis of the structure and significance of costs and benefits/incomes/;
4. Determination and evaluation of the annual and accumulated financial net benefits; expressed as profitability, efficiency or yield of the investment;
5. Consideration of the spread of flows of the costs and benefits over time, the economic life of the envisaged economic unit/firm/public entity/;
6. Costs of capital over time;

Identification and Analysis of the Estimates of Costs and Benefits

In project analysis, the identification of costs and benefits is the first step. This involves the specification of the costs and benefit variables for which data should be collected, identification of the sources of information, collection of the same and then assessment of the quality and reliability of the collected information.

Objectives and the Identification of Costs and Benefits

The costs and benefits of a project depend on the objectives the project wants to achieve. So, the objectives of the analysis provide the standard against which cost and benefits are defined. A cost is anything that reduces

an objective, and a benefit is anything that contributes to an objective. However, each participant in a project has many and different objectives.

- For a farmer, a major objective of participating may be to maximize family income. But this is only one of his/her objectives. She/He may also wish her/his children to be educated, which reduces the available labor force for farm work. Taste preferences may force the farmer to continue growing a traditional variety although a new and high yielding variety may be available. She/He may also wish to avoid risk and thus continue cropping a variety, which She/he knows well.
- For a private business firm or government corporations a major objective is to maximize net income, yet both have significant objectives other than simply making the highest possible profit. Both will want to diversify their activities to reduce risk. A bus public corporation may for instance decide to maintain services even in less densely populated areas or at off peak hours and thereby reduce its net income.
- A society as a whole will have as a major objective increased national income, but it clearly will have many significant, additional objectives. One of the most important of these is income distribution. Another may be to increase the number of productive job opportunities so that unemployment may be reduced - which may be different from the objective of income distribution itself. Another objective may be to increase the proportion of saving for future investment. Or there may be other broader objectives such as increasing regional integration, raising the level of education, improve rural health, or safeguard national security. Any of these may lead to the choice of a project that is not the alternative that would contribute most to national income narrowly defined.

No formal analytical technique could possibly take into account all the various objectives of every participant in a project. Some selection will have to be made. Most often the maximization of income is taken as the dominant objective of the firm because the single most important objective of an individual economic agent is to increase income and increased national income is the most important objective of national economic policy. Anything that reduces national income is a cost and anything that increases national income is a benefit. Thus anything that directly reduces the total final goods and services is obviously a cost, and anything that directly increases them is a benefit. The task of the economic analyst will be to estimate the amount of the 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.

Quantification: once costs and benefits are enumerated the next step is accurate prediction of the future benefits and costs which then be quantified in monetary units/Birr/. Thus, quantification involves the quantitative assessment of both physical quantities and prices over the life span of the project.

The financial analysis of projects is typically based on accurate prediction of market prices, on top of quantity prediction. It is worth thinking about the impact of the project itself on the level of prices; and the independent movement of prices due to other factors. The same principle applies in the case of economic analysis the only difference being the price needs to be changed to reflect net efficiency benefits to the nations at large. One widely accepted "efficiency" measure is its actual or potential value as an import or export; similarly the opportunity cost of any input is related to the question of its potential contribution to (or claims on) foreign exchange. In other words world price are considered as efficiency price indicators compared to domestic prices. However, to take account of the distribution impact of projects further adjustment of such price is required. This lends itself to the social cost benefit analysis.

Cost Classification

There are alternative ways of classifying costs and benefits of a project. One is to categorize both costs and benefits into:

- Tangible and Intangible

Another classification is in terms of:

1. Total investment costs;
 - a. Initial investment costs; includes, fixed investment costs and Pre-Production expenditures;
 - b. Investment required during plant operation / rehabilitation and replacement investment costs/
 - c. Net working capital
2. Operational/running costs; includes, Total investment costs and operating costs/costs of goods sold

Tangible costs of a project

In almost all project analyses costs are easier to identify (and value) than benefits. In examining costs the basic question is whether the item reduces the net benefit of a farm or the net income of a firm. The prices that the project actually pays for inputs are the appropriate prices to use to estimate the project's financial costs. These prices may include taxes, tariffs, monopoly or monopsony (seller monopoly) rents, or be net of subsidies. Some of the project costs are tangible and quantifiable while many more are intangible and non-quantifiable. The costs of a project depend on the exact project formulation, location, resource availability, or objective of the project. In general, the cost of a project would be the sum of the total outlays on the following items.

Initial Fixed Investment costs

The initial fixed investments constitute the major resources required for constructing and equipping an investment project.

These include the following tangible initial fixed investments.

1. The cost of land and site development

- ✓ Land charges
- ✓ Payment for lease
- ✓ Cost of leveling and development
- ✓ Cost of laying approach roads and internal roads
- ✓ Cost of gates
- ✓ Cost of tubes wells

2. The cost of buildings and civil works

- ✓ Buildings for the main plant and equipment's
- ✓ Buildings for auxiliary services (steam supply, workshops, laboratory, water supply, etc.)
- ✓ Warehouses and show rooms
- ✓ Non factory buildings like guest house, canteens, residential quarters, staff rooms
- ✓ Silos, tanks, wells, basins, etc.
- ✓ Garages and workshops
- ✓ Other civil engineering works

3. Plant and machinery

- ✓ Cost of imported machinery which might include the FOB value, shipping freight and insurance costs, import duty, clearing, loading, unloading, and transportation costs
- ✓ Cost of local or indigenous machinery
- ✓ Cost of stores and spares
- ✓ Foundation and installation charges

4. Miscellaneous fixed assets

- ✓ Expenses related to fixed assets such as furniture, office machines, tools, equipment's, vehicles, Laboratory equipment, workshop equipment

Pre-production Expenditures

Another component of the initial investment cost which includes both tangible and intangible costs is the pre-production expenditures. In every project, certain expenditures are incurred prior to commercial production/ inauguration and commencement of service delivery for public service rendering projects/.

This includes the following investment cost items.

1. Intangible assets; these assets represent expenditures which yield benefits extending over a long time period. These include:

a. Patents, licenses, lumpsum payments for technology, engineering fees, copy rights, and goodwill.

b. Preparatory studies, like feasibility studies, specific functional studies and investigations, consultant fees for preparing studies, supervision costs, project management services, etc.

2. Preliminary expenses; these costs include preliminary establishment expenses, (registration and formation expenses), legal fees for preparation of memorandum and articles of associations and similar documents. In addition it includes costs of advertisements, brokerage for mobilizing resources, shareholders, expenses for loan application and its processing.

3. Other Pre-operation expenses. These include:

- Rents, taxes, and rates

- Trial runs, start-ups and commissioning expenditures (raw materials and other inputs consumed immediately before commercial operation);
- Salaries, fringe benefits and social security contributions of personnel engaged during the pre-production period;
- Pre-production marketing costs, promotional expenses, creation of sales network, etc;
- Training costs, including all fees, travel, living expenses etc;
- Traveling expenses interest and commitment charges on borrowings
- Insurance charges
- Mortgage expenses interest on differed payments,
- Miscellaneous expenses

There are two approaches in allocating of pre-production expenditures.

- All pre-production expenditures may be capitalized and amortized over a period of time that is usually shorter than the period over which equipment is depreciated, say five years;
- A part of the pre-production expenditures may be initially allocated where attributable to the respective fixed assets and the sum of both amortized/depreciated/ as a the fixed asset, machinery and/or equipment.

Plant and Equipment Replacement Costs

Every machinery and equipment does not have equal economic life. There are machineries and equipment that productively be operated for many years, 20 years in the case of industrial technologies, about 50 years in the case of agricultural and infrastructural works. On the other hand there are equipment's, machinery components and parts which need to be regularly replaced for smooth operation of the same technology. So sound project planning work should adequately provide for replacement of components and parts. In fact the first thing to do would be to identify such items and then estimate the costs for replacement and then the same should be reflected in the financial and economic analysis.

Terminal Values/End-of-Life Costs/Salvage Costs/

Though firms may be institutionally organized to live and operate for unlimited period of time and hence unlimited age, technologies, machineries and equipment do have limited operational/economic/ life. During the end of the economic life of a good/machinery, equipment, building, etc) there is some salvaged value and the salvation may involve incurring of costs. The costs of associated with the decommissioning of fixed assets at the end of the project life, minus any revenues from the sale of the assets, are end-of-life costs. Major costs are the costs of dismantling, disposal and land reclamation.

Net Working Capital

Net working capital is part of the total investment outlays. It is defined to embrace current assets (the sum of inventories, marketable securities, prepaid items, accounts, receivable and cash) minus current liabilities (accounts payable). This investment is required for financing the operation of the plant. Any change in the current assets and/or current liabilities will have an impact on the net working capital requirements.

Any increase in net working capital/NWC/ corresponds to a cash outflow to be financed, and any decrease would set free financial resources (cash inflow for the project). Working capital is generally categorized into gross working capital and net working capital (NWC).

The gross working capital consists of all the current assets, including:

- raw materials;
- stores and spares;
- work-in-process;
- finished goods inventory;
- Debtors/accounts receivable/;
- Cash and bank balance.

Net working capital is defined as **gross working capital less current liabilities**. Current liabilities consist of creditors, provisions, accrued expenses, and short-term borrowings. For the purpose of financial analysis and even financial management of operational firms, it is net working capital which is the center of decision makers.

Costs of Goods Sold

Once the project idea has been accepted and the project is being implemented the cost of production may be worked out: For instance, for an agricultural project the following may be necessary:

- Material cost which comprises the cost of raw materials, chemicals, components, fertilizer and pesticides for increasing agricultural production, concrete for irrigation canal construction, material for the construction of homes etc and consumable stores required for production. It is not the identification that is difficult in this case but the problem of finding out how much is needed from each.
- Utilities consisting of power, water, and fuel are also important cost components.
- Labor: this is the cost of all manpower employed in the enterprise. It will not be difficult to identify and quantify the labor required for the production process. From the highly skilled manager to the unskilled factory worker the labor input can easily be identified. Problems in the case of valuing unskilled labor and family labor might arise in the economic analysis of projects.
- Factory Overhead: the expense on repairs and maintenance, rent, taxes, insurance on factory assets, etc. are collectively referred to as factory overheads.
- Land to be used for the project can also be easily identified and quantified. It will not be difficult to know how much land is needed and about the location. Yet problems might arise in valuing land because of the special kind of market conditions that exist when land is transferred from one owner to another.
- Contingency allowances are usually included as a regular part of the project cost. In general project cost estimates are assumed that there will be no relative changes in domestic or international prices and no inflation during the investment period or there will not be any modification in design, no exceptional conditions such as unanticipated environmental conditions (flood, landslides, or bad weather). It would be unrealistic to base project cost estimates only on these assumptions of perfect knowledge and complete price stability. 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 cost. Contingency allowances may be divided into those that provide for physical contingencies and those for

price contingencies. In turn a price contingency comprises two categories, those for relative changes in price and those for general inflation. Physical contingency allowances and price contingency allowances for relative changes in price are expected and form part of the cost base when measures of project worth are calculated. To avoid the problem of inflation on the other hand it is advisable to work with constant prices instead of current prices. This approach assumes that all prices will be affected equally by any rise in the general price level. So, contingency allowances for inflation will not be included among the costs in project accounts other than the financing plan.

- Taxes: payment of taxes including tariffs and duties is treated as a cost to the project implementer in financial analysis. But they are considered as transfer payments in economic analysis.
- Debt service: the same approach applies to debt service - the payment of interest and the repayment of capital. Both are treated as an outflow in financial analysis. In economic analysis debt service is treated as a transfer payment within the economy even if the project will actually be financed by a foreign loan and debt service will be paid abroad.

Sunk costs

Sunk costs are those incurred in the past and upon which the proposed new investment will be based. Such costs cannot be avoided however, poorly advised they may have been. When we analyze a proposed investment, we consider only future returns to future costs; expenditures in the past or sunk costs do not appear in our account.

Tangible Benefits

Tangible benefits can arise either from increased production or from reduced costs. The specific forms, in which tangible benefits appear, however, are not always obvious and valuing them might be difficult. In general the following benefits can be expected

- Increased production
- Quality improvement
- Changes in time of sale changes in location of sale
- Changes in product form (grading and processing)
- Cost reduction through technological advancement
- Reduced transport costs

- Looses avoided
- Other kinds of tangible benefits

How to value project costs and benefits in financial analysis

This is an issue of pricing/valuing/ of the project's inputs and outputs. The inputs and outputs of a project appear in physical form and prices are used to express them in value terms in order to obtain common denominator. Ideally, for the purpose of the feasibility study prices should reflect the real economic values of project inputs and outputs for the entire planning horizon of the decision makers. The financial benefits of a project are just the revenues received and the financial costs are the expenditures that are actually incurred by the implementing agency as a result of the project. If the project is producing some goods and services for sale the revenue that the project implementer expects to receive every year from these sales will be the benefits of the project. The costs incurred are the expenditures made to establish and operate the project. These include capital costs, the cost of purchasing land, equipment, factory buildings vehicles, and office machines, working capital as well as its ongoing operating costs; for labor, raw material, fuel, and utilities.

In financial analysis all these receipts and expenditures are valued as they appear in the financial balance sheet of the project, and are therefore, measured in market prices. Market prices are just the prices in the local economy, and include all applicable taxes, tariffs, trade mark-ups and commissions. Since the project implementers will have to pay market prices for the inputs and will receive market prices for the outputs they produce, the financial costs and benefits of the project are measured in these market prices. In a freely perfectly competitive market, without taxes or subsidies the market price of an input will equal its competitive supply price at each level of production. This is the price at which producers are just willing to supply that good or service. The supply curve will reflect the opportunity cost, or the value in their next best alternative use, of the resources used to produce that input. In equilibrium the supply price of an input will equal to its demand price at the market-clearing price for that input.

The financial benefit from a project is measured in terms of the market value of the project's output, net of any sales taxes. If the project's output is sold in a competitive market with no rationing or price control for the good concerned, and the project is small and does not change the good's price, its market price will equal its competitive demand price. This is a minimum

measure of what people are willing to pay for a unit of the good or service (produced by the project, at each level of output demanded).

Prices may be defined in various ways, depending on whether they are:

1. Market/explicit/ or shadow/imputed/ prices;
2. Absolute or relative prices;
3. Current or constant prices.

Market/Shadow

prices:

Market or explicit prices are those present in the market, no matter whether they are determined by supply and demand or by the government. They are the prices at which the firm will buy the inputs and sell the outputs. In financial analysis market prices are applied. In economic analysis we raise the question whether market prices reflect real economic value of project inputs and outputs. In economic analysis, if the market prices are distorted, then shadow or imputed prices will have to be used for economic analysis.

Absolute/relative prices:

Absolute prices reflect the value of a single product in an absolute amount of money, while relative prices express the value of one product in terms of another. For instance, the absolute price of 1 tone of coal may be 100 monetary units and an equivalent quantity of oil may be 300 monetary units. In this case the relative price of coal in terms of oil would be 0.33, meaning that the relative price of oil is three times the price of coal. The level of absolute prices may vary over the lifetime of the project because of inflation or productivity changes. This variation does not necessarily lead to a change in relative prices, in other words, relative prices may sometimes remain unchanged despite variations in absolute prices. Both absolute and relative prices can be used in financial analysis.

Constant Vs Current prices

Current and constant prices differ over time due to inflation, which is understood as a general rise of a price levels in an economy. If inflation can have a significant impact on project inputs and output prices, such an impact must be dealt with in the financial analysis. Wherever relative input and output prices remain stable, it is sufficiently accurate to compute the profitability or yield of an investment at constant prices. Only when relative

prices change and project input prices grow faster (or slower) than output prices, or vice versa, then the corresponding impacts on net cash flows and profits must be included in the financial analysis. If inflation impacts are negligible, the problem of choosing between current and constant prices does not exist, since they are equal and the planner may use either.

Cash Flows in Financial Analysis

Introduction

The three basic steps in determining whether a project is worthwhile or not are: (a) estimate project cash flows; (b) establish the cost of capital; and (c) apply a suitable decision or appraisal rule or criterion. This section deals with the first step.

Investment is a long-term commitment of economic resources made with the objective of producing and obtaining net gains in the future. A capital project generally involves current and 'near future' sacrifices made in the expectations of a flow of benefits extending over a period of time. From the financial point of view the sacrifice/commitment/ are in the form of cash outflows, and benefits are in the form of cash inflows measured in post-tax terms. The task at hand is to evaluate and determine whether the long-term investment is a profitable one or not.

To this effect, what conventions of accounting and methods should one use? This solved by introducing what is referred to "Cash - Flow Analysis". In view of addressing the major issues and tasks in financial analysis (for that matter economic analysis as well), one needs to develop certain mechanism of presentation, a mechanism that captures all the relevant data and enables for easier computation to decide whether a project is a viable one or not.

Cash flows are basically either receipts of cash (cash inflows) or payments (cash outflows) related to the long-term investment. Measurement of costs and benefits in terms of cash flows is quite rational and appropriate as money has time value - cash flows are more relevant than costs defined by conventional accounting and likewise cash inflows are more relevant than earnings measured by conventional accounting.

Whether one is calculating financial or economic rate of return, a key part of the analysis will be to work out the actual flows of income and expenditure. The financial cash flow of a project is the stream of financial

costs and benefits, or expenditures and receipts that will be generated by the project over its economic life, and will not be produced in its absence. Note that when one is working with market prices, the cash flow stream is referred to as financial Cash Flow. When these prices are adjusted to reflect national efficiency and equity objective (i.e. when shadow prices are used) it is referred to as Economic Net Benefit Stream and Social Net Benefit Stream, respectively. Contained in the conventional net income statement and the balance sheets are not sufficient to address.

METHODS OF FINANCIAL ANALYSIS

To assess financial viability of a project a range of tools and methods can be used and various types of financial statements can be prepared. This includes:

1. Resource flow statements
2. Profit and loss statements
3. Cash flow statements and
4. Balance Sheet

These statements are explained in detail below.

7.3.1 Resource Flow Statements

The starting point of the financial analysis of a project is **drawing up of a statement of project cost and benefits**. The benefit and cost items included in the statement should include only those items, which are incremental. The resource flow statement shows: (1) the **list of resources used in the project** and (2) **the resources generated by the investment on the project**.

The major elements of resource flow statements are:

1. **Investment costs:** investment costs cover capital expenditure items such as **land, buildings, equipment and furniture** etc. It includes three group of costs:

(a) **Initial fixed investment costs.** This includes investment made for the acquisition of land, development of land for construction purpose, civil works (laying the foundation), equipment and machinery costs, installation of the machines or the plant, vehicle, furniture, building etc. All these above costs are subject to depreciation except land which is depleted over time.

(b) **Pre-production capital expenditure.** The pre-production capital expenditure includes:

- Research and development
- Pre-feasibility or feasibility study cost
- Training costs incurred before the commencement of the operation
- Recruitment of personnel costs
- Arrangement for marketing of the product such as early **advertisement** to inform the public in advance before the actual distribution of the product to the market
- Arrangements for supplies etc.

(c) **Working capital.** Working capital is simply a revolving fund. It is the difference between current asset and current liability. This is known as a **circulating fund** because at the end of the project's life it can be put as a benefit of the project. Defining the working capital requirement appropriately is important because many projects fail while they are in operation due to shortage of cash or working capital. The amount of the total working capital required depends upon the operating costs for the project.

There are three basic components of physical working and capital inventories needed for production to be continuous. These are:

- **Initial stock and materials**
- **Work-in-process and**
- **Stock of outputs**

When these three components of working capital have been estimated, they can be summed to give the total working capital requirements in any year. The working capital resources that need to be included in a project statement are the incremental amount (additional commitment of resources) as the inventories build up or vary from year to year.

Table 71: Project Investment Costs ('000 Birr)

Item	Project Year					
	1	2	3	4	5	n
Land preparation	X	X	X	X	X	
Building	X	X	X	X	X	
Equipment	X	X	X	X	X	
Vehicles	X	X	X	X	X	
Working Capital	X	X	X	X	X	
Other costs	X	X	X	X	X	
Total	XX	XX	XX	XX	XX	XX

Generally speaking, the amount of funds required for operating needs varies from time to time in every business. But a certain amount of assets in the form of working capital are always required; if the business has to carry out its functions efficiently and without a break. The two types of requirements are permanent (fixed) and variable.

2. Operating Costs/Production Costs. Operating costs can be divided into two: **Fixed and Variable components**. Variable working capital includes items such as **materials, power, labor inputs** required for manufacture which will vary directly with the volume of production while **fixed costs** will include **maintenance, administration and managerial charges**, etc. which will be relatively fixed with respect to the volume of production.

The total operating costs will then be the sum of the fixed and variable costs and will increase over the operating years until full utilization of the investment asset is reached.

Table 7.2 Project Operating Costs Schedule

No	Items			Years					
				1	2	3	4	5	n
	Capacity Utilization Rate (%)			50 %	75%	80 %	85 %	90%	100 %
1	Raw material								
2	Labor								
3	Utilities								
4	Repair								
5	Maintenance and Repair								
6	Factory Overhead								
	Factory Costs (1-6) (a)			XX	XX	XX	XX	XX	
7	Administrative costs								

8	Sales costs						
9	Distribution cost						
	Operating Costs (7-9) (b)	XX	XX	XX	XX	XX	
10	Depreciation (c)						
11	Interest expenses (d)						
	Total production Cost (a + b + c + d) (Bold)	XX	XX	XX	XX	XX	

Note: n represents the number of periods covered in the project appraisal.

As it is shown in the above schedule, operating cost includes: cost of production/cost of sales, administrative expenses, selling expenses, depreciation on fixed assets, and write off preliminary and preoperative expenses.

A) Cost of Production

The cost of production includes

1. Material cost
2. Wages including salaries for executives
3. Utilities
4. Repairs and maintenance
5. Factory over heads. These items include expenses for the factory as:
 - rent, for factory, if any
 - insurance premium for factory assets and factory workers
 - postage, telephone, fax, e-mail, etc, in the factory
 - traveling expenses
 - depreciation of plant and machinery and other factory equipment;
 - Proportionate management expenses, which may be charged to factory on the basis of time spent by management on the project operation.

b) Administrative Expenses

This represents all indirect expenses incurred in the organization including estimates for

- salaries of all indirect staff
- postage, telephone, fax, e-mail etc
- traveling expenses
- insurance other than for the factory assets
- rent, rates, taxes, electricity etc and
- depreciations of all fixed assets other than factory assets other than factory fixed assets

c) Selling Expenses

This represents estimated expenses in sales divisions as per projected organizations and include the items:

- salaries and personnel cost for sales staff and managers as planned
- Publicity, advertisement, exhibitions, etc.
- Subsidies, commissions, discounts to dealers, etc.
- Administrative expenses of sales office including rent.

d) Depreciation

Depreciation expenses represent consumption of utility units contained in an asset. It relates to the cost center where such assets are installed.

e) Production Build Up

In the first years of operation, a project may not be 100% build up or it may not utilize the full capacity. It builds up over the years of its operation. From the technical details of the plant and machinery and the available other resources as manpower, space etc. an estimation of the plant's installed capacity is worked out. Once the installed capacity is worked out, estimation is made about the plant's operation achieving from the initial zero to eighty or ninety percent of the installed capacity. The peak is achieved in a span of three or four years from the start in the phase manner – like 50%, 60%, 75%, 90% of the installed capacity – estimated by year 1, 2, 3, and 4 respectively. The capacity utilization factor is included in the projects operating costs schedule.

3. Benefits

Benefits of a project can be several. For example, a range of different farm products in an agricultural project, or cost savings as well as production benefit from a transport infrastructure project. The different benefits will all be variable with respect to their associated costs, and hence, total benefits will also be variable.

Benefits can be direct (production output) which may include items like:

- main product
- by product
- residual and other income

Benefits can also be indirect or external. For example, in a road projects reducing transportation costs, reducing operating costs for maintenance of vehicles and saving time of the society are indirect benefits of the project.

Benefits are associated with the capacity utilization factor to which operating costs were also related. When the value and timing of investment costs of and operating costs have been determined the net benefits of the project can be calculated. The net benefit is computed by simply subtracting the investment, operating and working capital costs from benefits.

The following table depicts the complete project resource statement, which brings together the investment costs, operating costs, working capital and project benefits.

Table 7.3 Project Resource Statements

No	Items	Project Period					
		1	2	3	4	5	6
1	Land preparation						
2	Buildings						
3	Equipment						

4	Vehicles						
5	Total investment cost (1 + 2 + 3 + 4)						
6	Factory costs						
7	Administrative costs						
8	Selling expenses						
9	Depreciation						
10	Total operating costs (6 + 7 + 8 + 9)						
11	Incremental working capital						
12	Benefits						
13	Net Benefits						

The net benefits are negative in the first years while investment is taking place, and become positive when the utilization of the new assets is building up.

7.3.2 Project Financial Statements

Financial analysis also involves formulation of various financial statements, which enable project owners and other interested stakeholders to know whether the projects are worthy or not. Most commonly prepared financial statements are balance sheet, loss and profit statement, and cash flow statements.

a) Profit and Loss Statements

The main purpose of profit and loss or trading profit and loss account in short income statement is to calculate the profit or loss of enterprise or project. It is the measure of the profitability of the project. Firms are required by law to prepare an income statement at the end of each year to report to stakeholders on the performance and profitability of the project and at the same time it is used to calculate the tax liability to the

government. Borrowers also use this income statement as the base to grant loans. An example of typical income statement is given below.

XYZ Project
Profit and Loss Statements

No	Project Period Items	1	2	3	4	5	6	n
1	Total sales							
2	Variable production cost							
3	Gross profit (1-2)							
4	Other production costs							
5	Corporate tax							
6	Net profit after tax (3 - (4							
7	+ 5) Dividend							
8	Retained profit (6-7)							

The format of the profit and loss account varies according to who is preparing it and for what purpose, and on the type of activity, be it manufacturing, retail or service projects. Gross profit is calculated by deducting direct production costs (cost of sales) from sales revenue. Net profit item (6) in the above schedule is calculated by deducting other operation costs, such as over head costs including depreciation, loan interest and corporate tax from gross profit. The last part of P/L account is the appropriation account, which shows how much of the net profit is retained to be reinvested in the project and how much is distributed to stockholders.

b) Balance Sheet

Balance sheet is a statement of the assets and liabilities of the enterprise and gives "the net worth" an enterprise at a point of time. It is prepared to present a picture of the firm on one day in the year. The information represents the account balances recorded and does not indicate exact economic values.

The balance sheet shows the way in which a project is financed, whether by sponsors, lenders or creditors and how these funds have been employed. The sources of funds, even where they represent the capital invested by shareholders are regarded as the liabilities of the company and the use to which funds have been put are the assets.

The Balance Sheet is the key to understanding the financial position of a project or enterprise unlike the profit and loss account, which shows how well a project has performed over a period of time, the balance sheet is a measure of what the project is worth at a particular point in time. This is done by comparing assets (what the project owns) and liabilities (what the project owes). Balance sheet is usually prepared annually for project analysis and it is considered by commercial bankers to be one of the most important statement when deciding whether or not to invest in an existing project.

Balance sheets are presented in a number of different formats. An example of a typical vertical format is shown below.

XYZ Project
Balance Sheet
On Sene 30, 1996 E.C

No	Items	Years					
		1	2	3	4	5	6
1	Current Assets:						
2	Cash						
3	Inventories and supplies						
4	Accounts receivables						
5	Total current assets (2+3+4)						
6	Fixed assets:						
7	Building						

8	Machinery and equipment						
9	Other assets						
10	Total fixed assets (7 + 8 + 9)						
11	Accumulated depreciation						
12	Net book value of assets (10 - 11)						
13	Current liabilities:						
14	Short term loan						
15	Loan						
16	Tax payable						
17	Total current liability (14 + 15 + 16)						
18	Networking capital (5 - 17)						
19	Employment of funds (18 + 12)						
20	Funds employed:						
21	Owners equity						
22	Retained earnings						
23	Term loans						
24	Total funds (21 + 22 + 23)						

c) Cash flow statement

Finance is considered by many as the lifeblood of an organization or any project. A well designed project may fail due to insufficient cash for its day to day operation. Therefore, a project planner has to develop some techniques of forecasting cash in flows and out flows. Cash flow statement

is a basis for showing the cash flows associated with operating resources, funding and investment.

Cash flow statements are prepared for two reasons:

First, it is prepared for financial planning purpose: in this case, the purpose is to know the liquidity position of the project. It helps project planners to identify potential periods of cash shortages and enables them to plan appropriate responses designed to remove such shortages or how to utilize excess amount of fund during the life of the project.

Secondly, cash flow statement may be prepared for the purpose of Net Present Value (NPV) and Internal Rate of Return (IRR) calculation. The purpose here is to measure the overall profitability of the project.

In general, cash flow statement is the main tool of financial planning and is sometimes referred to as the "Source and application of funds statement". An example of a typical cash flow statement is given below:

XYZ Project

Cash Flow Statement for Financial Planning ('000)

No	Items	Years						
		1	2	3	4	5	6	N
1	Cash in flows							
2	Financial sources:							
3	Loans							
4	Equity							
5	Bank over draft							
6	Supplies							
7	Credit							
8	Total in flow (2 + 3 + 4 + 5 + 6)	XX	XX	XX	XX	XX		
9	Cash out flows:							
10	Operating costs (fixed and							

	variable)							
--	-----------	--	--	--	--	--	--	--

Financial Appraisal Criteria of Projects and Selection of Investments

It is to be reminded that the theme of project planning/study is to determine whether an investment is feasible or not. This means to show whether the financial return on both the total capital invested and on the paid-in equity capital (s) sufficiently high or not. Although sufficient returns are essential for a project to be implemented, investments must be justified usually within wider context, which for investors and financiers includes any gains, whether net profits or non-cash benefits, resulting directly or indirectly from an investment.

Thus once, costs and benefits have been identified, priced and valued, the project analyst should workout to determine on which project (s) to invest. To this effect, the project analyst should have ways and means/methods, tools, approaches/ to select more profitable from less profitable or unprofitable projects. A wide range of criteria have been suggested for choosing investment proposals, which are suitable for both financial and economic analysis. These criteria may be classified into two categories:

a. Non-discounting criteria including:

- Urgency;
- Payback period;
- Accounting rate of return.

b. Discounting criteria

- Net present value/NPV/
- Internal rate of return/IRR/
- Discounted benefit-cost ratio;
- Profitability index.

Non-Discounted Measures of Project Worth

Projects, which are powerful means of development, have to be appraised by multiple criteria. Since any national investment decision must be a political act summing up the best judgment of those responsible, the function of project analysis would be to provide one more tool by which these judgments can be sharpened. In order to appraise a project idea we need operational criteria applicable in evaluating alternatives.

Technical criteria are used to compare the merits of alternative technical solutions. It should be noted that there might be no one best technique for estimating project worth although some may be better than others. We should also note that these are only tools to improve decision-making. There are other non-quantifiable and non-economic criteria for making project decisions. The tools are only used to improve the decision making process. Before we discuss the discounted measure of project worth we need to consider some common undiscounted measures and show their limitations and hence require discounting.

1. Ranking by Inspection

It is possible, in certain cases, to determine by mere inspection which of two or more investment projects is more desirable. There are two cases under which this might be true.

(i) Two investments have identical cash flows each year up to the final year of the short-lived investment, but one continues to earn cash proceeds (financial results or profits) in subsequent years. The investment with the longer life would be more desirable.

Example: consider the following hypothetical irrigation project

Investment (project)	Initial cost	Net cash proceeds per year		
		Year I	Year II	Total Proceeds
A	10,000	10,000	-	10,000
B	10,000	10,000	1100	11,100
C	10,000	3762	7762	11,524
D	10,000	5762	5762	11,524

Accordingly project B is better than investment A, since all things are equal except that B continues to earn proceeds after A has been retired. More analysis is required to decide between C and D.

(ii) Two investments have the same initial outlay (the total net value of incremental production may be the same), the same earning life and earn the same total proceeds (profits), but one project has more of the flow

earlier in the time sequence, we choose the one for which the total proceeds is greater than the total proceeds for the other investment earlier. Thus investment D is more profitable than investment C, since D earns 2000 more in year 1 than investment C, which does not make up the difference until year 2.

2. Urgency

According to this criterion projects which are deemed to be more urgent get priority over projects which are regarded as less urgent. The problem with this criterion is: how can the degree of urgency be determined? In certain situations it may not be practically difficult to determine the urgency of a certain project proposal. For instance the project could be bottleneck alleviation bottleneck of an ongoing operation/firm/ etc.

Since it is not a systematic decision, this is not something that can be encouraged. Rather it is a practice that should be discouraged.

3. The Payback Period

The payback period also called the payoff period is one of the simplest and apparently one of the most frequently used methods of measuring the economic value of an investment. Since it addresses the prime concern of an investor in terms of reclaiming/recovering the initial outlay, it is frequently used method of project evaluation. The recovered money can be reinvested in something else. If the investor recovers its initial outlay, then in a way it is minimizing the risk it faces in the subsequent operation of the project. The payback period is defined as the length of time required for the stream of cash proceeds produced by the investment (project) to be equal to the original cash outlay required by the investment (capital investment). It is defined as the number of years it is expected to take from the beginning of the project until the sum of its net earnings (receipts minus operating costs) equals the cost of the projects initial capital investment. It is the period of time that the investor recovers its initial total outlay. This criterion is most often used in the business enterprises. However, its use in agricultural projects is limited.

Example: if a project requires an original outlay of Birr 300 and is expected to produce a stream of cash proceeds of Birr 100 per year for 5 years, the payback period would be $300/100 = 3$ years.

Note: if the expected proceeds are not constant from year to year, then the payback period must be calculated by adding up the proceeds expected in successive years until the total is equal to the original outlay.

Example: consider project C. $10,000 - 3762 = 6238$. Then $6238/7762 = 0.8$
So, the payback period is 1.80 years.

Example: consider the previous projects

Investment	Payback period (in year)	Ranking of projects using the payback period criteria
A	1	1
B	1	1
C	1.8	4
D	1.7	3

Investment A and B are both ranked as 1, since they both have shorter payback periods than any of the other investments, namely 1 year. But investment B which has the same rank as A will not only earn 10,000 Birr in the first year but also 1,100 Birr a year later. Thus investment B is superior to A. But a ranking procedure such as the payback period fails to disclose this fact. Thus it has two important limitations:

(i) It fails to give any considerations to cash proceeds earned after the payback date. It simply emphasizes quick financial returns, ignoring the performance of the project over its economic life.

(ii) It fails to take into account differences in the timing of receipts and earned proceeds prior to the payback date. For instance, if we have two projects with the same capital cost and if they have the same payback period then they are equally ranked. Yet we know by the inspection method the project with earlier benefits should be desirable and should be preferred since the earlier a benefit is received the earlier it can be reinvested or consumed.

4. **Proceeds per Unit of Outlay**

Under this method, investments are ranked according to their total proceeds divided by the amount of the corresponding investments. In other

words the total net value of incremental production divided by the total amount of the investment gives us the proceeds per unit of outlay.

Example: consider the following hypothetical example

Investment	Total proceeds	Investment outlay	Proceeds per unit of outlay	Ranking
A	10,000	10,000	1.00	4
B	11,100	10,000	1.11	3
C	11,524	10,000	1.15	1
D	11,524	10,000	1.15	1

Accordingly project C and D must be implemented. However, both projects are given the same rank. Although we know by inspection that project D is superior because D generates Birr 2000 of proceeds in year 1.

This method is again deficient because it still fails to consider the timing of proceeds. In other words, the method considers that 1 Birr of proceeds received in year 2 is equal to 1 Birr received in year 1. This is inconsistent with the generally accepted economic principle that 1 Birr today is more valuable than 1 Birr at some future date.

5. Output - Capital Ratio

This is another crude index of investment efficiency. It is defined as the average (undiscounted) value added produced per unit of capital expenditure. Under this criterion we select the project with the highest output capital ratio or the lowest capital output ratio (capital coefficient).

The main problem with this approach is that it ignores other factors of production such as labor and land and concentrates only on the productivity of capital. Accordingly the criterion favors those projects that use large quantities of labor and land in place of capital. Further it does not consider the timely spread of costs and proceeds.

There are two other undiscounted measures of project worth.

(i) The average annual proceeds per unit of outlay

This is similar to the proceeds per unit of outlay except that the average proceeds per year is expressed as a ratio of the original investment. The total proceeds are first divided by the number of years during which they are received, and this figure (the average proceeds per year) is then expressed as a ratio of the original outlay.

This method fails to take properly into considerations the timing of proceeds and exhibits a built in bias for short-lived investment with high cash proceeds.

Example:

Projects	Total proceeds	Average annual proceeds	Original outlay	Average annual proceeds per unit of outlay	Ranking
A	10,000	10,000	10,000	1.00	1
B	11,100	5,550	10,000	0.555	4
C	11,524	5,762	10,000	0.576	2
D	11,524	5,762	10,000	0.576	2

We know that project D is superior to C although this method gives them equal ranks. Investment A and B are also incorrectly ranked by ranking A above B in spite of the fact that the latter is obviously superior. No weight is given to the time distribution. For instance, a project that earns 10000 Birr for 10 years would also have an average proceed of 10000 per year and it would be given the same rank as project A.

DISCOUNTED PROJECT ASSESSMENT CRITERIA AND DISCOUNTING FUTURE INCOME FLOWS IN PROJECT ANALYSIS

Discounting Future Income Flows

Time Preference

The saying goes, a bird at hand is better than two birds in the bush!!!

The undiscounted measures discussed so far share a common weakness. They fail to take into account adequately the timing of benefits and costs. It is an accepted principle in economics that inter-temporal variations of costs and benefits influence their values and a time adjustment is necessary before aggregation. Therefore, before the Hicks – Kaldor criterion can be used to decide which projects should be selected for implementation, it is necessary to address the problem of the differences in the timing of a project's costs and benefits. If the costs and benefits of a project occur over a number of years, they will not be directly comparable. It is not possible to just add all the benefits of the project and to subtract all the costs, irrespective of when they occur.

Very rarely will all of a project's benefits and costs occur in the first year of an investment. The bulk of the project's costs will be incurred during extended period of implementation stage. Replacement and rehabilitation costs will be incurred after certain operation period is elapsed. Its operating costs will be incurred after the project begins and continue throughout the project's life, and its benefits will be realized after operation commences, rising to some plateau when the project reaches full capacity. For a whole range of reasons, people, enterprises and governments will not be indifferent about whether they receive income (or incur expenditure) now or in some future period. They are said to have time preference in that they will prefer to receive income sooner rather than later, and to pay for expenditures later rather than sooner.

Example: if a person is offered the choice between receiving Birr 10 now or in 10 years time, he will invariably opt to receive Birr 10 now, even if they do not expect there to be any price inflation over the period.

Some of the main reasons people will prefer to have income now rather than in the future include the following:

- i) There is an expectation that society and individuals will be better off in the future than they are now: it could be expected that people would gain less extra utility or enjoyment from additional Birr of income if they were rich than would the same people if they were poor. An individual would therefore be expected to get less utility from an extra Birr 10 of income received in 10 years time, when he or she expects to be better off, than from Birr 10 of income obtained now.
- ii) One may expect inflation to reduce the real value of Birr 100 in a year's time.
- iii) If there is no inflationary effect (say where the offer is made in real terms) it would still be preferable to take the money today and invest it at some rate of interest, r , hence receiving a total of Birr 100 $(1+r)$ at the end of the year. The return from the invested capital is referred to as marginal return on capital. These investors will be willing to pay interest to borrow capital to undertake such investments. If income becomes available from a project in earlier years than later ones, these funds can be used to reduce the amount the government or private investors will have to borrow for the project. The value of such funds will therefore be equal to the interest they would otherwise have had to pay to borrow this capital.

iv) Uncertainty about the future: Even if no investment opportunities are available, one might reason that Birr 100 today would still be preferable on the grounds that there is a finite risk of not being around to collect the money next year. Life is always uncertain, and people cannot be sure that they will be alive in 10 years time to collect their Birr 10s. They may also be uncertain about whether they really will be paid the Birr 10 in 10 years time, as many factors may change over such a period.

Such risks should be reduced if there is a strong legal system, enforcing contracts. This factor could be termed pure risk, pure time preference.

v) Even where inflation, investment opportunities, and risk are ignored, there is pure time preference, which would lead one to prefer the immediate offer.

For all these reasons, tomorrow's income available from a project cannot be treated as if it were equally valuable to today's income. Therefore, we say there is a positive rate of discount, which leads us to place a lower present value on a given sum of money the further in the future one expects it to accrue. That is valuation is different across time. It is therefore, necessary to find some method of standardizing the value of the benefits and the costs that occur in different periods over the project's life, so that they can be compared and added together. For the reasons outlined above, income available now is more valuable than future income even if there is no inflation. The accepted method for this adjustment amounts to bringing them to a common time denominator. This principle is called discounting.

The marginal rate of time preference (MRTP)

We need to find out how much more income will individuals need to receive in the future to make them indifferent to receiving this amount later rather than a given amount of income in the present. If a person is indifferent to receiving Birr 10 now rather than Birr 11 in 12 months time, he/she is said to have a marginal rate time preference (MRTP) of 10 percent or more usually 0.1 per annum. This is calculated from $(\text{Birr } 11 - \text{Birr } 10) / \text{Birr } 10$. This person would probably be equally happy to receive Birr 11, one year from now and $\text{Birr } 11 * (1 + 0.1)$ or Birr 12.1, two years from now.

In general terms if an individual is indifferent to receiving 1 unit of income in period 0 rather than $1*(1+r)$ units in period 1, then his or her MRTP is said to be r , where r is a proportion of 1, or percentage. This person would probably also be indifferent to receiving this $1*(1+r)$ units in period 1 and

$1 \cdot (1+r)^2$ units in period 2. Hence the individual would be indifferent to receiving 1 units of income in period 0 and $1 \cdot (1+r)^2$ units of income in period 2. This process could be continued on and in the most general case we would expect that the person would be equally be happy to receive 1 unit of income in period 0 and $1 \cdot (1+r)^n$ units of income in period n.

The Discounting Process

Discounting is a technique or a process by which one can reduce future benefits and costs to their

present worth or present value. This is the method used to revalue future cost and benefit flows from project into present day values so that they are comparable and can be added together. Costs and benefits are discounted by a factor that reflects the rate at which today's value of a monetary unit decreases with the passage of every time unit. Any costs and benefits of a project that are received in future periods are discounted, or deflated by some factor, r , to reflect their lower value to the individual (society) than currently available income. The factor used to discount future costs and benefits is called the discount rate and is usually expressed as a percentage. Hence, discounting is very important for project analysis. The discount rate is usually determined by the central authorities (national Bank).

In order to clearly understand the principles of discounting it will be helpful to have a clear understanding of the principle of compounding. Compounding is the technique of calculating the future worth (F) of a present amount (P) at the end of some period T at a given interest rate. On the other hand finding the present worth of a future stream of value is called discounting.

Consider that bank loans or in general debts involve two obligations:

- a. Payment of the principal,
- b. Payment of the interest expense/earning;

Hence, if there is an initial amount P at present, then if this investment was borrowed from the bank at an interest rate of r Birr then after one period it becomes:

$$P + Pr = P(1+r)$$

Since the borrower must also repay the principal.

Thus, if we have Br. 100 in 1990 with annual interest of r ($r = 10\%$) its value in 1991 will be: $\text{Br.110 (1991)} = \text{Br.100(1990)}(1+r)$. Thus, the present value of 110 in 1991 is $\text{Br.100(1990)} + \text{Br.100(1991)}/(1+r)$ or Br. 100 next year is equivalent to Br. 90.91 of this year (for Br. 90.91 at 10% yields 110 next year.)

That is: • $\text{Br.110} = \text{Br.100} (1+r) = 100+100r$

The present value of 110 in 1991 is: • $\text{Br.100} + \text{Br.100}/(1+r)$

After two periods the amount becomes:

In general, the amount accumulated after t periods would be

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

Observe that A constitutes the future value of initial loan to the lender (the bank) and ' t ' stands for the loan period, a year in which the loan agreement stipulates for the final settlement of the debt obligation. The term $(1+r)^t$ is referred to as compounding factor, a factor used to estimate the future value of given initial sum/loan/ (present value). The ' r ' in this term is referred to as compounding rate, which is the rate of interest, which the banks charge their client borrowers.

Now, given that future value accumulated after t periods as above, if we want to know the present value of this amount we would be talking about discounting. Hence the present value would be:

$$P = \frac{A}{(1+r)^t} = \frac{\text{amount accumulated at some future date}}{(1+r)^t}$$

The term $(1+r)^t$ in the denominator or $(1+r)^{-t}$ in the numerator is referred to as discounting factor, a factor used to estimate the present value of a stream of future values. The ' r ' in this term is referred to as discounting rate. So the discount factor tells us how much Br 1 at a future date is worth today at a certain discount rate. Example: The present value of 110 in 1991 is $\text{Br.100(1990)} = \text{Br.100(1991)}/(1+r)$ or Br. 100 next year is equivalent to Br. 90.91 of this year (for Br. 90.91 at 10% yields 110 next year). This example shows that 100 received in a years' time has a present value of Br. 90.91. If we want to work out the present value of Br. 100 to be received in 1992 it will be apparent that Br. 100 (1992) will be worth $\text{Br. 100}/(1+r)$ in 1991 which in turn will be worth $\text{Br. 100}/(1+r)^2$ in 1990.

Writing P_0 for the present value and $P_1, P_2, \dots, P_t$ for the stream of payments accruing for years 1 to t , and the relevant discount rate is denoted by r , then the general formula for discounting becomes,

$$P_0 = P_1 / (1+r) + P_2 / (1+r)^2 + \dots + P_t / (1+r)^t$$

$$PV = P_0 + \sum_{t=1}^t \frac{P_t}{(1+r)^t} = \sum_{t=0}^t P_t (1+r)^{-t}$$

Note that the above formula, by using a single discount rate (r) assumes that the time preference of benefits falls at constant rate. If that was not the case the work would have been more complicated. In general, it is possible to consider the value people will put on income in different periods, by working back in time from the future. The person with a MRTP of 0.1 will also be indifferent to receiving Birr 10 one year from now rather than Birr $10 / (1+0.1)$, or Birr 9.09 now. The relative valuation of income in the two periods is the same as that considered in the previous section, only now the future income, Birr 10 is divided by $(1+0.1)$ to find its equivalent value in current day Birr, 9.09, rather than multiplying current income, Birr 9.09 by $(1+0.1)$ to find its value in future Birr which is Birr 10.

The same individual would probably also consider Birr 10 available in 2 years time and Birr $10 / (1+0.1)^2$ or Birr 8.26, available now as equivalent. As income only becomes available further into the future, its value will fall in terms of current day Birr. This fits with our intuitive expectation that future income is considered less valuable than current income.

A person with a $MRTP = r$ would be as indifferent to 1 extra unit of consumption in period 1 as to Birr $1 / (1+r)$ of a unit available in period 0. Similarly, 1 extra unit of income in period 2 would be worth the same as $1 / (1+r)^2$ unit of income in period 0, and so on. The unit of income available in period 2 would be worth only $1 / (1+r)$ of a unit in period 1, and this would be worth only $1 / (1+r)^2$ of unit in period 0. In the most general case, 1 unit of income available in period n will only be worth $1 / (1+r)^n$ of a unit of income in period 0.

Example: Assume that a textile plant is to be established at a cost of 20 million Birr. It is expected that the annual total cost is 10 million Birr and the sales revenue is expected to be 14 million Birr annually. The operating life of the project is 10 years. Loan is available for the financing of the project at 10 percent rate, which means $r = 10\%$. The project's net present value can then be estimated by just adding up

these discounted net benefits. Column 1, 2 and 3 show the non discounted cost, benefits and net benefits (benefits - costs). Thus 4 million Birr in year 10 is only 3.64 Birr in year 1. The present value of the stream of payments (future income) realized over 10 years is 24.57 million Birr. The sum is what we call NPV. In other words, the present worth of 4 million received yearly for 10 years at a discount rate of 10 percent is 24.57 million Birr. The present worth is the sum of all the present values for all the years together.

Observe that the discounted value dwindling further and further as we proceed into the future

Undiscounted				Discounted	
	1	2	3	4	5
Year(t)	Cost	bene fit	Net benefits (cash flow) 2-1	Discount factors (10%)= $1/(1+0.10)^{-t}$	Discounted Net Benefits (Net Cash Flow) (3)*(4)
0	20	0	-20	$1/(1+0.10)^0 = 1.000$	$-20(1.000) = -20.00$
1	10	14	4	$1/(1+0.10)^1 = 0.909$	$4(0.909) = 3.64$
2	10	14	4	$1/(1+0.10)^2 = 0.826$	$4(0.826) = 3.30$
3	10	14	4	$1/(1+0.10)^3 = 0.751$	$4(0.751) = 3.00$
4	10	14	4	$1/(1+0.10)^4 = 0.683$	$=2.73$
5	10	14	4	$=0.621$	$=2.48$
6	10	14	4	$=0.564$	$=2.26$
7	10	14	4	$=0.513$	$=2.05$
8	10	14	4	$=0.467$	$=1.87$
9	10	14	4	$=0.424$	$=1.70$
10	10	14	4	$1/(1+0.10)^{10} = 0.386$	$4(0.386) = 1.54$
Total	120	140	20	$\sum 1/(1+0.10)^t = 6.144$	NPV = 4.57

Note: the figure -20 million Birr represent the investment outlay of the project. It is negative because it has been subtracted from zero revenue in the first (base) year of the project.

Working out the present worth of a future income stream or a given sum of

money in this manner is time consuming and laborious. Thus, discounting tables are normally used. We can use compounding and discounting tables for project evaluation prepared for the purpose. In this table the column entitled discount factor shows how much 1 Birr at a future date is worth today at a certain discount rate (interest rate).

Example: to know the present value of a fixed sum of money say 100 Birr received 5 years in the future at 10 percent discount rate we multiply the amount due in the future by the discount factor for the fifth year to get the result. The discount factor at 10 percent is 0.621 which gives $100 \times 0.621 = 62.10$ Birr.

On the other hand if we wish to find the present worth (value) of a future stream of income we can arrive at the result simply by taking the sum of the discount factors and multiply by the annual income to be received, i.e. simply multiplying by an annuity factor the amount received annually. Note: an annuity is an amount payable yearly or at any regular time intervals. It gives the present worth of future income stream of 1 currency unit a year. The present worth (value) of an annuity is simply the running subtotal of the discount factors.

How to set the discounting rate, r ?

In general it is meant to reflect the opportunity cost of the investment. Specifically one has to consider:

- Opportunity Cost of your investment and Discounting rate;
- Prevailing saving rate and discount rate

The discount rate and the interest rate are similar. The only variation is that the interest rate used for compounding assumes a viewpoint from here to the future, while discounting looks backward from the future to the present. For private companies (and some times even for public projects) the discount rate used for financial analysis is the interest rate at which bank loans are available, or where when the firm's own fund is utilized the rate which banks would pay on the deposit of such funds - their opportunity cost.

The discounted rate should be equal either to the actual rate of interest on long term loans in the capital market or to the interest rate paid by the borrower. However, since capital markets do not usually exist in developing countries, the discount rate should reflect the opportunity cost of capital i.e., the possible return of capital invested elsewhere. This is the minimum rate of return below which the planner considers that it does not pay for

him/her to invest.
The Net Present Value (NPV)

The most widely used and straightforward discounted measure of project worth is the net present worth or the net present value (NPV). This value is obtained when a stream of net benefits (benefits minus costs) accruing over a period of time are discounted to the present. Alternatively, the NPV is defined as the difference between the present value of benefits and the present values of costs. The NPV can be obtained by discounting separately for each year, the difference of all cash outflows and inflows accruing throughout the life of project at a fixed, pre-determined discounting factor.

The net present value formula is:
$$NPV = \sum_t^n \frac{(Bt - Ct)}{(1+r)^t}$$

Where:

1. Bt stands for the project benefits in period t

- ✓ Ct stands for the project costs in period t
- ✓ r, stands for the appropriate financial or economic discount rate
- ✓ n, stands for the number of years for which the project will operate, i.e. the economic life of the project .

The discounting period should normally be equal to the life of the project. This period is the economic life of the project and varies from project to project.

During the implementation period the net benefits are usually negative since costs, mainly investments costs may be greater than benefits. However, the interest should be on the present value of net benefits over the entire life of the project.

Decision Rule: Having set the discount rate, an investment project is deemed acceptable if the discounted net benefit (benefits minus costs) is positive or non-negative. The economic criterion of project appraisal is to accept all projects that show positive or zero NPV at the predetermined discount rate and reject all projects that show negative NPV.

Thus, the decision is to accept if $NPV \geq 0$. We can also discount benefits and costs separately, and if $B \geq C$ then $NPV = B - C \geq 0$

Example 1: Consider the following Discounted Cash Flows for a Fertilizer Project in million Birr)

Year	Net Cash Flow	Discount factors for 10 percent	Discounted cash flow (10%)	Discounted factor for 20%	Discounted cash flow(20%)
0	-20	1.00	-20.0	1.00	-20.0
1	4	0.909	3.64	0.833	3.33
2	4	0.826	3.30	0.694	2.78
3	4	0.751	3.00	0.579	2.32
4	4	0.683	2.73	0.482	1.93
5	4	0.621	2.48	0.402	1.61
6	4	0.564	2.26	0.335	1.34
7	4	0.513	2.05	0.279	1.12
8	4	0.467	1.87	0.233	0.93
9	4	0.424	1.70	0.194	0.78
10	4	0.386	1.54	0.162	0.65
NPV			4.57		-3.21

Note: the values for discount factors for $r = 10\%$ and $r = 20\%$ can be obtained from any standard set of discount tables.

Since discounting the cash flow at 10 percent produces a positive NPV of 4.57 million Birr we conclude that the project should be undertaken. Suppose now that the cost of capital were to be raised to 20 percent, the project produces a negative NPV of 3.21 million Birr. In this event the project would have to be rejected. This shows that the NPV is critically dependent upon the level of the discounting rate, r .

It is also possible to discount costs and benefits separately (individually) and now the decision rule becomes that the discounted benefits should exceed the discounted costs, i.e., $B > C$ and $NPV = B - C > 0$.

Example 2: what would be the present value of 1000 Birr received five years in the future assuming a 9 percent discount rate?

We consider the discount factor for the 5th period under the 9 percent table. The discount factor is 0.6499. Then we multiply the amount due by the discount factor.

$$1000 * 0.6499 = 649.90 \text{ Birr}$$

Example 3: what would be present value of a stream of income of 5000 Birr received each year for nine years assuming a discount rate of say 10

percent?

We use the table that gives the annuity factors to be used to derive the present value of a stream of uniform values over a number of years. Thus the annuity factor for 9 years at 10 percent discount rate is 5.759.

Now the annual income to be received is multiplied by the annuity factor.

$5000 * 5.759 = 28795$ Birr.

Thus if the going rate of interest is 10 percent then we could afford to invest Birr 28795 in an enterprise that would yield us an annual return of Birr 5000 for each of the 9 years.

If there are alternative projects, how do you select from the available alternative projects? The NPV does not indicate the rate of return, in the sense that it does not directly indicate the magnitude of investment that generates the NPV.

If one of several project alternatives has to be chosen, the project with the largest NPV should be selected. But we should know how much investment would be required to generate these positive

NPVs if there are two or more alternatives. The ratio of the NPV and the present value of investment (PVI) should be considered and we get the net present value ratio (NPVR) when comparing alternative projects.

$$NPVR = \frac{NPV}{PVI}$$

Given alternative projects, the one with the highest NPVR should be chosen. When comparing alternative projects, care should be taken to use the same discounting period and rate of discount rate for all projects.

Independent projects are projects that are not in any way substitutes for each other. In such cases the decision rule is to accept the project if the NPV is greater than or equal to 0 (approve any project for which $NPV \geq 0$). If two projects have positive NPV and there is no budget constraint both should be accepted and you do not need to choose the one with higher NPV. For example, if two independent projects road and fisheries development projects in different locations are being considered and both have a positive NPV, then both should be undertaken. Both will increase community's welfare if they were undertaken and hence both should be undertaken. If there is resource constraint and the decision maker is forced to make choices, then one will have to choose the project with the highest NPV.

A mutually exclusive project is defined as a project that can only be

implemented at the expense of an alternative project as they are in some sense substitutes for each other. Example of the mutually exclusive projects includes two versions of the same project, say with different technology, scale or time. Apparently, one decision rule is to choose one which is relatively efficient, i.e. the one with the highest NPVR. Yet if there is substantial difference in the value of NPV of the two mutually exclusive projects, one will have to go for the project with the highest NPV. Example: Consider two dams which may be proposed for one prime site in a locality in a fast flowing river (in million Birr). All the benefits and costs are discounted figures.

Alternative projects	Years									
	1	2	3	4	5	6	7	8	9	10
Dam A	1	2	3	4	5	6	7	8	9	10
Costs	5									
Benefits	0	0.5	1	1	1	1	1	1	1	1
Net benefit	-5	0.5	1	1	1	1	1	1	1	1
NPV=3.50; NPVR=3.50/5=0.700										
Dam B										
Costs	500									
Benefits	0	50	50	50	50	100	100	100	100	100
Net benefit	-500	50	50	50	50	100	100	100	100	100
NPV=200; NPVR=200/500=0.4000										

Which one of the two dams do you choose? Why?

Dam A is small but has a higher net present value ratio/NPVR/ =0.700, indicating that it is relatively more efficient than Dam B. However, the total benefits it produces and hence its NPV are quite small only Birr 3.5 million. The alternative dam B is much larger and has much larger benefits as well as higher costs, with NPV=Birr 200 million. Although NPV is large its NPVR(=0.400) is lower than project A's, indicating that project/Dam/ B is relatively inefficient.

In such a case, the decision rule is the NPV not the NPVR. If the two projects were independent and the country could therefore construct both, then it should do so as they both have positive NPVs. However, since the projects are mutually exclusive the dam with the higher NPV should be selected, that is dam B. If dam A were constructed a gain of only 3.5 million

Birr would be realized, and the community would be prevented for ever from gaining the much greater net benefits of 200 million Birr, which dam B is expected to produce. The opportunity of gaining the other Birr 196.5 million (200-3.5) of benefits from this unique dam site would be lost forever. Consequently in choosing between mutually exclusive projects the one with the highest NPV should always be selected.

The Internal Rate of Return of a Project (IRR)

This is a second measure of the long- term profitability of an investment. It is also called the Yield of an Investment Method or simply the Yield Method. The IRR of a project is probably the most commonly used assessment criterion in project appraisal. This is because the concept of an IRR is in some way comparable to the long-term profit rate of a project and is therefore easily conceivable for non-economists. Internal IRR is defined as the “earning rate of a project”. (Gittinger, 1982, p.331).

Unlike NPV, it does not rely on the selection of a predetermined discount rate. The method utilizes present value concept but seek to avoid the arbitrary choice of a discount rate. Hence an attempt is made to find that discount rate, which, just make the net present value of the cash flow equal to zero. It is possible to think a level of interest rate that could result in NPV of zero. This rate of interest rate is termed as the Internal Rate of Return (IRR). The IRR is the rate of discount, which makes the present value of the benefits exactly equal to the present value of the costs. Thus, it is the discount rate at which it is worthwhile doing the project. This is the interest rate that a project could pay for the resources used if the project is to recover its investment and operating cost and still can be at the break-even point. Denoting it by R, it is the solution to the definition of the NPV when the latter is set to zero.

$$NPV = P_0 = \sum_{t=0}^t \frac{P_t}{(1+R)^t} = 0 = \sum_{t=0}^t \frac{B_t - C_t}{(1+R)^t}$$

For financial analysis it would be the maximum interest rate that the project could afford to pay on its funds and still recover all its investment and operating costs. While calculating the NPV we have used a pre-determined discount rate and a table. The calculation of the IRR amounts to searching for the discount rate that gives a zero NPV. This is achieved through trial and error using the standard discounting table. This rate if determined will represent the exact profitability of the project. If the IRR is computed for financial appraisal in which all values are measured in market prices, it is

called the financial internal rate of return (FIRR). When economic prices are used instead, it will be termed as economic internal rate of return (EIRR)

The Decision Rule

The formal selection criterion using the IRR is to accept all independent projects having an internal rate of return (IRR) equal to or greater than the opportunity cost of capital.

$IRR \geq r$, where r stands for the opportunity cost of capital, the discount rate that we use when we compute NPV.

Calculation of IRR

The calculation procedure begins with the preparation of a cash flow table. Estimated discount rate is then used to discount the net cash flow to the present value. If the NPV is positive a higher rate is applied. If it is negative at this higher rate the IRR must be between those two rates.

By iterations it is possible to determine the discount rate that just makes the project's NPV equal to zero. This rate is the IRR of the project. Fortunately spreadsheet programs such as Lotus 123 and excel can calculate the IRR of project's net benefit flow once starting value for the iteration is provided.

If the positive and negative NPVs are close to zero, a precise and less time consuming way to arrive at the IRR is using the following interpolation formula.

$$IRR = I1 + \frac{PV(I2 - I1)}{PV + NV}$$

Where: $I1$ = the lower discount rate

$I2$ = the upper discount rate

PV = NPV (positive) at the low discount rate of $I1$

NV = NPV (negative) at the high discount rate of $I2$

Note: $I1$ and $I2$ should not differ by more than one or two percent. According to the IRR version of economic criterion we implement all projects that show an IRR greater than the predetermined discount rate (opportunity cost of capital), i.e., accept all independent projects having an $IRR \geq r$ the opportunity cost of capital (cut off rate). The reference discount

rate, which is also called the target rate, is predetermined by the Central Bank.

Once the IRR is identified, the decision rule is 'accept the project if the IRR is greater than the cost of capital, say r . Note also that:

When $NPV > 0$ then $R > r$

$NPV = 0$ then $R = r$

$NPV < 0$ then $R < r$

Note also the other point that, in the case of our example, if the discount rate is 10% both the NPV and IRR will suggest to accept the project if the cost of capital is 10% and both suggest to reject the project when the discount rate and the cost of capital is 20%. As will be demonstrated below, however, the two methods may not give identical signals.

All projects with an internal rate of return greater than some target rate of return, r^* , should be accepted. The target rate is usually the same rate used as the financial or social discount rate employed in the computation of the projects net present value. Note that the use of IRR does not avoid the need for discount rate, as sometimes claimed, but merely delays the need to use it until the IRR has been computed.

While the IRR cannot be directly used to choose between mutually exclusive projects it can be employed for further manipulation. This manipulation entails the subtracting the cash flow of the smaller project from the cash flow of the larger one and calculating the internal rate of return of the residual cash flow. If the residual cash flow's internal rate of return exceeds the target discount rate, which could only occur if the larger project has a higher NPV, then the larger project should be undertaken.

If the analyst encountered with mutually exclusive projects with IRR greater than the target interest rate, it cannot merely choose the project with the highest IRR.

Comparison of the NPV and IRR

From the foregoing discussions it is clear that both the NPV and the IRR methods can and do rank investment projects in more rational manner than the other methods previously considered. Thus it is advisable to calculate these measures so that easily understandable information is provided to the

authorities. In general it can be said that the NPV method is simpler, easier, and more direct and more reliable.

In some situations both the NPV and the IRR criteria give the same accept - reject decision. However, there is a probable reason why all acceptable projects cannot be undertaken. The investible funds (capital funds) may be limited. This will have implication on the discount rate. It may mean that the discount rate has not been set correctly.

When the capital requirements of all acceptable projects exceed the available funds, the central authorities (national bank) should raise the discount rate up to that level where the projects passing the test are just enough to exhaust the available funds. But if too few projects are acceptable then the discount rate should be reduced. Hence as long as capital funds are 'unlimited' it is argued that NPV should be the relevant criterion. But the function of the discount rate is to ration capital in such a manner, as eventually to pass just sufficient projects as will use up available investment resources. Hence the argument is not whether NPV or IRR should be preferred as a criterion, but whether planners have set the discount rate correctly.

Advantages of the IRR

1. The IRR is used in many projects
2. It is the only measure of project worth that takes account of the time profile of a project but can be calculated without reference to a predetermined discount rate. (Useful for international institutions like the WB since they cannot do with different discount rate for different countries.
3. It is a measure that could be understood easily by non-economists since it is closely related to the concept of the return on investment.
4. It is a pure number and hence allows projects of different size to be directly compared.

Other Investment Criteria

. The Net Benefit Investment Ratio (NBIR)

Are one of widely used and the most convenient selection criteria to use when there is a single period budget constraint.

It is the ratio of the present value of the projects benefits, net of operating costs, to the present value of its investment costs. This is given by

$$NBIR = \frac{\sum_{t=0}^t \frac{Bt - OCt}{(1+r)^t}}{\sum_{t=0}^t \frac{ICt}{(1+r)^t}}$$

Where OC is operating costs I period t; IC Investment costs in period t; r the appropriate discount rate, and B the benefits in period t.

The NBIR shows the value of the projects discounted benefits, net of operating costs, per unit of investment.

The decision rule using NBIR is to accept project when the ratio is greater than 1. This criterion is especially important for ranking independent projects since it shows the benefit per unit of investment. When we have a single period budget constraint projects with the highest NBIR should be selected up to the point where the budget is exhausted.

The main advantage of the NBIR is its capacity to determine the group of priority projects if there is a single period budget and investment constraint. Its limitation is, however, that it is not suitable for choosing between mutually exclusive projects, for the same reason that the IRR cannot be used for this purpose. That is a project with highest NBIR could have the lowest absolute net present value.

The other disadvantage of NBIR is that the convention used for dividing costs (for example maintenance) into operating and investment may vary from institution to institution and may render problems of comparability.

CHAPTER THREE

Economic Analysis of Projects

The Rationale for Economic Analysis

In financial analysis, the analyst is concerned with the profitability of the project from an individual point of view (firm's profitability). The main objective here is to maximize the income of the firm or to analyze the budgetary impacts. In financial analysis the analysis is done by applying market prices.

Given the prevailing market prices the financial analysis will tell the project analyst whether a project will be financially profitable. Thus governments and individuals can pursue only limited objectives when they choose projects on the basis of financial appraisal.

From the standpoint of the economy as a whole, however, the objective is to maximize national income no matter who receives it. But financial analysis will rarely measure a project's contribution to the community's welfare. Only in very unlikely conditions of perfect competition and absence of externalities, government interventions, taxes and other market distortions, will financial analysis of a project indicate whether or not a project will make a positive contribution to society's welfare. In the absence of these conditions, a financial analysis will only tell us whether a project is profitable or not.

Thus the project analyst must not only be sure that a proposed project will be profitable enough to attract investment but also that the project will

contribute sufficiently to the growth of national income. Making that assessment is the task of economic analysis.

What is the starting point for this analysis? The starting point for the economic analysis would be the financial prices. They are adjusted as needed to reflect the value to the society as a whole of both the inputs and outputs of the project. The objective of any legitimate government should be the promotion of social/community/ welfare.

They will be more concerned with their public work programs to promote community welfare than they merely maximize financial profits at distorted local prices.

The basic question here is whether it is possible to use market prices to assess the economic worth of projects. The answer is obviously no. Prices could be distorted because of many factors. So governments must choose projects on the basis of an economic analysis if they wish to promote the community's welfare.

It is useful to have a fuller understanding of the areas where government intervention and market failure result in serious distortion in market prices. This will help in understanding the process of correcting for these distortions when economic prices are used. The major conditions under which it is impossible to use market prices to assess the economic worth of projects can be grouped under the following major headings:

1. Intervention in and failures of goods markets including the markets for internationally traded goods.
2. Intervention in and failure of factor markets including the market for labor, capital, and foreign exchange.
3. The existence of externalities, public goods and consumer and producers surplus.
4. Imperfect knowledge, which the neoclassical model assumes that consumers and producers have full knowledge of about all aspects of the economy relevant to their choice of operations. This is unrealistic because of poor transport and communication and low education levels.

DISTINCTION BETWEEN FINANCIAL AND ECONOMIC ANALYSIS

The reason for conducting both financial and economic analysis is to view the project from various angles and to obtain different perspectives.

Decision makers need both profiles in order to evaluate the project and to design the necessary fiscal and monetary measures to meet its financial requirements. Even though the tools of analysis are the same, financial analysis is concerned with private profitability and is based on financial flows which relate to:

- market prices for products and inputs
- the terms of credit and borrowing in general
- tax and subsidy policy
- Financial depreciation and other financial conventions.

The financial analysis focuses on money profits accruing to the project entity. Various financial indicators are used to evaluate the entity's ability to meet its financial obligation and to finance future investment.

Economic analysis, on the other hand, is concerned with public "profitability" which is based on economic resource flows. It measures the project's effect on the efficiency of the whole economy. In economic analysis shadow prices (set of prices that is believed better reflect the opportunity cost) are used.

Economic resource flows relates to:

- a) Social opportunity costs (shadow prices) which adjust market prices to take into account differences based on tax and subsidies, external costs and benefits, monopolistic pricing, price control and rationing, quantitative trade restrictions, over-valued (or under valued) exchange rate and labor opportunity costs.
- b) Divergence between real rate of interest and nominal (financial) rate of interest, and difference between private and social/public rate of discount.

Economic analysis consists mainly of adjustments to information used in financial analysis and of a few additional ones.

The methodology and the criteria used to evaluate a project using financial and economic information are the same. However, the main difference lies in the value that the NPV and IRR take. This difference occurs because of the difference of:

- the items considered as inputs and outputs of the project
- the prices used in the valuation of the project inputs and outputs
- The treatment of taxes, subsidies and other transfer payments.

The following table and the discussion that follows best explains the difference between economic and financial analysis.

Factors	Financial Analysis	Economic Analysis
Pricing of inputs	Domestic market price	Shadow prices
Treatment of transfer payments, tax, subsidy, etc	All included	Excluded
Externalities	Excluded	Included
Discount rates	Takes into account the current lending rate	The economic discount rate

The Process of Economic Analysis

The economic analysis of a project has many features in common with a financial analysis.

1. Both involve the estimation of a project's cost and benefits over the life of the project for inclusion in the project's cash flow.
2. In both the cash flow is discounted to determine the project's net present value, or other measures of project worth
3. Both may also use sensitivity or probability analysis to assess the impact of uncertainty on the project's NPV.

But an economic analysis goes beyond a financial analysis appraisal, as it will also involve adjustments and incorporating of imputed items.

Economic analysis is an iterative process that normally begins with a "without the project" situation, which is the baseline against which all alternatives are compared.

Through a process of successive approximations, the analyst defines alternatives, drops poor project components, includes new components, examines the alternatives from financial and economic points of view, compares them with the baseline and with each other, and modifies them until a suitable and optimal project design emerges.

For each alternative, the analyst needs to identify the financial and economic streams of costs and benefits, then price them correctly.

Transfer Payments: In general terms, analysts need to remove all subsidies and taxes from the financial flows. The analyst must eliminate (deduct) transfer payments within the economy from the project's cash flow. Transfer payments are payments that transfer the command over the use of resources but do not, themselves use resources.

Examples:

- Taxes-Personal and company income taxes, VAT, indirect taxes, excise and stamp duties.
- Subsidies ---- Including those given via price support schemes.
- Tariffs on imports and exports subsidies and taxes .
- Producer surplus - gains received by a supplier
- Credit transactions - loans received and repayment of Interest and principal

Externalities: In addition one has to incorporate the project's most significant externalities, which involves the valuation and inclusion of both the positive and negative externalities created by the project. Analysts must keep careful track of who pays for or receives the costs and benefits of projects in order to assess financial and fiscal sustainability.

Estimation/Valuation of outputs and inputs: The estimation of economic or shadow prices for project produced outputs and inputs (included internationally traded and non-traded goods) to correct for any distortions in their market prices. In financial analysis inputs and outputs are valued at actual market prices while in economic analysis accounting (shadow) prices are employed. Thus because of using different prices different economic and financial NPV and IRR are obtained even if the inputs and outputs are identical in physical terms.

Identifying Costs and Benefits

Identifying costs and benefits is the first and most important step in economic analysis. Often project costs and benefits are difficult to identify and measure, especially if the project generates side effects that are not reflected in the financial analysis, such as air or water pollution. A second important step is to quantify them. The final step is to value them in monetary terms.

The major steps in economic analysis can be summarized as:

1. Identification of cost and benefit items that need to be incorporated in economic analysis; This involves the inclusion of some variables and exclusion of others from the economic accounts.
2. Quantify both the cost and benefit items;
3. Revalue the cost and benefit items; i.e. what prices to use?

The projected financial revenues and costs are often a good starting point for identifying economic benefits and costs, but two types of adjustments are necessary. First, we need to include or exclude some costs and benefits. Second, we need to revalue inputs and outputs at their economic opportunity costs. Financial analysis looks at the project from the perspective of the implementing agency. It identifies the project's net money flows to the implementing entity and assesses the entity's 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 country, or society, and measures the effects of the project on the economy as a whole. These different points of view require that analysts take different items into consideration when looking at the costs of a project, use different valuations for the items considered, and in some cases, even use different rates to discount the streams of costs and benefits.

Financial analysis assesses items that entail monetary outlays. Economic analysis assesses the opportunity costs for the country. Just because the project entity does not pay for the use of a resource, does not mean that the resource is a free good. If a project diverts resources from other activities that produce goods or services, the value of what is given up represents an opportunity cost of the project to society. Many projects involve economic costs that do not necessarily involve corresponding money flow from the project's financial account. For example, an adverse environmental effect not reflected in the project accounts may represent major economic costs. Likewise, a money payment made by the project entity--say the payment of a tax--is a financial but not an economic cost. It does not involve the use of resources, only a transfer from the project entity to the government. Finally, some inputs—say the services of volunteer workers--may be donated, entailing no money flows from the project entity.

Analysts must also consider such inputs in estimating the economic cost of projects.

Another important difference between financial and economic analysis concerns the prices the project entity uses to value the inputs and outputs. Financial analysis is based on the actual prices that the project entity pays for inputs and receives for outputs. The prices used for economic analysis are based on the opportunity costs to the country. The economic values of both inputs and outputs differ from their financial values because of market distortions created either by the government or by the private sector. Tariffs, export taxes, and subsidies; excise and sales taxes; production subsidies; and quantitative restrictions are common distortions created by governments. Monopolies are a market phenomenon that can either be created by government or the private sector. Some market distortions are created by the public nature of the good or service. The values to society of common public services, such as clean water, transportation, road services, and electricity, are often significantly greater than the financial prices people are required to pay for them. Such factors create divergence between the financial and the economic prices of a project.

Economic and financial costs are always closely intertwined, but they rarely coincide. The divergence between financial and economic prices and flows shows the extent to which someone in society, other than the project entity, enjoys a benefit or pays a cost of the project. Sometimes such payments are in the form of explicit taxes and subsidies, as in a sales tax; sometimes they are implicit, as in price controls. The magnitudes and incidence of transfers are important pieces of information that shed light on the project's fiscal impact, on the distribution of its costs and benefits, and, hence, on its likely opponents and supporters. By identifying the groups benefiting from the project and the groups paying for its costs, the analyst can extract valuable information about incentives for these groups to implement the project as designed, or to support it or oppose it.

A thorough evaluation should summarize all the relevant information about the project. To look at the project from society's and the implementing agency's viewpoint, to identify gainers and losers, and ultimately to decide whether the project can be implemented and sustained, it is necessary to integrate the financial, fiscal, and economic analyses and identify the sources of the differences.

Cash Flow Analysis

We base financial analysis of projects on cash flow analysis. For every period during the expected life of the project, the financial analyst estimates the cash the project is likely to generate and subtracts the cash likely to be

needed to sustain the project. The net cash flows result in the financial profile of the project. Because we base the financial evaluation of a project on cash flows, it omits some important items that appear in profit-and-loss statements. For example, we use depreciation and depletion charges in income statements and balance sheet accounting to arrive at an estimate of net profit. These concepts are imputed financial costs that do not entail cash outlays and consequently do not appear in either the financial or economic flows used to calculate NPVs and rates of return (IRRs).

Sunk Costs: /Bygones are bygones!!

For both financial and economic analysis, the past is the past. What matters are future costs and future benefits. Costs incurred in the past are sunk costs that cannot be avoided. When analyzing a proposed project, sunk costs are ignored. Economic and financial analyses consider only future returns to future costs.

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. As a ridiculous extreme, consider a bridge that needs only one dollar to be completed in order to realize any benefits.

The returns to the last dollar may be extremely high, and the bridge should be completed even if the expected traffic is too low to justify the investment and the bridge should never have been built in the first place. However, arguing that a project must be completed just because much has already been spent on it is not valid. To save resources, it is preferable to stop a project midway whenever the expected future costs exceed the expected future benefits.

On the other hand, although stopping a partially completed project may be more economical than finishing it, closing a project is often costly. For example, one may have to cancel partially completed contracts, and lenders may levy a penalty. Such costs have to be taken into account in deciding whether or not to close the project. Similarly, the cash flow of a project should show some liquidation value at the end of the project. This liquidation value should be counted as a benefit. Sometimes, to focus attention on the years for which the information is more reliable, we use the estimated liquidation value of a project as of a certain year.

Exercise: Consider yourself as an advisor to a newly appointed president

of AAU or you are the new president of the AAU. Note that there is an on going project in the FBE. If there is a change of authorities and one of the decision problem faced by the new president is whether to proceed with the investment or to stop it.

i. What is the general approach of dealing with the sunk costs?

ii. Given the fact that already spent investment is Birr 150,000 and the additional investment cost required to complete the project is Birr 180,000 and the total benefit of the project after its completion is Birr 200,000, what should be the decision? Should we proceed with the investment or stop the investment? Why?

Given the fact that already spent investment is Birr 150,000 and the additional investment cost required to complete the project is Birr 210,000 and the total benefit of the project after its completion is Birr 200,000, what should be the decision? Should we proceed with the investment or stop the investment? Why?

iv. Given the above data on 'iii' above and the cost of quitting the project is around Birr 20,000 for compensating the contractor, what is the decision? Should one continue or stop?

Answers:

ii. Initial investment=sunk cost=150,000 and additional investment=180,000 and total benefit after completion=200,000. $180,000 < 200,000$ $C < B$ So proceed with the investment. Why net benefit is greater than incremental cost of 180,000.

iii. Initial investment=sunk cost=150,000 and additional investment=220,000 and total benefit after completion=200,000. So $210,000 > 200,000$ $C > B$ So quite the investment as the incremental cost is greater than benefits..

iv. Given that Initial cost/sunk cost=150,000 and additional investment =210,000; benefits=200,000 and cost of liquidation =20,000. Benefit + possible cost of liquidation of 20,000=220,000 which is greater than the incremental costs.

Physical Contingencies (+)

Physical contingencies represent expected real costs and, unlike price contingencies, we include them in project economic costs in the analysis.

Physical contingencies may be allocated to specific items of cost, or they may be unallocated, that is, not attributable to expected cost increases for any specific item in the project costs.

Transfer Payments (-)

(But + when assessing losers & gainers of a project)

Some payments that appear in the cost streams of financial analysis do not represent economic costs, but merely a transfer of the control over resources from one group in society to another. Transfer payments involve the transfer of claims over real resources from one person or entity in society to another, rather than payments made for the use of or received from the sale of any good or service.

Thus transfer payments are payments made among different persons/economic agents/ but they are not related to any particular resources cost. So they do not reflect changes in the national economy. The term direct transfer payment notifies payments that show up directly in the project accounts but do not affect National income. Direct transfer payments redistribute national income and generally affect the government treasury, positively or negatively. When looking at the project from the project entity's point of view, taxes and subsidies affect the benefits and costs of the project. When looking at the project from society's viewpoint, however, a tax for the project entity is an income for the government, and a subsidy for the entity is a cost to the government; the flows net out. Hence transfer payments have to be excluded from all estimates of economic costs and benefits during the economic analysis of a project.

It is to be noted that transfer payments affect the distribution of income though they don't affect the overall level of resources available to the economy/society/. Taxes and subsidies should not be disregarded altogether. Transfer payments affect the distribution of project costs and benefits and, hence, are important to assess gainers and losers. If taxes and subsidies render a project unfeasible from the project entity's viewpoint, they are important in assessing project sustainability. A complete profile of the project should identify not only the amounts involved in taxes and subsidies but also the groups that enjoy the benefits and bear the costs. Usually, the government collects the taxes and pays the subsidies. In these cases, the difference between the financial and economic analysis accounts for a major portion of the fiscal impact of the project.

Taxes versus User Charges (-T and + Charges)

Some care must be exercised in identifying taxes. Not all charges levied by governments are transfer payments. Some are user charges levied in exchange for goods sold or services rendered. Water charges paid to a government agency, for example, are a payment by farmers to the irrigation authority in exchange for the use of water. Whether a government levy is a payment for goods and services or a tax depends on whether the levy is directly associated with the purchase of a good or a service. Also, it must accurately reflect the real resource flows associated with its use. For example, irrigation charges frequently do not cover the true cost of supplying the service. While they indicate a real resource flow as opposed to a pure transfer payment, the real economic cost would be better measured by estimating the long-run marginal cost of supplying the water and showing the difference as a subsidy to water users.

Subsidies (-)

Subsidies are taxes in reverse. They shift control over resources from the giver to the recipient and do not constitute a cost to society. As with taxes, analysts must keep track of the recipient's benefit and the giver's cost to present a complete picture of project flows. Because the flows net out, they are not a cost to society. Nevertheless, because subsidies often flow from the government to the project entity, they are part of the project's fiscal impact, and analysts must take care to show them explicitly.

Donations and Contributions in Kind (+)

In some cases, the project entity receives goods and services free of charge. For example, hospitals may receive costly medical equipment as gifts from the private sector or nongovernmental organizations. When evaluating projects from society's viewpoint, it is important to include these items. It is customary to impute a value to the goods and services so rendered by valuing them at their market price as a first approximation to their economic cost.

Interest Payments and Repayment of Principal (-)

Financial costs are an important component of a firm's income statement. Debt service—the payment of interest and the payment of principal—entails cash outlays, but is never the less omitted from economic and financial analysis. In both cases assessing the quality of the project independently of its financing mode is what matters most. Another reason for excluding debt service from economic analysis is that debt service does not entail a use of

resources, but only a transfer of resources from the payer to the payee. Gittinger states the rationale clearly:

From the standpoint of the farmer [who receives a loan], receipt of a loan increases the production resources he has available; payment of interest and repayment of principal reduce them. But from the standpoint of the economy, things look different. Does the loan reduce the national income available?

No, it merely transfers the control over resources from the lender to the borrower... A loan represents the transfer of a claim to real resources from the lender to the borrower. When the borrower pays interest or repays the principal, he is transferring the claim to the real resources back to the lender--but neither the loan nor the repayment represents, in itself, use of the resources (Gittinger 1982, p. 52).

Interest during Construction (-)

Sometimes lending institutions capitalize the interest during construction; that is, they add the value of interest during construction to the principal of the loan and do not require any interest payments until the project begins to generate income. Whether the bank capitalizes the interest or not, we treat the interest the same for purposes of economic analysis. Interest during construction is still a transfer, and we omit it from the economic accounts.

Externalities ($\pm$)

A project may have a negative or positive impact on specific groups in society without the project entity incurring a corresponding monetary cost or enjoying a monetary benefit. For example, an irrigation project may lead to a reduced fish catch. The reduction in fish catch would represent a cost to society that fishermen would bear, yet the monetary flows of the project entity would not necessarily reflect this cost. Analysts should consider these external effects, known as externalities, when adjusting financial flows to reflect economic costs. If the cost were measurable in monetary terms, we would gain an important insight into the incentives that fishermen would have to oppose the project.

Consumer Surplus (+)

In some cases, a project may not only increase output of a good or service but also reduce its price to consumers. When a project lowers the price of its output, more consumers have access to the same product, and the old consumers pay a lower price for the same product. Valuing the benefits at

the new, lower price understates the project's contribution to society's welfare. If the benefits of the project are equated with the new quantity valued at the new price, the estimate of benefits ignores consumer surplus—the difference between the maximum amount consumers would be willing to pay for a product and what they actually pay. In principle, this increase in consumer surplus should be treated as part of the benefits of the project. There may also be a gain in consumer surplus without any decline in price. If supply is rationed at a price below what consumers would be willing to pay, an increase in supply at the same controlled price involves a gain in consumer surplus over and above what consumers actually pay for the increase. This may be particularly significant for public utility projects.

Determining Economic Values

Traded and Non Traded Goods

Once it is agreed that market prices are inappropriate in project selection the question that arises would be how the necessary accounting prices should be estimated.

In principle, it would be proper to adjust all prices to reflect opportunity costs of all outputs and inputs. However, if we adjust all prices, these adjustments would be extremely time-consuming and expensive calculations. In practice, analysts undertake few adjustments and concern themselves primarily with adjustments of the prices of main tradable goods, the exchange rate, and some of the factor prices, mainly the wage rate.

The valuation of inputs and outputs depends on whether the good can be traded in international market or whether it is consumed locally such as in a closed economy. Such classification of the goods (both outputs and inputs) is important because the valuation of each type of a group of good is different.

Project outputs (Goods and services) and inputs can be classified as:

- a. Tradable goods;
- b. Non tradable goods

Non-Tradable Goods

The non-tradable goods are goods that do not enter into the international trade because of their:

- Nature or physical characteristics: Perishable and/or bulky goods, goods for which there is only endogenous taste/demand/ (Like Teff in Ethiopia);
- Economics of trading: cost and/or quality performance of products;
- Policy barriers that affect international trade.

Non-tradable goods are those goods by their nature either cannot be traded or are uneconomical to trade internationally. Non tradable goods include goods for which the costs of production and transportation are so high as to preclude trade, even under conditions of free trade. In principle, a good falls into this category if:

- $CIF > \text{Market Prices}$: If the CIF cost or landed price of a good is greater than the local cost/market prices/, importation of the same is precluded. Example, until recently in Ethiopia, oranges, sugar, cement etc are not being imported even if there are shortages in the domestic supply because of the fact that the CIF prices are higher than the domestic market prices.
- $FOB \text{ prices} < \text{Market Prices}$: If the local costs are greater than the FOB price, then exportation is precluded. In Ethiopia many goods fail to enter into the international trade because of cost/price in competitiveness. Example: many textile and garment and tannery and leather products (shoes and leather clothes).

So the non-tradable inputs and outputs of a project cannot be valued directly at border or world prices. The economic value of non-traded goods depends on whether their production is assumed to be fixed or variable. If production is assumed to be variable it is assumed that the use of one more unit of a non-traded item will cause the output to increase by a similar amount. The cost to the economy is then the long run marginal cost of producing the extra item.

In some cases it is possible that the supply of a non-traded good is fixed. In such cases the economic value would be estimated by consumer 'willingness to pay' (WTP) on the assumption that the use of the item deprives the alternative user of a value represented by their WTP.

The most important non traded items include:

1. Non traded agricultural products, teff in Ethiopia;
2. Electricity; It is rarely transmitted across frontiers.

3. Transport; usually, inland transportation;
4. Water;
5. Construction;
6. Services; real estate, hotel accommodation, haircuts, and other services are non-tradable goods;
7. Some industrial products, like cement which is bulky to transport;
8. Land and unskilled labor are always non-tradable goods/factors.

Technological developments are turning a number of non-tradable into tradable goods. Following containerization in the shipping industry bulky products like cement have become tradable goods. For instance, while in Ethiopia cement is non-tradable good till the present (at least before 2006), it is tradable good in the Sudan. The Sudan has been heavily dependent upon imported cement for the last two or so decades because of the fact there has been domestic supply shortfall in the Sudanese cement market. Likewise, perishable products like vegetables and flowers have become tradable goods thanks to refrigerators that extend the effective life of perishable products. Example. Ethiopia has already started flower farming meant to European Union market. A number of countries are doing well in the flower industry. There are a number of Latin American countries known as the Banana Republics, whose economy has been dependent upon the exportation of vegetables, specifically banana.

Tradable Goods

In almost all projects many of the inputs and outputs will be traded goods. Traded goods are defined as inputs and outputs (goods and services) whose use or production causes a change in the country's net import or export position. Tradable goods are those goods for which the economic/opportunity/ costs or benefits derived from their use or creation is determined by their international price. With few exceptions this category includes all those items that are exportable and importable. Traded goods produced or used by a project do not actually need to be imported or exported themselves, but must be capable of being imported or exported. Exportable goods are those whose domestic cost of production is below the FOB export price that local producers can earn for the good on the international market.

Some goods that are not traded in their primary form may be regarded as

indirectly traded if their economic value is derived from the value of a traded processed product.

Examples tradable goods include all kinds of:

- Manufacturing
- Agricultural goods
- Intermediate goods
- Raw materials
- Some services such as tourism and consultancy services

We can classify tradable goods into two other sub-categories:

- Traded goods: Goods that are either imported or exported by the country;
- Potentially traded goods: goods that the country could import or export under conditions of free trade, but does not do so, because of trade barriers such as import duties.

In the case of Ethiopia, the most important tradable goods for detailed considerations in undertaking economic analysis are:

1. Petroleum products;
2. Some major agricultural products (particularly coffee, chat, wheat, livestock, hides and skins, oilseeds and pulses);
3. Nearly all industrial products are traded but it is unlikely that the issue of their valuation will have a major impact on the analysis of most public projects in the last decade or so since the EPRDF government has not been investing in the industrial sector.

The opportunity cost of tradable goods is defined by their border prices. For example, if a project uses an item that could otherwise have been exported, the loss experienced by say the Ethiopian

Economy is represented by the foreign exchange that could otherwise have been earned, that is the export price. Similarly, if a project produced an item that substitutes for imports, the benefit to the Ethiopian economy is the foreign exchange saved by not having to import it that is the import price of the item in question. Differences between the opportunity costs and the market prices may arise either because of trade restrictions or because

of taxes and subsidies. Differences in transport costs also have to be taken into account.

There are different types of traded goods.

1. Imported input;
2. Locally Produced Import Substitute;
3. Exported Output;
4. Diverted Export as an Input.
5. Simultaneously a good can be both import and export good

Some traded goods may be regarded as both imports and exports. This occurs quite frequently in relatively open economies where the same category of good might be both exported and imported. It is particularly likely to be the case for manufactured goods where each category might cover a large number of different products. In such cases, valuation according to opportunity cost principles would be based on a weighted average of the different situations. Such cases are relatively unimportant in Ethiopia because of the small size of the industrial sector, but it is possible that they could become more important in future.

Border Parity Pricing

If the domestic price of inputs a project uses is far higher than under conditions of free trade, a project that uses the protected input may have a low financial NPV. On the other hand, if a project produces a good that enjoys protection, the project's financial NPV may be higher than under conditions of free trade. So the market prices need to be adjusted to reflect the real economic values of tradable inputs and outputs.

In almost all cases, the economic benefits of producing tradable outputs and costs of using tradable inputs are measured by the border price of these inputs and outputs. The opportunity cost of tradable goods is defined by their border prices. The efficiency/shadow prices are border prices determined by international trade. The project inputs and outputs are thus valued on the basis of international trade. The basic assumption here is that international market is less distorted than the domestic market and thus taking international price is more realistic to value the true cost of inputs and outputs.

World prices are normally measured as border prices reflecting the value of a traded good at the border or port of entry (airport or sea port) of a country. Border price is the unit price of a traded good at a country's border or point of entry. Border prices are either CIF or FOB prices suitably adjusted for internal transport and other costs, but net of taxes and subsidies.

It is to be recalled that values in project financial statements will normally be at prices received by the project - ex - factory or farm gate prices or paid by the project for inputs. To move from market to shadow price analysis therefore, shadow prices must be expressed in terms of world prices to the project. This means that for traded goods domestic margins, relating to transport and distribution (including port handling) will have to be adjusted to prices at the border to obtain values at the project level. The decomposition of these margins is referred to as border parity pricing. A parity price or parity economic value is the price or value of a project input & output that is based on a border price adjusted for expenses between border and the project boundary.

The economic principle involved is that production or use of a traded good has a dual effect, both in terms of direct foreign exchange given by the border price of the good and also in terms of the resources that go into its distribution between the project location and the border. To assess the full economic values of a traded good in a world price system requires both its foreign exchange worth at the border, plus the value at world price of the non-traded activities of transportation and distribution required per unit of output.

Recall that for tradable goods,

1. CIF prices < Domestic market prices;
2. Fob prices > Domestic market prices.

Where a project imports an input its border parity price is the CIF price plus transport and distribution costs up to the destination to the domestic market. An importable border price is its

CIF price of imports - its price landed in the importing country before the effects of any tariffs or quantitative restrictions have been added to its price. The landed cost of an import on the dock or other entry point in the receiving country includes the cost of international freight and insurance and often includes the cost of unloading onto the dock. But this excludes any charges after the import touches the dock and excludes all domestic

tariffs and other taxes or fees. The CIF price represents the direct foreign exchange cost of the input up to the port of entry (air port, seaport, land port (eg Moyale)).

Similarly an exportable good should be valued at a border price or FOB export price. For goods that are traded directly by a project the border parity price for the project output is the FOB price minus the value of transport and distribution. The FOB price is the price that would be earned by the exporter after paying any costs to get the good to the border, but before any export subsidies or taxes were imposed. These later costs must be deducted since real resources are required before the good can be exported.

The FOB border price should be netted from handling, transportation and marketing expenses to arrive at the project site price or farm/factory gate price. By subtracting these expenses one arrives at the factory or farm gate value of the exportable output at border prices. The FOB border price is the actual foreign exchange earned from exporting at the export price minus any marketing margins and transport costs to get the good from the project site to the border.

If the project does not actually import or export the goods concerned but produces that save imports (import substitutes) and uses domestic goods that could have been exported (exportable) or could have been imported (importable) the adjustment is less straight forward.

The reason for using border prices to measure the economic value of a project's tradable inputs can be understood in terms of the assumption that the international markets are comparatively competitive and free of distortions. The international price paid for goods and services will be a good measure of the increase in welfare created from consuming the foreign exchange earned by producing a particular tradable goods or service.

Import and Export substitutes

If the project output substitutes for imports the relevant accounting price is the CIF of the substituted import adjusted for marketing expenses as explained earlier. If a project uses as inputs a commodity that could otherwise have been exported, we should value this input at the FOB price adjusted for transportation cost, handling, marketing margins, etc. But potential or expected imports and exports should be treated with caution.

One should check whether a commodity used as project input or output is actually or would definitely be exported or imported.

For traded goods shadow prices are based on prices on the world market, with no reference to value in domestic use or supply. With suitable adjustments world prices provide a norm against which to assess the costs of domestic production of traded goods. But finding an appropriate world price may be difficult since export may go to different countries or imports may come from many countries with differing imports or export prices. Under such circumstances one approach is to take the lowest import price and the highest export price (optimal approach). Another approach may be to take an average. But long run prices instead of temporary prices should be used in project appraisal.

Measuring/Revaluation of Non-Tradable Goods: Conversion Factors

It has been already stated that all project inputs and outputs should be valued at the world prices which are the border prices. World prices are used to measure the opportunity cost to the economy of inputs and outputs, which can be bought and sold on the international market. This means that the world price reflect the terms on which it can buy and sell on the world market.

However, in practice there are some problems. It is always possible that there will be significant number of commodities for which there will be no direct world price to use as a measure of economic value. These commodities fall under the general heading of non trading goods, that is goods which for reasons relating to physical characteristics, costs, or trade policy do not enter into international trade. For some non-tradable goods no reference border prices are available. Example: Teff. For other commodities the local supply price is below the CIF price of potential imports but above the FOB price of potential exports.

In such cases the non-tradable inputs and outputs of the project cannot be valued directly at border or world prices. So the valuation of non-tradable goods at world prices consists of a number of steps.

- a) Net out taxes from the domestic market price of the commodity;
- b) The net of taxes price is decomposed into its traded and non-tradable cost elements. When goods do not enter into international trade by their very nature decomposing is a pre requisite to their valuation in terms of world prices.

For the traded components a border price is available by definition and they are valued at this price. The non-tradable items are further decomposed into traded and non-tradable and the procedure continues until in successive rounds the original inputs or outputs are restated in terms of traded components and labor.

Example: consider the production of electricity from coal.

Major cost elements are

- Coal,
- Transport of coal to its site,
- Transmission costs,
- Wages and salaries, etc.

But this procedure is cumbersome if not difficult because it requires detailed production data and cost, which are not easily available and time consuming. Furthermore, the additional accuracy obtained in successive rounds of decomposition will diminish fast. Thus one or two rounds of decomposition might be sufficient. After one or two rounds, then;

1. The non-tradable components will be valued at the domestic price and multiplied by a conversion factor,
2. Traded components will be valued at border prices and
3. Labor at the shadow wage rate.

If the output of a project is a non-tradable good for which border prices are, however, known and if its domestic supply price is below CIF but above the FOB, a convenient approximation is to value it at the average of the two.

So it is recognized that even when non-tradable goods are decomposed there always remain items that are non-tradable and for which there is only domestic market. Thus some world price equivalent figure needs to be derived for these non-tradable goods. To estimate the accounting prices for all other non-tradable goods (inputs and outputs) we use conversion factors.

Economic Evaluation: National Parameters

In computing border parity prices, we used OER to convert the border prices into local currency. This procedure assumes that OER is appropriate

to make the two prices comparable. Border prices of tradable goods valued at foreign currency and non-tradable services (like local transportation) valued in domestic currency are two prices of two categories of goods. Can they be made comparable? If yes how? These are the two relevant questions. In a way we are talking not of two types of goods, but two types of cost components of one type of tradable good. This cuts across both categories of goods, the tradable and non-tradable goods.

There are some important parameters that have general applicability in the sense that they are used in all projects. These parameters should take the same value in all projects although they can change from time to time. In other words, such parameters are national in that they apply to all projects regardless of their sector, and they are economic because they reflect the shadow price of the items concerned.

For instance, a typical list of national economic parameters may cover conversion factors for:

- Unskilled and skilled labor
- Some of the main non-tradable sectors
- Some aggregate conversion factors such as consumption conversion factor, a standard average conversion factor, the discount rate,
- Shadow foreign exchange rate, etc.

A project analyst can apply these parameters directly to the project under analysis. They are called national parameters to distinguish them from the project specific shadow prices. They are estimated by central planners and are taken as given by the project analyst. How many parameters should be estimated depends upon the economic conditions of the country and the degree of sophistication desired in project analysis. However, a minimum of the following national parameters should be estimated:

- The standard conversion factor;
- The shadow exchange rate
- The shadow wage rate; and

The discount rate;.

6.5.1 A Conversion Factor

A conversion factor is defined as the factor by which we multiply the actual price in the domestic market of an input or output to arrive at its economic/accounting/ price when the latter cannot be observed or estimated directly. The more the inputs and outputs are traded the less will be the need to use conversion factors. The conversion factor is simply the ratio of the shadow price of the item to its market price. A conversion factor is estimated simply by taking the ratio of border prices (world prices) to domestic market prices of the good. The conversion factor for any item 'i' is defined as:

SOCIAL COST BENEFIT ANALYSIS

The Purpose of Social Cost Benefit Analysis

The previous chapters were concerned with the basic tools required for financial and economic appraisal of projects. When undertaking financial and economic project appraisal it is implicitly assumed that income distribution issues are beyond the concern of the project analyst or that the distribution of income in the country is considered appropriate. For a private commercial entrepreneur project choice is a rather simple exercise. If he/she knows his/her objectives, which seems to be a reasonable assumption, all he/she has to do is to ascertain which projects satisfy his/her objectives best. But in most countries governments are not only interested in increasing efficiency but also in promoting greater equity. A financial objective is narrow one for a public agency to pursue and for public decisions; a broader social objective would be more appropriate. In most countries the existing distribution of income is clearly not considered to be ideal by governments or the population. When one project is chosen rather than another the choice has consequences for employment, output, consumption, savings, foreign exchange earnings, income distribution and other things of relevance to national objectives. The purpose of SCBA is to see whether these consequences taken together are desirable in the light of the objectives of national planning. Therefore, a social appraisal of projects goes beyond economic and financial appraisal to determine which project will increase welfare once distributional impact is considered. The project analysts will not be only concerned to determine the level of project's benefits and costs but who receives the benefit and pays the costs. In a situation where a project is only marginal from the point of view of an economic analysis but has strong positive distributional benefits, the analyst may consider a social analysis in addition to the traditional economic analysis.

In an economic analysis of a project it is implicitly assumed that a dollar received by any individual will increase the community's welfare by the same amount as a dollar received by any other individual. But an extra dollar given to a very poor person will usually increase the person's welfare by much more than would a dollar given to a rich person. A rationale in welfare economics for the social analysis of projects is therefore, quite strong, the marginal utility of income of a person who receives a low income is expected to be greater than the marginal utility of income of the same person if he/she receives a high income. An economic analysis of projects A and B would not capture these differences and would merely indicate that both had the same positive impact on community welfare.

Basic Arguments for the Application of Social Cost benefit Analysis

It has been indicated that commercial profitability is measured in terms of the difference between the value of earnings and costs in a certain period. Social cost benefit analysis must go deeper and ask what the meaning of profits is.

1. The price offered in the market is not a good guide to social welfare for it includes the influence of income distribution on the prices offered. One of the simpler means of income redistribution may, in fact be project selection. The choice may be between project A to be located in a poor region or project B to be located in a rich area or between project X which uses a large amount of poor, unskilled labor which might otherwise be unemployed and project Y which uses factors of production supplied by rich people.

2. A project may have influences that work outside the market rather than through it. These effects are called "externalities". Externalities are relevant for social choice and provide a sufficient argument for rejecting commercial profitability as a guide to public policy. Externalities may arise in the process of production (industrial pollution) in the process of consumption (private cars causing overcrowding of roads), and in the process of sales and distributions (shops displays sex shops).

3. Even in the absence of externalities and consideration of income distribution commercial profitability may be misleading because of consumer's surplus.

Distributional Weights

One of the most commonly used methods of undertaking a social cost benefit analysis is to introduce distributional weights into the cash flow.

Distributional weights are attached to changes in income, costs and benefits, received by different income groups, ensuring that a project's impact on the income of the low income groups receive a higher weight than the same dollar impact of the income of the high-income groups. The introduction of these distributional weights enables projects to be assessed on the basis of distributional as well as efficiency objectives.

The introduction of distributional weights into the cash flow

In an economic analysis, project-generated-changes in consumption enjoyed by all income groups are weighted at unit, $d = 1$. In social analysis income accruing to (or being taken from) lower income groups would typically be given a distributional weight greater than one, $d > 1$. On the other hand, income accruing to (or being taken from) a high-income group would be given a weight less than one, $d < 1$. A project that benefit a low income group would therefore have a higher social net present value than one that benefits a high income group, if all other un-weighted costs and benefits remain the same.

Projects A and B are mutually exclusive projects. Project A's cost are borne by the rich and its benefits are received by the poor, while project B is the opposite. Its costs are borne by the poor and its benefits are received by the wealthy. Since the two projects are mutually exclusive the project with the highest NPV should be selected. If an economic analysis were undertaken and distributional weights of unity were applied to the cost and benefits of the two projects, project B would have an NPV of 80 million and project A an NPV of 50 million. Hence project B should be selected. However, if the government decides that it values income going to the poor more highly than income going to the rich and applies a distributional weight of for example $d = 2$ to the low income group's income, A would have a social

NPV of 200 million and project B would have a social NPV of 0. Project A would then be selected on the basis of a social cost benefit analysis. Example: The use of distributional weights in social analysis of projects

		Project A			Project B	
	Poor	Rich		Poor	Rich	
Costs paid by	0	100		80	0	
Benefits received by	150	0		0	160	

If distributional weights	1	1		1	1	
Economic NPV			+50			+80
Therefore Select project B. This is a pure economic analysis with no weight for income distribution						
If distributional weights, d	2	1		2	1	
Cost paid by	0	100		160	0	
Benefits received by	300	0		0	160	
Social NPV			+200			0
Therefore Select project A: this is a SCBA, providing a weight for income distribution.						

Methods of estimating distributional weights

Little and Mirrlees (1974) and then Squire and van der Tak (1975) have suggested that the marginal utilities of income consumption be used to estimate the distributional weights. Among the many possible alternatives, for the normalization of the distributional weights d , of a group in the society that receive a per capita consumption level of c is

$$d = \frac{\text{marginal utility of income at consumption level } C}{\text{Marginal utility of income at the average consumption level}} = \frac{MU_c}{MU_a}$$

The marginal utility of income of a group in the society that receives per capita consumption level of C can be expressed as

$$MU_c = C^{-n}$$

Where n represents the amount by which the government believes that an individual's marginal utility falls as his or her per capita income rises. The higher n is set, the more rapidly the marginal utility of income is assumed to decline as per capita consumption increases and therefore the greater is the apparent commitment of the government to egalitarianism. If n is set equal to zero, the government has no commitment to egalitarianism.

$$d = \frac{MU_c}{MU_a} = \left(\frac{C_a}{C} \right)^n$$

Where

- MU_c is the marginal utility of income of a group in the society that receives a per capita consumption level of C .

- MU_a is the marginal utility of income of a group in the society that enjoys the average per capita consumption level.
- C_a is the average per capita consumption level
- C is the per capita consumption of the group concerned.

If $n = 0$, then $d = 1$, implying that the government considers a one dollar addition to the consumption of one group in society will be equally valuable to a one dollar addition to the consumption of any other group.

If $n = 1$, $d = C_a / C$, then d equals the ratio of average per capita income in the economy to the per capita income of the group whose distributional weight is being assessed. This is likely to be such that $C_a / C > 1$, because the $C < C_a$, after all, we are addressing the problem of disadvantaged groups in a society.

If the target group has an income level that is only half the national average, the group's distributional weight would therefore, be 2. Squire et al, believes that $n = 1$, is the right level for n , but levels of n between zero and 1 also imply a reasonable degree of commitment to egalitarianism.

COST EFFECTIVENESS ANALYSIS METHODS.

Thus far we have focused on cost-benefit analysis. This technique is appropriate for projects with benefits and costs that are measurable in monetary terms. A vast class of projects generates benefits that are not easily measurable in monetary terms. If the project measures its benefits in some non-monetary unit, the NPV criterion for deciding whether or not to implement it cannot be used.

Note that generally, projects can be classified into three distinct groups:

1. Directly productive (agriculture, industry, tourism). Possible to undertake cost benefit analysis (C-B-A).
2. Economic infrastructure (roads, railways, ports, airports, power); Possible to undertake C-B-A.
3. Social infrastructure and services (education, health, housing, water supply, waste water, sewage and effluent). For large proportion of such projects, one cannot use C-B-A analysis and hence the need for cost effectiveness analysis (CEA).

The problems of valuing the benefits of social sector projects stem from three factors:

1. Difficulties in quantifying benefits: The services are often non-priced, provided free of charge but occasionally nominal fees are charged for their use.
2. The existence of sizeable external benefits: It is difficult to capture external benefits (positive externalities).
3. The problem of determining willingness to pay the services: For all goods sold in a market there will be a demand curve which reflects the price consumers are willing to pay for additional units of that good. The goods/services of non-traded sectors like health and educational are not sold in markets and it is difficult to properly determine what people are willing to pay for these social goods or services since better-off users will inevitably express a higher willingness to pay than those who are less well-off.

In situations where it is difficult to measure project benefits in monetary terms the appraiser should attempt to ensure that project resources are used as efficiently as possible. In this situation cost effectiveness analysis (CEA) can be used to identify (BCID, 2003:72):

- Maximum output for a given input (efficiency). Here we have fixed costs and the selection criterion is to opt for the project with the highest benefits.
- Minimum input for a given output (economy). This is a case of fixed benefit and the decision is to select the least cost to attain the fixed benefits.
- Two main techniques exist for comparing projects with benefits that are not readily measurable in monetary terms:
 - Cost-Effectiveness Analysis (CEA) and
 - Weighted Cost-Effectiveness Analysis (WCEA).

In all cases we measure costs as we do it in computing the Cost-Benefit Analysis (Computing economic and financial NPV, IRR). Both CEA and WCEA consist of calculating all the costs, both capital and recurrent, of a project, applying the appropriate shadow prices and discounting the resultant stream to obtain a present value of costs. This procedure is repeated for the main alternative ways of carrying out the project, and the one with the lowest present value of costs is chosen. The main difference

between these two approaches and the Cost-Benefit analysis is in the measurement of benefits.

Cost-effectiveness analysis (CEA): If the benefits are measured in some single no monetary units, such as number of vaccines delivered, the analysis is called cost-effectiveness. We use it to select among programs that try to achieve a given result, such as choosing among several methods to improve mathematical skills.

CEA involves comparing alternative health projects on the basis of costs per year of life gained or alternatively allowing for the impact of the project on morbidity, cost per healthy year of life or disability adjusted year of life gained.

Use of cost-effectiveness analysis for health projects requires that project impact, for example in terms of life or healthy days gained, be identified and compared with project costs, either in financial or economic prices. Both project impact and costs should be linked with particular years of a project's life so that impacts and costs can be discounted to the present. The ratio of discounted costs to the discounted stream of impacts is a measure of cost-effectiveness.

Further CEA can be used when benefits can be quantified in financial terms and are identical for more than one proposed project. CEA is used here to determine which alternative is the cheapest. Whatever other decision rule is applied, the chosen method should normally also be the most efficient way of meeting the objectives of the project.

Weighted cost-effectiveness: If the benefits consist of improvements in several dimensions, for example, morbidity and mortality, then the several dimensions of the benefits need to be weighted and reduced to a single measure. It is used to select among methods that have multiple outcomes. Further example, three methods might be available for raising reading speed, comprehension, and word knowledge. Each method may have a different impact on each of the three dimensions and on cost.

This method enables us to compare the costs of various options with their expected benefits as a basis for making choices.

The choice of technique depends on the nature of the task, the time constraints, and the information available. We would use cost-effectiveness for projects with a single goal not measurable in monetary terms, for example, to provide education to a given number of children. When the

projects or interventions aim to achieve multiple goals not measurable in monetary terms, we use weighted cost-effectiveness; for example, several interventions may exist that simultaneously increase reading speed, comprehension, and vocabulary, but that are not equally effective in achieving each of the goals.

A comparison of methods to achieve these aims requires reducing the three goals to a single measure, for which we need some weighting scheme.

All evaluation techniques share some common steps. The analyst must:

- identify the problem,
- consider the alternatives,
- select the appropriate type of analysis, and
- decide on the most appropriate course of action.

Cost-Effectiveness Analysis

Given that CEA is used in two situations:

- When the benefits of alternative projects is the same and hence the decision problem is to select the efficient one from the alternative projects;
- When the benefit side cannot be measured or expressed in monetary terms and it can be measured in some single non-monetary unit.

To begin with the simpler case, consider the table that follows which compares two alternative malaria eradication programs. Program one is based on vector control and involves spraying against mosquitoes. Program two is based on drug therapy involving malaria clinics. The impact of the former is greater in terms of healthy life days, but its cost effectiveness is less than program two, which is approximately 10 percent cheaper.

Health Project Illustration-Cost-effectiveness

Present Value at 3%

	Program One	Program two
Costs (Birr Millions)	988	846
Health Impact (health days millions)	18	17
Cost-effectiveness (Birr per day) (Cost/Impact)	54.9	49.8

Use of the cost-effectiveness criterion selects the cheapest alternative, which in this case is program two. Observe that the difference between the impacts of the two programs is not significant. But if we select our projects solely on the basis of cost-effectiveness (CE) ratios it is tantamount to saying that the marginal gain between program one and program two is not worth the marginal expense.

But principally, cost effectiveness analysis is applicable when it is not possible/not economic/ to express or measure the benefits of a project in monetary terms and rather we have a single non-monetary measure of the benefit/impact/ of a project. So CEA is used to measure the benefits in non-monetary units, such as test scores, number of students enrolled, or number of children immunized. As an example, suppose we want to evaluate the cost-effectiveness of four options to raise mathematics skills (Levin 1983):

- Small remedial groups with a special instructor
- A self-instructional program supported with specially designed materials
- Computer-assisted instruction
- A program-involving peer tutoring.